RFP OPEN

2019 NATURENET SCIENCE FELLOWSHIP PROGRAM RFP: PROJECT AND MENTOR LIST

FULL-POSTDOCTORAL FELLOWSHIPS

BROWN UNIVERSITY- INSTITUTE AT BROWN FOR ENVIRONMENT AND SOCIETY

REPOWERING

Reducing greenhouse gas emissions from hydroelectric reservoirs more (Re-powering): Many countries are turning to hydropower as a more carbon-neutral form of electricity generation. The Nature Conservancy works with partners around the world, including in Gabon, Central Africa, to reduce the impacts to freshwater biodiversity and local communities from hydropower project siting and operations. Yet hydropower reservoirs are also known as sources of methane, a potent greenhouse gas. What are the key drivers of reservoir methanogenesis, and are there site-specific strategies that can reduce methane emissions from hydroelectric reservoirs in tropical countries, like Gabon, which are poised to increase their hydropower generation in the coming decades? **TNC Mentor:** Allison Aldous, Freshwater Scientist, Oregon Chapter and Gabon Program, aaldous@tnc.org; **University Mentor:** Dr. James Russell, Brown University. [Keywords: decision making]

AGRICULTURE

Phosphorus cycling and sustainable agriculture (Agriculture)- The paradox of phosphorus in sustainable agriculture is that it is both a major contributor to eutrophication and scarcely available to plants because of how quickly it is occluded onto soil particles. Because producing phosphorus fertilizers requires mining rapidly depleting stores of rock phosphate, finding ways to make occluded phosphorus available--while reducing losses to water--is one of the most under-appreciated future challenges for sustainable agriculture. This project welcomes new ideas on how to more efficiently use phosphorus for sustainable agriculture. Research projects could include promoting microbial nutrient mining of stored phosphorus, exploring the potential for organic acid exudates from plant roots in liberating phosphorus, or any other new way of thinking of phosphorus biogeochemistry in agriculture. **TNC Mentor**: Stephen Wood, Applied Soil Scientist- Global Lands, stephen.wood@tnc.org; **University Mentor**: Stephen Porder, Brown University

DECISION MAKING

Understanding Human Responses to Coastal Flooding on the Eastern Shore of Maryland (Decision Making): Research approaches will provide insights into how rural counties on Maryland's Eastern Shore are affected by and respond to environmental changes associated with sea level rise and climate change. Of particular interest are projects that would inform policies related to residential relocation and nature restoration. Applicants with background in anthropology, demography, economics, geography, psychology, public policy, sociology, or another social science discipline with expertise in environmental topics preferred. **TNC Mentor**: Ariana Sutton-Grier, Director of Science, Maryland/DC

Chapter; **University Mentor:** Elizabeth Fussell, Institute at Brown for Environment and Society-Brown University

COLUMBIA UNIVERSITY- EARTH INSTITUTE

ECONOMICS

Economics of connecting solar ground water pumps to the grid (Economics): Farmers in India are beginning to use solar pumps to obtain groundwater. This cheap electricity is very good for farmers but may complete reduce ground water in the aquifers. Thus, we need to figure out a way to connect these pumps to the grid, so farmers can sell their electricity to the grid and not waste ground water. **TNC Mentor:** Priya Shyamsundar, Lead Economist-Global Science, priya.shyamsundar@tnc.org; **University Mentor:** Vijay Modi, Columbia University [Keywords: decision making, social science, re-powering, energy sustainability]

REPOWERING

Optimizing re-powering to benefit people and nature (Re-powering)- As we target re-powering for conservation, central applied questions are (1) what energy hierarchy combinations are realistic (e.g. how much well-sited solar/wind could we really get into the grid? how much hydro power could we get out or not build at all?) and (2) what impacts/trade-offs come with different energy hierarchy combinations? Research approaches should include implementation of a spatially-explicit water-energy model that considers hierarchy of energy across urban and rural/agricultural development and across different development trajectories considered as case studies (e.g. Eastern Africa vs. the Balkans vs. Eastern US) to inform development of global strategies. **TNC Mentor:** Steven Lyon, Freshwater Scientist-New Jersey Chapter, steven.lyon@tnc.org; **University Mentor**: Upmanu Lall, Columbia University [Keywords: spatial science, energy siting, decision making]

Integrating low environmental impact intermittent renewable energy (Re-powering)- Expanding renewable energy generation requires significantly large land areas which can create environmental or social land-use conflict which can impede development. Siting renewable energy on already converted lands (e.g., urban, agricultural lands, etc.), while also considering impacts to existing land use and livelihoods, can reduce the potential for conflict while maintaining existing carbon storage. Given the intermittency of several renewable energy resources (wind & solar), it remains unclear to what degree it will be possible to integrate them into existing, or new, energy systems to meet future targets, and if so at what costs? Analyses will assess these costs along with exploring the possibility of siting renewables on current land incorporating engineering feasibility and economic costs of renewable energy development siting on already converted and unconverted lands in India, the Amazon, and/or the Balkans. Energy system analysis expertise (engineering, economics) preferred. **TNC Mentors**: Joseph Kiesecker, Lead Scientist-Global Lands, jkiesecker@TNC.ORG & Sharon_Baruch-Mordo, Spatial Scientists-Global Lands, sbaruch-mordo@TNC.ORG; **University Mentor:** Vijay Modi, Columbia University [Keywords: repowering, decision making]

AGRICULTURE

RFP OPEN

Monitoring Agricultural Fires and Air Pollution in the Indo-Gangetic Plains (Agriculture): Develop operational remote sensing methods to monitor agricultural fires that degrade air quality in northern India. Ground truth remote sensing data using information from household surveys, develop methods for an operational monitoring system to identify fires from agricultural burning, and support the monitoring of interventions undertaken to reduce agricultural residue burning in northwest India. **TNC mentors**: Priya Shyamsundar**,** Lead Economist, Global Science, priya.shyamsundar@TNC.ORG and Tim Boucher, Senior Conservation Geographer, Global Science; **University mentor:** Arlene Fiore and Ruth deFries, Columbia University

SCIENCE FOR NATURE AND PEOPLE PARTNERSHIP (SNAPP)

The Nature Conservancy is pleased to solicit applications for a special opportunity in partnership with the Science for Nature and People Partnership (SNAPP), which convenes working groups to provide timely and rigorous synthesis science linked directly to sustainable development and conservation solutions. Fellows applying to projects under this heading should discuss with the listed mentors, in addition to their independent project proposal, their involvement in the SNAPP working group and be sure to include how the working group will benefit and/or advance their research. ***[NOTE: Some SNAPP projects are cross-referenced with a University. For cross-referenced projects, when applying please apply under the University NOT under SNAPP]***

ECONOMICS

The Mississippi River Basin Roadmap - Economic and Social Science (Economics): A critical global challenge is meeting growing demand for food while maintaining a healthy environment that provides a range of benefits to society. The Mississippi River Basin (MRB) is an ideal place to address this challenge because it supports some of the most productive agriculture in the world yet is also degraded by land use change, habitat loss and pollution from nutrients and sediment, impacting drinking water and ecosystem health, and causing a persistent and growing "Dead Zone" in the Gulf of Mexico. While there is a strong body of science showing that a variety of conservation and best-management practices (BMPs) can mitigate the impacts of intensive agriculture, there has not been measurable progress on reducing nutrient pollution in the MRB. We think that to catalyze the restoration of the MRB we need to operationalize the science into a shared vision (the "roadmap") that is co- created with key scientists and partners across the many sectors that need and want a healthy MRB. This roadmap will answer a critical unknown: how many acres of which practices implemented where in the MRB are needed to meet nutrient reduction goals and provide additional benefits as cost-effectively as possible. Our research team is applying for a SNAPP project to convene key academic experts and stakeholders from agriculture and other key sectors to co-create the roadmap. This Nature Net fellow would contribute compilation and analysis of agro-economic and ecosystem services valuation data and also support optimization modeling that will highlight strategies to both reduce nutrients and meet multiple ecosystem services objectives. **TNC Mentor**: Bryan Piazza, Director of Fresh Water and Marine Science-Louisiana Chapter, bpiazza@tnc.org, 225-338-1040, ext. 2005; **University Mentor**: Stephen Polasky, University of Minnesota [Cross-referenced: University of Minnesota]

