

**Report and Recommendations**  
**NORTHEAST MULTISTATE ACTIVITIES COMMITTEE MEETING**  
**Monday, December 12, 2022, 8:00-9:00 AM ET Zoom Teleconference**

**Members: Jan Nyrop (Cornell, chair), Matt Wilson (WVU), Puneet Srivastava (UMD), Jason White (CT-New Haven), Cindy Fitch (WVU/NEED), Ali Mitchell (NEED), Non-voting, ex officio: Rick Rhodes (NERA), David Leibovitz (NERA)**

**MAC Recommendations to NERA**

***Request to Approve Peer Reviewed Multistate Activities:***

- NE\_TEMP1962: *Outdoor Recreation, Parks and Other Green Environments: Understanding Human and Community Benefits and Mechanisms, 10/2022 – 09/2027* [Renewal of NE1962, AA: Matt Wilson – West Virginia]
  - Varied feedback from reviewers reflected different levels of understanding of multistate research projects.
  - One reviewer mentioned the group is not taking advantage of unstructured data in the form of social media, other “mineable” sources. There is no big data expert in the group, but they will be urged to explore the use of unstructured data.
  - There is potential to expand the team’s Extension participation with family and consumer sciences leaders who have discussed ways to do more in the outdoor recreation / outdoor community health space.
  - The group should be cautioned about their notion of a “top-down orientation” which reads like a lack of focus on diversity, equity, and inclusion and community-based engagement.
  - At mid-term review, the technical team will be called upon to clearly identify community-based engagement and diversity, equity, and inclusion activities.
  - **The MAC unanimously recommends to NERA the full approval of NE\_TEMP1962.**
- NE\_TEMP2201: *Mycobacterial Diseases of Animals, 10/2022 – 09/2027* [Renewal of NE1701, AA: Matt Wilson – West Virginia]
  - The project works more like a group of individual investigators who get together to discuss their work, rather than a group who is working together.
  - The AA is advised to inquire about what kind of group progress they are making; what synergy exists among its membership. (Group outcomes and outputs rather than individual.)
  - This field is narrow; many people working in this field are listed participants. During this cycle, the technical team may age out and this could work out to be its final 5-year renewal
  - At mid-term review, the technical team will be called upon to clearly identify interdependence and synergy among its membership. This could be an opportunity to usher the team toward sunsetting in 2027.

- **The MAC unanimously recommends to NERA the full approval of NE\_TEMP2201.**
- NE\_TEMP2204: *A regional network of social, behavioral, and economic food systems research*, 10/2022 – 09/2027 [New multistate project, AA: Kumar Venkitanarayanan – UConn]
  - The global food system is under pressure and AI is a way to analyze and develop solutions for food systems challenges.
  - AI has agricultural applications beyond the farm gate – data from grocery stores, rec facilities, neighborhood health facilities are all troves of information.
  - While the technical team has used a “kitchen sink” approach, they are creating an interdisciplinary network of social and data scientists to assess impact of shock (economic/social/behavioral) associated with consumers.
  - Reviews were mixed, two reviews recommended project approval, one did not. The most negative review had concerns about the use of mobility data and the expertise of the principal investigator.
  - Social and data scientists are working together to create an umbrella project of innovative techniques for food systems research.
  - Clear relevance to extension professionals which could increase participation.
  - **The MAC unanimously recommends to NERA the full approval of NE\_TEMP2204.**
- NE\_TEMP2206: *Green Stormwater Infrastructure and Agriculture*, 10/2022 – 09/2027 [New multistate project, AA: Wendie Cohick – Rutgers]
  - The proposal includes elements addressing the equine industry, however there is an existing multistate project addressing these issues. (NE1941: Environmental Impacts of Equine Operations). The proposal also focuses on urban areas.
  - The team will be made aware of its overlap with NE1941 activities and urged to connect with that team to discuss opportunities for collaboration.
  - **The MAC unanimously recommends to NERA the full approval of NE\_TEMP2206.**
- NE\_TEMP2203: *Legal Issues in Agriculture and Natural Resources*, 10/2022-09/2027 [New multistate project, AA: Puneet Srivastava – Maryland]
  - Multistate Research Project to replace NECC2203: Legal Issues in Agriculture and Natural Resources.
  - The technical team’s original intent was to draft a multistate research project rather than a coordinating committee. A misunderstanding caused the NERA OED to usher the team through approval as a coordinating committee.
  - The group received strong reviews and NERA was supportive of a multistate research project from the inception of the proposal.
  - The proposal was revised to clearly identify its research objectives and will be an important addition to the national proposal.
  - **The MAC unanimously recommends to NERA the full approval of NE\_TEMP2203, which replaces NECC2203.**