GRASSLANDS AND PRAIRIES

RFP OPEN

FRESHWATER

Integrating analysis of wetlands and in-stream processes into assessments of nutrient reduction in agricultural watersheds (Freshwater) Although numerous studies have evaluated the potential for conservation actions to reduce nutrient loss from agriculture, none yet have completed an integrated assessment of the performance of both in-field practices as well as off-field activities. This project will develop a river nutrient network model that includes fluvial wetlands and floodplains and integrate it with existing watershed models to develop comprehensive model predictions of the nutrient reduction potential of a diverse range of both in-field as well as off-field practices. This project will complement and support a SNAPP working group in which this biophysical information will contribute to an agro-economic analysis of the cost vs. benefit trade-offs of watershed scale intervention options. **TNC mentor**: Kris Johnson, Associate Director for Science and Planning, North America Agriculture Program, kjohnson@tnc.org; **University mentor**: Amy Hansen, Assistant Professor, University of Kansas, amy.hansen@ku.edu

The Mississippi River Basin Roadmap - Ecosystem Science (Freshwater): A critical global challenge is meeting growing demand for food while maintaining a healthy environment that provides a range of benefits to society. The Mississippi River Basin (MRB) is an ideal place to address this challenge because it supports some of the most productive agriculture in the world yet is also degraded by land use change, habitat loss and pollution from nutrients and sediment, impacting drinking water and ecosystem health, and causing a persistent and growing "Dead Zone" in the Gulf of Mexico. While there is a strong body of science showing that a variety of conservation and best-management practices (BMPs) can mitigate the impacts of intensive agriculture, there has not been measurable progress on reducing nutrient pollution in the MRB. We think that to catalyze the restoration of the MRB we need to operationalize the science into a shared vision (the "roadmap") that is co- created with key scientists and partners across the many sectors that need and want a healthy MRB. This roadmap will answer a critical unknown: how many acres of which practices implemented where in the MRB are needed to meet nutrient reduction goals and provide additional benefits as cost-effectively as possible. Our research team is applying for a SNAPP project to convene key academic experts and stakeholders from agriculture and other key sectors to co-create the roadmap. This Nature Net fellow would contribute hydrological and other biophysical modeling and analysis and also support optimization modeling that will highlight strategies to both reduce nutrients and meet multiple ecosystem services objectives. **TNC Mentor**: Bryan Piazza, Director of Fresh Water and Marine Science-Louisiana Chapter, bpiazza@tnc.org, 225-338-1040, ext. 2005; **University Mentor**: Jessica Hellmann, University of Minnesota. [Cross-referenced: University of Minnesota]

REPOWERING

AGRICULTURE

Heuristics and key factors influencing natural capital-based decisions in agriculture (Agriculture): Understanding the tension between private and public benefits of farm management decisions are central to farmer adoption of sustainable or regenerative agriculture practices. Challenges of data availability make using and parameterizing ES models challenging. We suggest that heuristics could be

developed to understand how context (e.g. eco-region, soil, slope, landscape, etc) predicts private and public outcomes of management, thereby simplifying evaluation and expanding inference. **TNC mentor**: Kris Johnson, Associate Director for Science and Planning, North America Agriculture Program, kjohnson@tnc.org; **University mentor**: Eric Lonsdorf and Stephen Polasky, University of Minnesota [Cross-referenced: University of Minnesota]

DECISIONS MAKING

Integrating demand for ecosystem services into prioritization of easements and best management practices (Decision Making): Where does the integration of spatial data on people's preferences and behaviors change the prioritization of conservation actions? This project will work with TNC staff to better integrate information on the societal demand and socio-economic vulnerability of household and communities to changes in ecosystem services. Results will include updated prioritization maps, more robust valuation tools, and integrated biophysical and economic datasets, including expanded work on the social costs of nitrogen and phosphorus pollution. **TNC mentor**: Kris Johnson, Associate Director for Science and Planning, North America Agriculture Program, kjohnson@tnc.org; **University mentor**: Bonnie Keeler, University of Minnesota [Cross-referenced: University of Minnesota]

Linking Capacity Development to Conservation Outcomes and Diversity (Decision-Making): Within the conservation community, capacity development—the ability of individuals, communities, and organizations to develop, enhance and organize their systems, resources and knowledge to perform functions, solve problems and achieve objectives—is often underfunded and under-investigated despite a growing body of evidence that indicates that capacity development is strongly associated with conservation gains. The proposed project will address some of the major knowledge gaps around capacity building programs and collect qualitative and quantitative evidence to help determine the best methods to uncover links between capacity gaps, interventions, and outcomes. Specific questions to investigate in this space include: What can we learn from other fields to demonstrate the impact of investment in capacity development? Is there evidence to support a relationship between investments in capacity building and outcomes, particularly for projects related to topics such as people and nature, land management, global health, and climate science policy? What role does diverse representation and participation play in capacity building and how does this translate to impacts on conservation practice and outcomes? This project will complement and support a SNAPP working group developing a global data hub of conservation-related education, training, learning and funding opportunities and recommendations and guidelines for capacity building programs at conservation organizations. Successful candidates will have experience with the methods of literature or systematic reviews, in particular knowledge in evaluating study design and quality of evidence, quantitative methods (e.g. regression, meta-analysis, multi-level models), monitoring, and evaluation. Experience coordinating large collaborative groups a plus. **TNC Mentor:** Dawn O'Neal, Director of NatureNet Science Fellowship and Science Impact Project, Global Science, dawn.oneal@tnc.org; **University Mentors:** Eva (Nora) Bynum, Executive Director Amazon Center for Environmental Education and Research, ebynum013@gmail.com and Ana Porzecanski, Director Center for Biodiversity and Conservation, American Museum of Natural History

RFP OPEN

Connected and conserved landscapes to improve ecosystem health and human well-being (Decision-Making): Connectivity conservation on a large landscape scale provides the possibility of meeting the twin goals of protecting nature and improving human well-being through the maintenance of ecosystem structure and function, which in turn ensure critical ecosystem services that meet human needs. The goal of this postdoctoral position is to conduct analyses with an interdisciplinary SNAPP working group focused on specific relationships between connectivity and the intended outcomes of terrestrial conservation, including maintaining ecosystem structure (for nature) and providing health and economic benefits (for human well-being). Analyses of patterns and relationships will be conducted at global and regional scales, with a focus on model specification and causal analysis for landscapes in four social-ecological regions of the globe: Australia (Gondwana/Great Eastern Ranges), Northern Rocky Mountains (Yellowstone to Yukon), Brazil (Cerrado and Atlantic Forest), and the Eastern Himalayas (Terai Arc and Bhutan). The NatureNet Fellow will work with the interdisciplinary team to compile and reconcile data that characterize connectivity, ecosystem structure, and human well-being, and the Fellow will conduct analyses to identify patterns and causal paths in relationships between connectivity, ecological health and human well-being. **TNC Mentor:** Christina Kennedy, Senior Scientist, Global Conservation Lands, ckennedy@tnc.org; **University Mentor:** Andrew Gonzalez, Professor, Biology, McGill University

A Science-Based Framework for an Atmospheric Recovery Plan: Criteria and Guidance for Implementing Natural Climate Solutions Projects (Decision-Making) If there existed an "Atmospheric Recovery Trust" with billions of dollars in it, what science-based guidelines and criteria should be used to invest funds to best remove carbon from the atmosphere via Natural Climate Solutions? This postdoc will engage with a working group of global experts to answer this question. Existing literature demonstrates potential for natural carbon solutions (NCS) to remove significant quantities of atmospheric carbon and sequester it in soils and vegetation, while achieving substantial ecosystem co-benefits. These strategies include reforestation and improved forest management; wetland and mangrove restoration; regenerative agriculture; and improved grassland/rangeland management, among others. But those solutions cannot find broad application until they are translated into science-based guidance and prescriptions suggesting where and how to invest funds and what to require of landscape projects to achieve desired carbon sequestration benefits. The existence of such guidance would build the confidence that land owners, managers, private funders, and courts presiding over climate cases need to invest in NCS. **TNC Mentor**: Joe Fargione, Science Director - North America Region jfargione@tnc.org; **University Mentors**: Richard Houghton - Woods Hole Research Center rhoughton@whrc.org; Johnathan Sanderman - Woods Hole Research Center jsanderman@whrc.org

FORESTS

Restoring the Northern Forest for Economic and Climate Change Resilience (Forests): A review of the most recent US Forest Service Forest Inventory and Analysis (FIA) data shows that 40% of the forestland of the 26-million-acre Northern Forest (Maine, New Hampshire, Vermont, and northern New York) is in a degraded condition. That is, a significant area of forest lacks sufficient stocking of current or potential future merchantable timber to maintain sustainable production in working forests throughout the region. This project will model forest management pathways for degraded stands to understand how foresters and landowners might rehabilitate their property to conditions that meet a range of economic

and ecosystem service objectives. This Nature Net Fellow would be responsible for conducting forest growth and harvest modeling work using the USFS Forest Vegetation Simulator and FIA and landowner-specific forest inventory data. The Fellow will then use the results to create "dashboards" that allow users to understand how pulling various levers (e.g., forest management practices, policies, and incentives) can change timber and ecosystem service outcomes. The Fellow will also assist with coordinating the SNAPP working group meetings during the first year, which will be focused on soliciting input on practices, policies, and incentives required to restore the Northern Forest. **TNC Mentor**: Peter Ellis pellis@tnc.org; **University Mentor**: Dr. John Gunn, john.gunn@unh.edu, University of New Hampshire.

URBAN CONSERVATION

MARINE AND FISHERIES

STANFORD UNIVERSITY

GRASSLANDS AND PRAIRIES

Manipulating soil biodiversity to improve native species restoration (Grasslands and Prairies)- There is growing interest at the Conservancy in using mycorrhizal inoculation to give native species restoration an advantage over invasive species. We have begun exploring this in several chapters. But the science is very unclear about if this should actually be an effective practice and what are the best ways to do it. This fellowship will be in partnership with a mycorrhizal, plant-feedback ecologist to dig into whether this strategy could be an effective way to transform or native species restoration work at the Conservancy. The project will include a mix of field work and lab work. Candidates should have a background in microbial and plant ecology, such as in the area of plant-soil feedbacks. **TNC Mentor**: Stephen Wood, Applied Soil Scientist- Global Lands; **University Mentor**: Kabir Peay, Stanford University

FORESTS

Quantifying and Monitoring Tropical Forest Degradation with Remotely Sensed Data: How can countries demonstrate the success or failure of policies to reduce forest degradation? Nature conservancy research has identified natural forest management, reduced woodfuel, and improved silviculture as significant natural climate solutions, and many countries are now integrating these strategies into international biodiversity and climate commitments. However, all three pathways lack the science to inform implementation and measure performance. TNC Scientists are currently investigating the use of field sampling methodologies (e.g. Reduced Impact Logging for Carbon (RIL-C)) and airborne surveys (Lidar), but neither of these data sources are available at scale. Therefore, we are interested in research to investigate the potential for new remote sensing data such as synthetic aperture radar (SAR) to measure forest degradation from logging, fire, and woodfuel collection. SAR data is now publicly available, but no good systems are in place for delivering maps or consistent performance metrics. In addition, TNC RIL-C and Lidar source data can be used to calibrate and validate signals provided by SAR and other Remote Sensing data. Research approaches should consider efficient data processing workflows that can provide timely and accurate maps of forest degradation at scale, ideally in the form of interactive web-based platforms that can be readily interpreted and used to

inform policy and regulate implementation of conservation interventions designed to mitigate forest degradation. **TNC Mentor:** Peter Ellis, Forest Carbon Scientist, Global Lands Carbon Science Team, pellis@tnc.org; **University Mentor:** Alex Konings, Stanford University

UNIVERSITY OF CALIFORNIA, LOS ANGELES- INSTITUTE OF ENVIRONMENT AND SUSTAINABILITY

FRESHWATER

Predicting observed instream flows for ungaged streams in California (Freshwater)- Managing stream flows for ecological outcomes requires understanding the natural flow regime, the current (observed) flow regime, and flows needed to achieve ecological objectives. We have developed an approach to predict natural (unimpaired) flow metrics for all streams and rivers in California (gaged and ungaged) and are currently modifying that approach to develop environmental flow recommendations statewide. However, we do not have a method to accurately predict observed flows for all streams in California. Estimates of observed flows are required to determine the type and degree of alteration to instream flows and prioritize management actions to add water back instream when and where it is needed. **TNC Mentor:** Julie Zimmerman, Lead Scientist- California Chapter, julie.zimmerman@tnc.org; **University Mentor:** Richard Ambrose, University of California-LA

Refine California's statewide environmental flow recommendations though development of flow-ecology relationships for key species and communities (Freshwater)- We have advanced an approach to develop environmental flow recommendations that will apply to all streams and rivers in California, both gaged and ungaged, based on functional flow metrics that characterize key components of the natural hydrograph. Under a proposed 2-tiered environmental flows framework for California, the functional flows approach can be further refined according to ecological and water management objectives. Further refinement would require identification of objectives and flow-ecology relationships that can illustrate trade-offs between flow and ecological outcomes. How can we best develop flow-ecology relationships to inform refinement of flow recommendations for California streams? This could be accomplished as a state-wide analysis, for a particular stream class or classes, or as a case study of one or more watersheds. **TNC Mentor:** Julie Zimmerman, Lead Scientist- California Chapter; julie.zimmerman@tnc.org ; **University Mentor**: Richard Ambrose, UCLA (IOES) – rambrose@ucla.edu

DECISION MAKING

Enabling Consumer Demand for Sustainable Products (Decision Making)-Information is potentially a powerful tool to move consumers towards sustainable behavior, and it is more readily available than ever before. However, many consumers have yet to use sustainability criteria to drive their purchases. Proposed research approaches will experiment with different eco-label strategies to drive consumers towards sustainable behavior with a social science focus including but not limited to economics, business strategy, management, marketing, communication or psychology. Empirical approach will include survey experiment and quantitative analysis. **TNC Mentor**: Jon Fisher, Center for Sustainability Science; **University Mentor**: Magali (Maggie) Delmas, University of California-LA

FORESTS

RFP OPEN

Catalyzing private landowners to implement improved natural forest management (Forests): Improved natural forest management (NFM) is one of the most significant potential natural climate solutions (NCS) in the United States and must be rapidly adopted by private landowners to reach its potential. However, large evidence gaps remain around 1) the degree to which NFM is already practiced in the U.S., 2) the receptivity of private landowners to implementing NFM practices, and 3) the set of incentives most likely to influence adoption of NFM practices. Working with a diverse team, proposed approaches should include a systematic literature review on NFM practices likely to have a carbon benefit in the U.S. and the development of a research design (including surveys, focus groups, and experiments) that tests a set of incentives to overcome barriers to adoption of NFM practices among private forest landowners. **TNC Mentors:** Yuta Masuda, Senior Sustainable Development and Behavioral Scientist, Global Science, ymasuda@tnc.org & Joe Fargione, Lead Scientist, North America Region, jfargione@tnc.org; **University Mentor:** Hal Hershfield, University of California-LA

UNIVERSITY OF MINNESOTA - INSTITUTE ON THE ENVIRONMENT

ECONOMICS

Identifying Landscape-Level and Local-Level Natural Infrastructure Solutions for Toxic Release Management in the U.S. (Economics): How do we successfully incorporate toxic release and management data into landscape level tools? How do we use toxic release data to identify improved private and public natural infrastructure solutions for managing the spread of these chemicals? Research approach should consider inclusion of economic factors in the distribution of these chemicals over time as well as in their management. **TNC Mentor:** Martha Rogers, Natural Capital Economist-Center for Sustainability Science, martha.rogers@tnc.org **University Mentor:** Justin Johnson, University of Minnesota

The Mississippi River Basin Roadmap - Economic and Social Science (Economics): A critical global challenge is meeting growing demand for food while maintaining a healthy environment that provides a range of benefits to society. The Mississippi River Basin (MRB) is an ideal place to address this challenge because it supports some of the most productive agriculture in the world yet is also degraded by land use change, habitat loss and pollution from nutrients and sediment, impacting drinking water and ecosystem health, and causing a persistent and growing “Dead Zone” in the Gulf of Mexico. While there is a strong body of science showing that a variety of conservation and best-management practices (BMPs) can mitigate the impacts of intensive agriculture, there has not been measurable progress on reducing nutrient pollution in the MRB. We think that to catalyze the restoration of the MRB we need to operationalize the science into a shared vision (the “roadmap”) that is co- created with key scientists and partners across the many sectors that need and want a healthy MRB. This roadmap will answer a critical unknown: how many acres of which practices implemented where in the MRB are needed to meet nutrient reduction goals and provide additional benefits as cost-effectively as possible. Our research team is applying for a SNAPP project to convene key academic experts and stakeholders from agriculture and other key sectors to co-create the roadmap. This Nature Net fellow would contribute compilation and analysis of agro-economic and ecosystem services valuation data and also support optimization modeling that will highlight strategies to both reduce nutrients and meet multiple

ecosystem services objectives. **TNC Mentor**: Bryan Piazza, Director of Fresh Water and Marine Science-Louisiana Chapter, bpiazza@tnc.org, 225-338-1040, ext. 2005; **University Mentor**: Stephen Polasky, University of Minnesota [Cross-referenced: SNAPP]