## **MAC Discussion Items**

### **Northeast Administrative Adviser assignments to be addressed:**

- Mark Hutton (Maine, former Assoc Director)
  - NE1943: *Biology, Ecology & Management of Emerging Disease Vectors*
  - NE1944: *Management of the Brown Marmorated Stink Bug* – renewing 2022-23
  - NE2101: *Eastern White Pine Health and Responses to Environmental Changes*
- Brad Hillman (Rutgers, retired)
  - NE1833: *Biological Improvement of Chestnut through Technologies that Address Management of the Species and its Pathogens and Pests* – renewing 2022-23
- Adel Shirmohammadi (Maryland, former Assoc Director)
  - NE1835: *Resource Optimization in Controlled Environment Agriculture* – renewing 2022-23
  - NE2045: *Onsite Wastewater Treatment Systems: Assessing the Impact of Soil Variability and Climate Change*
- Rick Rhodes (NERA Executive Director)
  - NECC1812: *Northeast Coordinating Committee on Soil Testing* – renewing 2022-23
- Eric Wommack (Delaware, former Assoc Director)
  - NECC1901: *Integrating Genomics and Breeding for Improved Shellfish Aquaculture Production of Molluscan Shellfish*
  - NE2202: *The Equine Microbiome*
- Jan Nyrop (Cornell AgriTech, retiring 12/2022)
  - NE9: *Conservation and Utilization of Plant Genetic Resources* – renewing 2022-23
  - NE1832: *Biological Control of Arthropod Pests and Weeds* – renewing 2022-23
  - NE1839: *Development and Evaluation of Broccoli Adapted to the Eastern US* – renewing 2022-23
  - NE2001: *Harnessing Chemical Ecology to Address Agricultural Pest and Pollinator Priorities*

### **Revisions of Multistate Guidelines (NERA OED proposed changes):**

- Changes in the guidelines to remove the “two supporting AES Directors” requirement for a team’s statement of intent to draft a new/renewal proposal.
- **The MAC proposes an additional change to ask the OED to inform NERA Directors and Associate Directors of the intent to draft project proposals.**
- **The OED will make the additional changes to the guidelines for presentation to NERA.**

### **Follow-up discussion:**

- The MAC is seeking a new member and someone to serve as Chair.
- Renewing multistate project teams are working with the OED in accordance with the revised operating guidelines. No requests to write this year.
- Urban Agriculture multistate project – any interest or movement?
  - Faculty member at WVU was interested in urban rooftop/container agriculture
  - Extension could have greater involvement in this project, enticing opportunity
  - Prospective UConn, CAES, UDC, URI and UMD participants
  - NEED can develop a strategy for recruiting extension members to join multistate projects

- NERA would commit funds to recruit a team and help kickstart the writing of this proposal

DRAFT

# NE\_TEMP1962: Outdoor Recreation, Parks and Other Green Environments: Understanding Human and Community Benefits and Mechanisms

Status: Submitted As Final

Duration 10/01/2022 to 09/30/2027

Admin [\[Matthew E Wilson\]](#)

Advisors:

NIFA Reps: [\[Adam Wilke\]](#) [\[Diomides Zamora\]](#)