GRASSLANDS AND PRAIRIES

Prairie Strips in agricultural landscapes: Soil carbon sequestration and water quality improvements (Grasslands and Prairies): Prairie Strips, pioneered at Iowa State University, are a novel approach to strategic integration of native vegetation into crop fields—with demonstrated benefits to water quality. What is the potential of this approach to sequester soil carbon in agricultural landscapes over time, and thus contribute to a "Natural Climate Solution" mitigation strategy? **TNC mentor**: Meredith Cornett, Director of Conservation Science – MN,ND,SD, mcornett@TNC.ORG; **University mentor**: Kate Brauman, University of Minnesota

Are we turning wild plant species into crops? (Grasslands and Prairies): Mass quantities of native seed are required for prairie restorations and the native seed industry has increasingly relied upon large-scale farming methods to increase seed harvest. The process of wild seed collection, farm production, and restoration plantings can cause drift and unconscious selection that promotes the evolution of domestication traits in wild plants. These changes may be maladaptive when farm-grown restoration propagules are planted back into nature, but the extent to which this occurs is unknown because nobody has tested it. Evaluate the effects of commonly used seed collection and plant propagation methods on traits and genetic diversity important for the success of prairie restoration. Compare establishment and survival of wild-collected and farm-produced seeds at active restoration sites. Collect seeds using different methods and rear these plants in a farm production garden to generate additional seed. Compare wild-collected and farm-produced seeds in a greenhouse to monitor trait changes and analyze DNA for changes in genetic diversity. **TNC mentor**: Marissa Ahlering, Lead Prairie Ecologist, MN/SD/ND Chapter, mahlering@TNC.ORG; **University mentor:** Julie Etterson and Briana Gross, University of Minnesota

Adapting managed disturbances in grasslands to climate change and conservation directives? (Grasslands and Prairies) The diversity and function of grassland ecosystems relies on disturbance. Substantial resources are dedicated to mimicking these disturbances, but climate change creates challenges for these management efforts and may require alternative strategies. Shifts in disturbances and therefore plant communities could also impact carbon storage and productivity for agricultural livestock production on native rangelands. We are interested in identifying and evaluating new and innovative management techniques or disturbance regimes that can help maintain or increase resilience and carbon storage on the remaining grasslands in an effective and efficient way. Improved management of native rangelands will also have implications for ranching communities faced with trying to raise livestock under increased climate and drought variability. **TNC Mentor:** Marissa Ahlering, Lead Prairie Ecologist, MN-ND-SD Chapter, mahlering@tnc.org; **University Mentor:** Laura Dee, Department of Fisheries, University of Minnesota [Keywords: carbon storage, biodiversity, sustainable livestock production]

FRESHWATER

RFP OPEN

Prioritizing wetland restoration sites in the upper Mississippi Watershed (Freshwater): Assess optimal locations for placement of restored wetlands for increasing water storage, carbon storage, and water quality treatment in the Upper Mississippi basin. Given limited resources and multiple needs to protect water quality in a rapidly evolving landscape there is a strong need to develop an approach for prioritizing wetlands restored for nutrient removal, water storage and/or for carbon storage. Using a combination of GIS analysis and field collection of soil organic carbon (SOC) data, build on existing data sets and knowledge bases to develop an approach for optimizing wetland restoration locations for multiple goals. **TNC mentor:** Kristen Blann, Freshwater Ecologist, MN-ND-SD Chapter, kblann@TNC.ORG; Chris Lenhart, Restoration Scientist, MN-ND-SD Chapter, christian.lenhart@TNC.ORG; **University mentor:** John L. Nieber, University of Minnesota

The Mississippi River Basin Roadmap - Ecosystem Science (Freshwater): A critical global challenge is meeting growing demand for food while maintaining a healthy environment that provides a range of benefits to society. The Mississippi River Basin (MRB) is an ideal place to address this challenge because it supports some of the most productive agriculture in the world yet is also degraded by land use change, habitat loss and pollution from nutrients and sediment, impacting drinking water and ecosystem health, and causing a persistent and growing "Dead Zone" in the Gulf of Mexico. While there is a strong body of science showing that a variety of conservation and best-management practices (BMPs) can mitigate the impacts of intensive agriculture, there has not been measurable progress on reducing nutrient pollution in the MRB. We think that to catalyze the restoration of the MRB we need to operationalize the science into a shared vision (the "roadmap") that is co- created with key scientists and partners across the many sectors that need and want a healthy MRB. This roadmap will answer a critical unknown: how many acres of which practices implemented where in the MRB are needed to meet nutrient reduction goals and provide additional benefits as cost-effectively as possible. Our research team is applying for a SNAPP project to convene key academic experts and stakeholders from agriculture and other key sectors to co-create the roadmap. This Nature Net fellow would contribute hydrological and other biophysical modeling and analysis and also support optimization modeling that will highlight strategies to both reduce nutrients and meet multiple ecosystem services objectives. **TNC Mentor**: Bryan Piazza, Director of Fresh Water and Marine Science-Louisiana Chapter, bpiazza@tnc.org, 225-338-1040, ext. 2005 **University Mentor**: Jessica Hellmann, University of Minnesota. [Cross-referenced: SNAPP]

Balancing groundwater-based irrigation with freshwater conservation (Freshwater): Groundwater-based irrigation is on the rise as other water sources become more unpredictable in a changing climate; as a result, groundwater levels are dropping world-wide. This has fueled interest in improving the efficiency with which groundwater is exploited and used in the agricultural sector. At the same time, groundwater provides critical climate refugia for many threatened, endangered, and sensitive aquatic species, which also are stressed by over-exploitation from the agricultural sector. How can irrigation systems be modernized while also protecting the many aquatic species dependent on this source of water? **TNC Mentor:** Allison Aldous, Freshwater Scientist, Oregon Chapter and Gabon Program, aaldous@tnc.org, 503-802-8100; **University Mentor:** Kate Brauman, University of Minnesota

RFP OPEN

Restored Wetlands: Reactive Species Production - Carbon, Nutrient, and Pesticide Cycling (Freshwater): Wetlands are critical places that drive carbon cycling and are locations where nutrient management and pesticide destruction is facilitated. Both sunlight and chemical gradients lead to production of reactive species which will drive carbon processing, nutrient turnover, and pesticide degradation. This project would seek to understand if restored wetlands function similarly to natural wetlands with respect to these biogeochemical reactions. Glacial Ridge in Polk County, MN would be the target site. **TNC mentor:** Marissa Ahlering, Lead Prairie Ecologist, MN/SD/ND Chapter, mahlering@TNC.ORG; **University mentor**: William Arnold, University of Minnesota

AGRICULTURE

Value of nature in agricultural landscapes: **Examining the role of behavioral and economic instruments (Agriculture):** This project seeks to understand how the inclusion of diverse forms of values (cultural, relational, stewardship) influence conservation decision-making on private lands. Researchers should have experience and interest in behavioral and ecological economics, social psychology, cultural ecosystem services, or the human dimensions of natural resource management. Activities include integration of multiple value elicitation methods (discursive, participatory, deliberative) and the testing of behavioral and economic instruments (commitments, pledges, social rewards versus payments etc.) in order to better understand the values and programs that drive conservation decisions in agricultural landscapes where TNC operates. **TNC mentors**: Martha Rogers, Natural Capital Economist, Center for Sustainability Science, martha.rogers@TNC.ORG and Priya Shyamsundar, Lead Economist, Global Science, priya.shyamsundar@TNC.ORG; **University mentor**: Bonnie Keeler, University of Minnesota [Keywords: social science, decision-making]

Heuristics and key factors influencing natural capital-based decisions in agriculture (Agriculture): Understanding the tension between private and public benefits of farm management decisions are central to farmer adoption of sustainable or regenerative agriculture practices. Challenges of data availability make using and parameterizing ES models challenging. We suggest that heuristics could be developed to understand how context (e.g. eco-region, soil, slope, landscape, etc) predicts private and public outcomes of management, thereby simplifying evaluation and expanding inference. **TNC mentor**: Kris Johnson, Associate Director for Science and Planning, North America Agriculture Program, kjohnson@tnc.org; **University mentor**: Eric Lonsdorf and Stephen Polasky, University of Minnesota [Cross-referenced: SNAPP]

Can silvopastoral systems be scaled for people and nature? (Agriculture)- Silvopastoral systems for beef production are often reported to offer substantial benefits over conventional production, both for ranchers and conservation. The Nature Conservancy and many of its partners promote this strategy for restoring degraded lands. However, data on these benefits are sparse, and it is not yet clear what the major barriers to adoption are. The fellow for this project would begin by synthesizing the evidence on which benefits—including biodiversity, carbon storage, reductions in deforestation, climate adaptation, and farmer income—are most likely to accrue under which contexts. They would then assess socioeconomic barriers to adoption and explore the potential solutions for increasing adoption and measuring effectiveness of restoration efforts. **TNC Mentor**: America Melo, GIS Specialist GEF/ICF, N

RFP OPEN

Andes & S Cent Am Sci, america.melo@TNC.ORG ; **University Mentor**: Paul West, University of Minnesota

Nanofertilizers for conservation agriculture (Agriculture): Efficient nutrient management in agriculture is key to conservation because it can help mitigate nutrient losses to aquatic ecosystems and atmosphere. One new approach to improving nutrient use efficiency is nanofertilizers, where nutrients are bound onto or incorporated into nanoparticles and are released to the plant more slowly and efficiently. Nanofertilizers also come with risks, such as potential toxic impacts on non-crop species. What is the evidence that nanofertilizer adoption could improve nutrient use efficiency above existing best practices, such as 4R? What are optimal nanoparticle designs for crop application? What are the trade-offs between the benefits and consequences of nanofertilizer use? **TNC mentor:** Steve Wood, Soil Scientist, Global Lands, stephen.wood@tnc.org; **University mentor**: Christy Haynes, University of Minnesota

DECISION MAKING

Integrating demand for ecosystem services into prioritization of easements and best management practices (Decision Making): Where does the integration of spatial data on people's preferences and behaviors change the prioritization of conservation actions? This project will work with TNC staff to better integrate information on the societal demand and socio-economic vulnerability of household and communities to changes in ecosystem services. Results will include updated prioritization maps, more robust valuation tools, and integrated biophysical and economic datasets, including expanded work on the social costs of nitrogen and phosphorus pollution. **TNC mentor**: Kris Johnson, Associate Director for Science and Planning, North America Agriculture Program, kjohnson@tnc.org; **University mentor**: Bonnie Keeler, University of Minnesota [Cross-referenced: SNAPP]

Range shifts in resilient and connected landscapes: TNC is expanding the "Resilient and Connected Landscapes" approach with the idea that connected and complex topography and diverse microclimates can buffer against climate impacts and facilitate range shifts and evolutionary adaptation. Research approaches should explore the efficacy of this approach by testing whether recent documented range shifts (for example from nation-wide FIA data or individual range shift studies) are better able to keep up with shifting climate envelopes in mapped high resilience sites and climate corridors compared to elsewhere on the landscape. **TNC Mentor:** Mark Anderson, Director of Conservation Science, Eastern Resource Office, manderson@tnc.org, **University Mentor**: Jessica Hellmann, University of Minnesota.

FORESTS

Enhancing Carbon Storage in Working Forests of the Great Lakes Region (Forests): Forests of North America have a critical role to play in mitigating the effects of climate change. What combination of reforestation, avoided conversion and improved forest management will result in greater carbon storage for Great Lakes Forests—and what are the tradeoffs with other important forest values, such as providing forest products, clean water, and habitat? **TNC mentor**: Meredith Cornett, Director of Conservation Science – MN,ND,SD, mcornett@TNC.ORG; **University mentor**: Laura Dee, University of Minnesota [Keywords: Natural climate solutions]

RFP OPEN

Managing working forests for climate change mitigation – a novel focus on the herbaceous layer (Forests): Healthy working forests produce both ecological and economic benefits by providing carbon sequestration and storage as well as sustainable harvests. In the face of climate change, forward-thinking management strategies are being tested that aim to maintain forest productivity into the future. One such strategy, referred to as "assisted migration," recommends regenerating forests with seeds that originate from more southern locations thereby introducing plants with adaptations, such as drought tolerance and greater water-use efficiency, which will promote tree survival and growth as climate changes. However, healthy forests also depend upon the small herbaceous plants on the forest floor, the importance of which is often underestimated. The herb layer not only accounts for the greatest biodiversity in a forest, it also influences natural regeneration of canopy trees and contributes to water cycling through evapotranspiration and erosion control. Like trees, southern populations of forest herbs may also be better able to tolerate the climate change and contribute to future ecosystem function and economic value. We will test the value of assisted migration of understory species. Research will include testing whether herbaceous understory species sampled from more southern Minnesota seed zones have greater survival and adaptive traits when planted into more northern seed zones. Research will be conducted on working forest plots in northern Minnesota where canopy tree species (white pine, red oak, and bur oak) from more southern locations have already been planted as a part of a Nature Conservancy/University of Minnesota-Duluth adaptation forestry collaboration. **TNC mentor**: Mark White, Forest Ecologist – MN, ND,SD, mark_white@tnc.org; **University mentor**: Julie Etterson, University of Minnesota-Duluth, jetterso@d.umn.edu

Adaptation to Climate Change in Tropical Dry Forest Ecosystems (Forests): Seasonally dry tropical forests (SDTF) are one of the most threatened biomes in the world, including the megadiverse country of Colombia. Currently policy in Colombia dictates that any land-use changes or development requiring the destruction of STDF must mitigate this loss by restoring an area equivalent to ten times the size of any lost forest. The proposed project will evaluate the efficacy of this policy using multiple perspectives including ecological, economic, and social. The ultimate goal is to assess whether this policy is achieving its goals and if not, to recommend suggestions that would improve the outcomes. **TNC mentor**: Juliana Delgado, jdelgado@tnc.org; **University mentor**: Jennifer Powers, University of Minnesota

URBAN CONSERVATION

Who benefits from the benefits of urban nature? (Urban Conservation): Greenprinting and urban ecosystem services modeling are increasingly being used in the prioritization of parks and green infrastructure in cities. However, we know little about the equity and distributional implications of these interventions, as most greenprinting methods rely primarily on biophysical data. This project will integrate urban ecology, ecological economics, and ecosystem services approaches to assess the environmental justice and equity dimensions of urban nature. The project will expand current understanding of the economic value of green infrastructure in cities to include consideration of gentrification, power relationships, historical trends in infrastructure development, and the cultural and relational values for urban nature. **TNC**

RFP OPEN

mentor: Rob McDonald, Lead Scientist, Global Cities, rob_mcdonald@TNC.ORG; **University mentors**: Bonnie Keeler, University of Minnesota

Climate Change Impacts on the Sustainability of Stormwater Infrastructure (Urban Conservation): The proposed project will transfer coupled-climate model projections to the stormwater infrastructure, in a form understandable to planners, resource managers and decision-makers. The study will model capacities required for the infrastructure to convey peak flows from projected mid-21st century climate-changed precipitation and population growth, and the potential for green infrastructure (GI) methods to provide more economical and effective management of peak flows than drainage system upsizing. The proposed adaptation plan generated from the technical analyses will incorporate procedures to manage residual uncertainty in coupled-climate model output and downscaling. These include sensitivity analyses of the incremental cost of over-sizing components to provide a safety margin for possible under-estimating of climate change impacts, prioritizing the upgrade schedule based on a simple risk analysis of extent of under-sizing and flood damage at each component, and incorporating adaptation methods including GI techniques (with infiltration) to reduce peak flows as an alternative to upgrading components. The additional ecosystem benefits of GI implementation will also be calculated and compared with alternative costs, resulting in a complete ecological economic analysis of GI in adaptation to climate change impacts. **TNC mentor**: Phil Levin, Lead Scientist, Washington Chapter, phillip.levin@TNC.ORG; **University mentor**: John S. Gulliver, University of Minnesota, gulli003@umn.edu