## Statement of Issues and Justification

### Statement of the Issue(s) and Justification:

#### *Need as indicated by stakeholders.*

Over the past 10 years, the NE1962 Multistate Research Project has investigated the nexus of nature, health, wellness, and community well-being, generating knowledge and products designed to inform research and practice across multiple disciplines. However, many research and education gaps remain, and there is much work left to accomplish. This need is especially evident in the wake of the COVID-19 pandemic, which highlighted the critical value of parks' and greenspaces' relationship to wellness and public health (Carr, 2021; Kleinschroth & Kowarik, 2020; Labib et al., 2022; Larson et al., 2022; Li et al., 2022), while also underscoring exclusion and segregation from green space and other environmental amenities due to demographic factors such as race, income, or immigration status (Larson et al., 2021; Nay et al., 2022; Pipitone & Jovic, 2021). For this reason, now is the perfect time to sustain and ideally expand this important area of inquiry and collaboration, helping to build a happier and healthier future through parks, greenspace, and nature-based recreation opportunities. Our project seeks to do this through a renewed focus on four key areas: health and well-being, environmental literacy and stewardship, and community resilience and vitality, and equity and inclusion. This comes as a pivotal time, where interest in parks, nature-based recreation has grown during the post-pandemic era amidst a rise of "urgent biophilia" (MacKinnon et al., 2022; Slater et al., 2020), yet governmental funding to support parks and greenspace remains stagnant (Barrett et al., 2017). The purpose of this multistate project is to facilitate collaboration that can stimulate new research, ultimately augmenting our understanding of the extent and means by which outdoor recreation, parks, and greenspaces connect humans and nature. This evidence should inform policy development and practices that lead to healthier people, communities, and natural environments.

#### *Importance of work and consequences if work is not accomplished*

Themes explored in this research can influence the future health and well-being of humans and the environment in multiple ways. For example, promoting active and healthy lifestyles and environmental literacy among youth and adults will improve quality of life across multiple generations and support a more sustainable future. The project will also promote quality of life by supporting vibrant and resilient communities, in which outdoor recreation opportunities and green infrastructure serve to protect and sustain ecosystems and provide ecosystem services upon which human health depends (Bratman et al., 2019). Additionally, the project is progressing at a time when concerns about systemic inequities and social justice are omnipresent and rapidly rising on the policy agenda (Nesbitt et al., 2019; Jennings et al., 2016). This project will provide a chance to explore diversity, equity, and inclusion in the outdoors, highlighting barriers and opportunities to develop and improve impactful, innovative, and compelling DEI programs and policies that advance health, environmental literacy, and community vitality for all populations.

In addition to these broader benefits, this project also advances multiple U.S. government initiatives. For instance, Executive Order 13266 (2002) mandated that land management agencies promote the use of outdoor recreation areas for improved health. Since then, federal land management agencies have moved forward to address health issues. For example, the National Park Service (NPS) has established a “Health and Wellness Steering Committee” (US Department of Interior, National Park Service, 2010) and developed multiple national initiatives that link parks to public health, such as “Healthy Parks, Healthy People” (HPHP), “Parks Prescriptions” (ParkRx), and “Every Kid in a Park” (O’Dell, 2016; Razani et al., 2019). In addition, the USDA Forest Service has estimated the caloric expenditures of recreation activities on Forest Service lands (Kline, Rosenberger & White, 2011). The role of outdoor recreation for a healthier US is also recognized as an important study area in the Outdoor Recreation Research and Education strategic plan (USDA CSREES, 2007). However, as noted earlier, these benefits and opportunities are often inequitably distributed. Executive Order 13985 (2021) sought to address these disparities by encouraging planning and policy to remove barriers to equal opportunity and deliver resources and benefits equitably to all Americans, a movement that includes expanding underserved communities’ access to public parks and greenspace. Ongoing debates regarding legislation such as the No Child Left Inside Act (2022), which would support the development of environmental literacy via environmental education and outdoor learning in public schools, could be informed by this project. The project also aligns with the goals of the USDA’s McIntire–Stennis Capacity Grant (2022), which prioritizes land management for outdoor recreation and aims to advance understanding of human behavior and attitudes related to natural resources. Without this multi-state project, many of these goals would be more difficult to achieve.