MARINE AND FISHERIES

Anthropogenic Disruption of Animal Communication (Marine and Fisheries): Machine noise can negatively impact social animals that rely on sound for communication, including humans, birds, frogs, and whales. Noise is a particularly pressing problem in the San Juan Islands of WA. The National Park Service notes that, “tranquility is shattered” in the islands “by airplanes, boats, traffic, chain saws, loud music, and yard machinery”. We’re using static sound monitoring arrays and dynamic transects on and around Orcas Island to map soundscapes and measure contextual effects. A variety of collaborative activities would be made possible as part of our project, from Bioacoustic fieldwork to assessing ecosystems services (e.g., the economic impacts of noise pollution). **TNC mentor**: Phil Levin, Lead Scientist, Washington Chapter, phillip.levin@TNC.ORG; **University mentors**: Mark Pedelty, and Pete Marchetto, University of Minnesota

UNIVERSITY OF VIRGINIA- DEPARTMENT OF ENVIRONMENTAL SCIENCE

MARINE AND FISHERIES

Resilience and spatial dynamics of recovering oyster reefs (Marine and Fisheries): This project will investigate the dynamics and connectivity of oyster populations along the shallow bays of Virginia’s Eastern Shore in order to determine their functioning as a spatially-distributed metapopulation, assess the value of local restoration efforts to overall population persistence, and predict the resilience of oyster reefs to future sea level rise. **TNC mentor:** Cristina Corollo, Senior Coastal Scientist, Virginia Chapter, cristina.carollo@tnc.org; **University mentor:** Max Castorani, University of Virginia

RFP OPEN

Carbon sequestration, storage, and cycling in seagrass meadows (Marine and Fisheries): This project will study carbon flows and retention in restored seagrass meadows in the shallow bays of Virginia's Eastern Shore and provide insights on seagrasses' role in mitigating anthropogenic CO2 emissions. Research approaches should include flux measurements by aquatic eddy covariance. **TNC Mentor:** Cristina Carollo, Senior Coastal Scientist, Virginia Chapter, cristina.carollo@tnc.org**; University Mentor:** Peter Berg, University of Virginia. [Keywords: blue carbon]

Seagrass resilience and blue carbon sequestration (Marine and Fisheries)- This project will investigate the effects of marine heatwaves on the resilience of carbon sequestration in restored seagrass meadows in the shallow bays of Virginia's Eastern Shore and will inform climate mitigation actions. Research approaches should incorporate measurements of carbon burial and temperature on multiple spatial scales. **TNC Mentor:** Cristina Carollo, Senior Coastal Scientist, Virginia Chapter, cristina.carollo@tnc.org**; University Mentor:** Karen McjaGlathery, University of Virginia [Keywords: blue carbon]

UNIVERSITY OF QUEENSLAND

DECISION MAKING

Embedding conservation of biodiversity and cultural values in strategic planning for northern Australia (Decision Making): Identify potential developments (including infrastructure and agriculture) and their likely impacts on biodiversity and cultural values on Indigenous lands of the northern savannas. Explore effective offsetting approaches and develop an approach to strategic and local landscape-scale decision-making. This will support Indigenous agency in the development planning process and improve outcomes for biodiversity. **TNC mentor**: James Fitzsimons, Director of Conservation Science – Australia Program, jfitzsimons@TNC.ORG; **University mentor**: Martine Maron, University of Queensland

FORESTS

Developing cost-effective sampling designs for monitoring peatland restoration in Indonesia (Forests): Measures may include field data on groundwater levels and expert knowledge, along with environmental variables likely to govern the effectiveness of restoration (e.g. rainfall, proximity to canals, elevation, and vegetation cover). The project will require environmental modelling and monitoring design expertise. **TNC mentor**: Edward Game, Lead Scientist Asia Pacific Region, Global Science, egame@tnc.org; **University mentor:** Kerrie Wilson, University of Queensland,

Evaluating impact of rewetting on vegetation reestablishment (Forests): Evaluate across a range of forest types and disturbance histories. Measures may include field and remotely-sensed measurements of vegetation recovery. The project will require ecological field skills and experience working in the tropics. **TNC mentor**: Edward Game, Lead Scientist Asia Pacific Region, Global Science, egame@tnc.org; **University mentor**: Kerrie Wilson, University of Queensland

The role of community participation in peatland restoration projects (Forests): Methods include interviewing key stakeholders to understand the process of peatland restoration efforts and household surveys to measure the level of participation by local communities. The project will require social

science skills and relevant field experience. **TNC mentor:** Edward Game, Lead Scientist Asia Pacific Region, Global Science, egame@tnc.org; **University mentor**: Kerrie Wilson, University of Queensland

RESEARCH GRANT OPPORTUNITIES

ECONOMICS

The Economics of Latin American Forest Restoration (Economics) Recent work undertaken by the Nature Conservancy suggests that reforestation is the single largest natural pathway to help hold global warming to below 2 °C. This natural infrastructure solution is the focus of the Nature Conservancy's Latin America Forest Restoration Strategy addressing floods, droughts, and water funds. An examination is needed, however around the costs and co-benefits of forest restoration in Latin America to move the overall strategy forward. This includes, estimating forest restoration costs and investments across Latin America using existing and collected data and estimating the net benefits of restoration including potential benefits of reforestation and the opportunity costs (particularly, agriculture related) of business as usual. **TNC Mentor:** Timm Kroeger, Senior Environmental Economist- Global Science, tkroeger@tnc.org

Examining forests and economic livelihoods in Myanmar (Economics): Myanmar has the third highest deforestation rate in the world as a result of forest over-exploitation necessitating an examination of the drivers of degradation and the identification of opportunities to reduce degradation along the supply chains for fuelwood and charcoal. Primary research approaches include assessing the economic drivers of degradation and the markets for forest products in Myanmar and carefully examining the markets and supply chains for fuelwood and charcoal in a specific sub- region the country as well as identifying any opportunities to intervene in the market to reduce degradation. Primary goals are to develop a business plan for market intervention to reduce degradation and re-design the Forest LSMS (created by the World Bank and partners) to suit the Myanmar context. **TNC Mentor**: Gina Waterfield, Environmental Economist- Global Science and Tim Boucher, Sr. Geographer, Global Science, tboucher@tnc.org

FRESHWATER

Developing a statewide framework for evaluating groundwater-surface water interactions in California and the effects of groundwater pumping on environmental flow recommendations (Freshwater) California passed the Sustainable Groundwater Management Act (SGMA) in 2014 and now requires groundwater sustainability agencies (GSAs) to manage groundwater to avoid significant and unreasonable adverse impacts on beneficial uses of surface water, among other impacts. However, there is uncertainty about the interactions between groundwater and surface water for many parts of the state, as well as how to assess significant and unreasonable adverse impacts to surface water. How can we develop a framework to evaluate the effects of groundwater pumping on beneficial uses of surface water, particularly impacts to environmental flow recommendations and desired ecological outcomes? **TNC Mentor:** Julie Zimmerman, Lead Scientist- California Chapter; julie.zimmerman@tnc.org

AGRICULTURE

RFP OPEN

Improving peatland agricultural practices to increase crop yield and carbon storage: Peatlands cover 3% of the earth's surface yet contain more carbon than all of the forests of the world combined. Like in many places, the peatlands of North Carolina are rapidly becoming degraded due to active draining for agriculture and perceived flood mitigation benefits, and subsequent susceptibility to wildfire. However, preliminary research on new agricultural practices (e.g., holding higher water levels in-field) suggests that the goals of increased crop yield and improved soil quality/carbon storage are not exclusive. The Fellow for this project would build on existing research to design and run field experiments comparing agricultural practices on peat soils in the Albemarle- Pamlico region of North Carolina. Our goal is to produce both publishable evidence and a proof-of-concept demonstration project that can then be leveraged to inform other farmers of best management practices. **TNC Mentor:** Liz Kalies, Director of Science-North Carolina Chapter, elizabeth.kalies@tnc.org

REPOWERING

Impacts of climate change risk on hydropower investment (Re-Powering)- Southeastern Europe is undergoing an energy transition and is now a global hotspot for new hydropower production. However, climate change models predict significant declines in flows in the region's rivers at the same time as wind and solar power prices plummet. What are the financial risks associated with climate change and to what degree are they priced into new hydropower investment decisions? What are the implications on the regional economy, energy security, ecosystems and biodiversity resulting from failure to account for this climate risk? Lastly, what are the policy implications for the advancement of a clean energy transition in this region and beyond? **TNC Mentor**: Emily Chapin, GIS Specialist- Balkan Program, emily.chapin@tnc.org

Evaluating implications of biomass production for climate/energy policy (Re-powering)- Often referred to as the "Green Heart of Europe," the forests of Southeastern Europe are among the largest intact, natural forest systems found on the European continent. Yet, these forest systems may be under significant threat as the region is on the verge of a major energy system transition. Biomass energy for fuel and power may play a significant role in this transition. How can research evaluating scenarios of biomass energy production resolve the ecosystem, biodiversity and carbon implications and infor key debates over climate and green energy policies in this region and in other relevant geographies? **TNC Mentor**: Emily Chapin, GIS Specialist- Balkan Program, emily.chapin@tnc.org

DECISION MAKING

Examining farmer adoption of conservation agriculture in India (Decision Making) - Over the last decade, a farm technology called the Happy Seeder has been developed as a promising solution to the straw burning challenge among Indian farmers in NW India. TNC India and partners are collecting baseline data on ≈1,000 farm households and 200 service providers in Punjab, India. Research approaches should include statistical analyses to answer the following questions: a) What are the costs to farmers, if any, of using the Happy Seeder, i.e. are the returns to the use of this seeder comparable to other options? b) Does demonstration and training help increase farmer participation on conservation agriculture? We hope to influence the next agricultural crop burning season, ≈October-December, with timely analyses that can help the government act to reduce pollution. **TNC Mentor**: Priya Shyamsundar,

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Lead Economist- Global Science, priya.shyamusundar@tnc.org; **University Mentor**: Subhrendu Pattanayak, Duke University, subhrendu.pattanayak@duke.edu

Natural Climate Solution Strategies for the Pacific Northwest (Decision-making): Building on TNC momentum around Natural Climate Solutions, an evaluation is needed of the potential for various natural climate solution "pathways" within the Pacific Northwest to contribute to the reduction of greenhouse gas emissions and / or increased sequestration and storage of carbon. Pathways may include but are not limited to: avoided conversion of natural lands, ecological restoration, improved forest management, reforestation, and other related conservation actions. Ideally, included within this analysis are the projected impacts of climate change on these pathways (via altered physical and biological processes) as well as the potential influences of these pathways on factors of social equity and environmental justice. **TNC Mentor:** Ryan Haugo, Director of Conservation Science, Oregon Chapter, rhaugo@tnc.org; **University Mentor:** Andres Holz, andres.holz@pdx.edu and Max Nielsen-Pincus, maxnp@pdx.edu, Portland State University

Designing optimal changes for "green living" (Decision-Making)- People interested in the environment are presented with inconsistent and conflicting information on what they can do to best help the environment in their daily life. As a result, they may spend most of their available time and energy on changes with limited impact. Strangely there is relatively little research around "green living" with the end user in mind. This fellowship could evaluate possible changes individuals can make to improve their carbon footprint, water footprint, impact on biodiversity, etc. through a set of quantitative choices. **TNC Mentor**: Jon Fisher, Center for Sustainability Science, jon_fisher@tnc.org

Nature Exposure and Human Health (Decision-Making)- We are very interested in knowing more about how nature exposure influences human health both physiologically and psychologically. The questions are interested in having a postdoc work on with us are: 1) What is the "dose" of nature that people need? This entails a lot of questions such as, if we want to be more prescriptive about what people should experience we need to know how much is enough and how long is enough for immune function or for depression and anxiety reduction? Is there some kind of threshold we should get people over that helps maximize the health benefits of nature/biodiversity exposure? And how much of what type of nature do we need? For example, do we need to experience a specific level of biodiversity to get the best effects or do we need to experience a certain number of different ecosystems? 2) Is there an impact of mindfulness practices in combination with biodiversity/nature exposure as a potentially more potent way to increase human health and wellbeing, as well as connection to nature? **TNC Mentor**: Ariana Sutton-Grier, Director of Science, Maryland/DC Chapter, a.sutton-grier@tnc.org

Using remote sensing to evaluate our conservation impact (Decision-Making): We propose developing and applying a method to detect our impact on habitat area & quality or other key conservation impact measures, especially linked to tackling climate change. The focus will be on using remote sensing data and machine learning methods. TNC and partner's projects will serve as training data. The project is intended to provide proof of concept for a monitoring & evaluation platform for the TNC and the sustainability sector. **TNC Mentor**: Sheila Walsh Reddy, Associate Director of Strategic Initiatives-Chief Strategy Office, sreddy@tnc.org

RFP OPEN

Testing behavioral and economic interventions for promoting conservation behavior (Decision-Making): We will use qualitative and experimental methods to develop and test behavioral and economic conservations. The focus will be on advancing a TNC priority strategy. Opportunities include but are not limited to interventions related to land use, energy use, transportation, and civic behavior. The research may include scenario modeling that accounts for how human behavior influences outcomes for people and nature. **TNC Mentor**: Sheila Walsh Reddy, Associate Director of Strategic Initiatives-Chief Strategy Office, sreddy@tnc.org

Assessing and informing the performance of a portfolio of conservation strategies (Decision-Making): The Nature Conservancy is advancing a portfolio of strategies to address interlinked challenges for people and nature. This creates new challenges for diagnosing and improving these strategies, taking a portfolio approach. This project aims to develop and apply new diagnostic tools to help increase conservation impacts across the portfolio. **TNC Mentor**: Sheila Walsh Reddy, Associate Director of Strategic Initiatives-Chief Strategy Office, sreddy@tnc.org

Predicative Impact Evaluation and ROI (Decision-Making): To successfully address complex, linked social-ecological challenges, it is essential to anticipate the effectiveness of conservation interventions prior to implementation. Interdisciplinary predictive approaches can be used to inform decisions about strategies, and the expectations and metrics by which their success can be assessed, but this is not yet done systematically in conservation. This project is looking for a post-doctoral candidate who can work with TNC science leaders to provide methodological leadership in modeling the predicted impact of priority global strategies for The Nature Conservancy. **TNC Mentor:** Eddie Game, Lead Scientists Asia Pacific, Global Science, egame@tnc.org

FORESTS

Modeling Impacts of Forest Pests and Pathogens on C Sequestration and Storage in North America (Forests): Preliminary analyses indicate that the regional expansion of just four highly damaging invasive forest pests already present in the Northeast and Midwest in combination with climate change could result in reductions of aboveground biomass by roughly 60-70 metric tons/hectare by the year 2050 and that reductions would persist through at least year 2100. Additional analyses are required to project losses to North American forest carbon storage and sequestration that can be expected by 2050 if no new international trade policies are enacted as well as how much these losses could be reduced if recommended prevention policies were enacted. This information would allow the Conservancy and others to better determine whether the enactment of these prevention policies is an essential component of its Natural Climate Solutions strategy in the North America Region. To provide the scientific basis for advancing this potential strategy, this research will also quantify the economic costs and benefits to industry of enacting additional prevention policies by modeling expected near-term (50 – 100 year) impacts of forest pests and pathogens on carbon sequestration and storage by forests of the United States and Canada as well as whether and by how much these impacts would be limited by successful enactment and implementation of international forest pest and pathogen prevention policies.

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Project scope could be increased based on the interest and capacity of the Fellow and research institution(s). Potential Steering Committee to guide post-doc: Joe Fargione, Director of Science North America Region; Campbell Moore, acting NCS Mitigation Lead; TNC's Invasive Species Advisory Committee; Cary Institute of Ecosystem Studies. **TNC Mentor:** Leigh Greenwood, Forest Health Program Director-North America Region, lgreenwood@tnc.org

URBAN CONSERVATION

Triaging urban stream systems for the future: Hyporheic restoration (Urban Conservation) - As urban population centers grow and climate shifts bring more intense rainstorms, innovative green infrastructure that addresses multiple benefits simultaneously will be needed to protect freshwater and nearshore marine ecosystems, as well as human health and well-being. In Seattle, WA, an urban floodplain restoration project is pioneering the use of hyporheic zone restoration for habitat and water quality improvement. To be accepted as a cost-effective best management practice by surface water management agencies, detailed quantification of flow mitigation, temperature, and contaminant reductions must be demonstrated for a broad suite of contaminants under different hydrologic conditions. Research approaches should consider incorporating compounds of interest to TAPE certification for stormwater treatment, as well as emerging organic chemicals of concern associated with urban stormwater runoff, nutrients, and pathogens. Using a variety of analytical techniques, (e.g. ICP-MS, High-resolution time- of-flight mass spectrometry) we will compare the water quality before and after passing through engineered hyporheic flow paths. **TNC Mentor**: Emily Howe, Aquatic Ecologist- Washington Chapter, emily.howe@tnc.org; **University Mentor**: Ed Kolodziej, koloj@uw.edu and David Butman, dbutman@uw.edu, University of Washington

Multi-functional connectivity in urban landscapes (Urban Conservation): Although we have traditionally looked at habitat connectivity for its biodiversity benefits, green connections in urban landscapes can be designed to serve multiple functions—such as improving bike/pedestrian infrastructure that can improve public health, reduce urban greenhouse gas emissions associated with transportation, and connect urban residents with nature. Methods for this project will draw from landscape ecology, community & regional planning, environmental psychology, and public health with the goal of producing maps and recommendations for a multi-functional connectivity plan in Austin, Dallas, and/or Houston as well as guidelines for other cities to use in similar planning efforts. **TNC Mentor:** Amy Belaire, Austin Urban Scientist, Program Manager, Texas Chapter, amy.belaire@tnc.org; **University Mentor:** Shalene Jha**,** University of Texas-Austin, sjha@austin.utexas.edu

Building Healthy Urban Green Spaces (Urban Conservation): How do we plan, design, and manage urban green spaces to meet multiple social and ecological objectives, especially in diverse communities with wide- ranging preferences? Methods will draw from field ecology, landscape ecology, environmental psychology, and public health. This project will result in a protocol to evaluate city-specific social and ecological objectives and recommendations to improve existing green spaces (and plan new ones) in Austin, Texas and Chicago, Illinois. **TNC Mentor:** Amy Belaire, Austin Urban Scientist, Program Manager, Texas Chapter, amy.belaire@tnc.org, 512-623-7239; **University Mentor:** Emily

Minor, University of Illinois- Chicago, eminor@uic.edu [Keywords: public health, green infrastructure, biodiversity, ecosystem services]

Monitoring human well-being after natural infrastructure installation (Urban Conservation): population and consequent land development in cities worldwide are placing unprecedented demands on stormwater infrastructure, leading to increased flooding. Frequent and chronic stormwater-related flooding results in economic losses, degrades natural systems, and affects the productivity, health, and psychosocial wellbeing of individuals. The Nature Conservancy's urban conservation strategy aims to help cities solve stormwater problems using green infrastructure, helping alleviate problems with flooding experienced by communities. There is an urgent need to identify the positive and negative impacts of flood mitigation and adaptation strategies for communities, so that the Conservancy can be sure our projects are meeting the needs of local communities. This project will (1) Assess communities' perceived risks, experiences with, and coping strategies for flooding; (2) Evaluate community impacts of green infrastructure (GI) interventions and education to manage stormwater and flooding; and (3) Understand communities' perceived value of, and experiences with, urban green spaces and engineered GI installations. **TNC Mentors**: Rob McDonald rob_mcdonald@TNC.ORG, Lead Scientist for the Global Cities Program, and John Legge john.legge@TNC.ORG, Chicago Conservation Director, Illinois Chapter; **University Mentors**: Sera Young sera.young@northwestern.edu, Northwestern University and Bill Miller wmmiller@northwestern.edu, Northwestern University

MARINE AND FISHERIES

Understanding Impediments & Enabling Investments in Coastal Natural Infrastructure (Marine & Fisheries): The Coastal Sustainability Institute (CSI) at Northeastern University and the Massachusetts and Global Science programs of The Nature Conservancy (TNC) are joining forces to support a postdoctoral fellow to jointly address impediments to and support for more projects and greater investments in coastal natural infrastructure for flood risk reduction. **TNC Mentor:** Mike Beck, Lead Marine Scientist-Global Science, mbeck@tnc.org **&** Alison Bowden, Freshwater Program Director-Massachusetts Chapter**; University Mentor:** Geoff Trussel **&** Steven Scyphers**,** Northeastern University.

Next-generation methods for monitoring oyster reefs (Marine and Fisheries): Current methods for monitoring the health and productivity of oyster reefs are expensive and time-intensive. Using a combination of unoccupied aircraft systems, multispectral sensors, powerful photogrammetry techniques, and very high-resolution satellite imagery the project team will develop integrated multi-scale methods to assess the extent, growth and health of natural and constructed oyster reefs in both intertidal and shallow subtidal areas. The project will provide baseline data (including high resolution orthomosaics, detailed habitat maps, and digital surface models) for TNC sites in North Carolina and deliver standard protocols for wider application. **TNC Mentor:** Brian Boutin, Dir, Albemarle-Pamlico Program, bboutin@TNC.ORG; **University Mentor:** Dave Johnston, Duke University, david.johnston@duke.edu

Food Security: Connecting coastal community's quality of life to sustainable fisheries management in Belize (Marine and Fisheries) - The National Fishers Cooperative (NFC) is known throughout Belize for its high standards and strict sustainability criteria. Due to changes in the regulatory environment, NFC is

under unprecedented pressure from private competition who can offer higher prices to fishermen, leading to decreasing numbers of members for the NFC and detrimental impacts on fishermen and coastal communities. The Conservancy is working with NFC to retain and recruit new members, access better prices for their products, and lower costs but a robust socioeconomic baseline of Belize's commercial fishers is needed to drive impact. Proposed approaches should build from an existing socioeconomic survey that Future of Fish has developed and tested in the field in partnership with The Conservancy and other local groups to help 1) determine a baseline against which work with NFC and other initiatives with fishers can be measured, 2) identify what benefits and initiatives fishers and their families need, and 3) guide future surveys and analysis of feedback to help re-focus strategies and initiatives as needed. **TNC Mentor:** Julie Robinson, Fisheries Lead, Mexico and Northern Central America Oceans Program-Belize, jrobinson@tnc.org

Sustainable Fisheries and West Coast Nursery Fish Habitats (Marine and Fisheries): The importance of coastal marine habitats serving as juvenile fish nurseries has long been an accepted fisheries paradigm. Conserving and restoring these habitats is a critical component of managing sustainable fisheries to provide diverse benefits to people. However, quantifying the specific fish production provided by different natural habitats, such as seagrasses, oysters, rocky reef or kelp involves complex and often expensive dedicated studies. It is possible to create models predicting the augmented fish production values provided by a given area of habitat via meta-analysis of existing habitat specific empirical studies. However, along the US west coast, recent investigations into critical coastal estuarine habitats (including oysters, seagrasses and salt marsh) determined that data was either lacking or not synthesized in a usable way. These gaps in the available evidence inhibit the Conservancy's efforts to integrate conservation of coastal marine habitats with transformation of fisheries management. How do we develop a robust evidence base on the fish stock-recruitment and nursery functions of key estuarine and near-shore habitats, from southern California to northern WA? Can we develop and apply standardized data collection and synthesis methods to fill these evidence gaps? **TNC Mentor:** Ryan Haugo, Director of Science, Oregon Chapter, rhaugo@tnc.org

Pacific Northwest Crab Stock Assessments (Marine and Fisheries): Within the Pacific Northwest, Dungeness crab is an iconic species and supports the region's largest single species fisheries in terms of volume and value. Despite the importance of Dungeness crab, we do not have a stock assessment conducted or appropriate methodology identified for assessment of this important stock. We are seeking a fellow to evaluate the existing information for Dungeness crab coastwide, develop stock assessment methodology, and conduct the first ever stock assessment for Dungeness crab. Doing so will help ensure sustainable management of this important stock and aide the fishery in meeting the standards for certification through the Marine Stewardship Council. **TNC Mentor:** Ryan Haugo, Director of Science, Oregon Chapter, rhaugo@tnc.org

Building environmental health and the value of coastal industries: restoring water quality through shellfish ecosystems (Marine and Fisheries): Projects aims are to determine and economically value the role of shellfish and shellfish ecosystems, and their restoration, in assimilating nutrients (in particular nitrogen and phosphorus) and enhancing local biogeochemical processes to reduce local and diffuse

sources of nutrients. Approaches should focus on understanding the rates at which native Ostrea angasi can achieve assimilation and denitrification (the conversion of excess N to harmless N2 gas) rates via tissue under various site- specific biotic and abiotic conditions (e.g. currents, depth, salinity, substrate) and operating environments (aquaculture and waste-water treatment facilities). This will support the testing active 'design' (co-design or eco- engineering) of restoration activities, to more accurately define the potential economic value of the shellfish to these industries. Alongside these outcomes approaches should also consider assessments the biodiversity and fish productivity values of O. angasi reefs, which are often considered to be largely public good benefits. **TNC Mentors:** Chris Gilles, Australia Program, chris.gillies@tnc.org, and Boze Hancock, Global Oceans, bhancock@TNC.ORG