### ***Technical feasibility of the research.***

This multi-state project vision is guided by a cadre of experienced and productive researchers at land-grant institutions, other public and private institutions, federal agencies, state agencies, and non-governmental organizations, all working across diverse disciplines to accomplish project aims and goals. There are few technical limitations in social science research of this nature. The broad scope and approach of this project allows and promotes the recruitment of researchers with a diverse set of skills to practice advanced study designs utilizing such tools and approaches such as GIS, psychometric scaling, multi-level modeling, behavioral and physiological monitoring devices, cognitive concentration tests, experimental designs, photo elicitation, and qualitative and mixed methods techniques. Given this diversity of disciplinary contexts and approaches, coordination can be challenging. This project is specifically designed to facilitate collaboration and information exchange, effectively sharing projects, methods and results to achieve the intended outcomes and impacts. Specifically, evolution and standardization of methods and instruments, assessments of reliability and validity across populations, and strong coordinated leadership will enhance successful project outcomes and advance a shared research agenda, enabling replication and expanding inferential capacity to create synergies not yet realized.

### ***Advantages of a multi-state effort.***

A Multi-State effort will allow for exploration of key outcomes across many more diverse geographic settings, scales, and demographic populations, including replication across different contexts with larger samples. This would enhance researchers’ ability to evaluate community-level outcomes, assess the robustness of results, and examine the transferability of observed relationships, hypothesized mechanisms, and experiences. Identification of causal mechanisms driving observed relationships between things such as nature and health, or outdoor recreation and environmental literacy, have been elusive, often because research on these topics tends to be sporadic and opportunistic. A multi-state approach would allow for more strategic and intentional investigation of pathways and mechanisms, potentially identifying optimal dosages of nature required to achieve positive outcomes (Shanahan et al., 2016). A collaborative approach will also facilitate collection of baseline data that improves longitudinal tracking of health, literacy, resilience, and equity outcomes. Another key benefit is the integration of researchers from multiple disciplines (e.g., public health, natural resources, geography, sociology, education, and many more) who are already addressing these issues from multiple angles. A multi-state approach will help to build this community of practice, creating a new space for innovative interdisciplinary solutions to contemporary challenges related to greenspace, health, and sustainability.

To ensure that results of this work reaches practitioners across multiple disciplines, the research will be coupled with extension efforts in each state to disseminate results to recreation, health, education, natural resource, and community professionals through workshops, presentations, and publications. Results will be widely disseminated throughout the multi-state network via synthesis articles, centers and institutes, land grant outlets at colleges and universities, professional organizations (i.e., NRPA, SAF, IASNR), and Cooperative Extension. This will facilitate the practical application of research findings associated with the Multi-State effort.

## ***Expected impacts.***

Research that stems from this project will lead to an improved understanding of links between parks and green spaces, outdoor recreation, health, environmental literacy, community vitality, and equitable outcomes across diverse communities. Knowledge from this research will provide the basis for evidence-based practices and policies at the national, state and local levels. For example, with respect to public health, such policies may result in lower healthcare costs by emphasizing upstream health promotion via preventative methods (e.g., physically active lifestyles) and green infrastructure (Becker et al., 2019; Larson & Hipp, 2022). Research results could also enhance quality of life by enabling professionals to design greenspaces and outdoor recreation opportunities where green infrastructure not only retains and sustains ecosystems but also provides ecosystem services that promote human health across generations (Bratman et al., 2019; Smith et al., 2013). Our project will also help to identify attributes of green infrastructure that fuel vibrant and resilient communities by attracting families, tourism, and businesses (DuPuis & Greenberg, 2019), inspiring sustainable development. Our work will advance understanding of environmental literacy, and the factors that promote it, in multiple ways, helping to meet the long-term goal of public participation in pro-environmental behaviors that help combat emerging environmental challenges such as climate change. For all of these reasons, this project will answer calls to increase citizens' and policy makers' ability to make responsible, informed decisions about human-environment interactions (Kellert et al., 2017), creating a healthier and more sustainable future for people and the planet. Finally, by integrating the work of researchers, extension specialists, and graduate and undergraduate students, the project will influence the nature-based focus of the next generation of public health, urban planning, and park and recreation practitioners via targeted courses, trainings, workshops, outreach, and other professional development opportunities.

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## **Related, Current and Previous Work**

### **Related, Current, and Previous Work**

The following section explores previous work conducted around our four focal themes related to parks, greenspace, and outdoor recreation: health and well-being, environmental literacy and stewardship, and community resilience and vitality, and equity and inclusion. We also highlight future research gaps and future opportunities.

#### ***Health and well-being.***

Quality of life is highly dependent on good health, yet the COVID-19 pandemic has negatively impacted Americans' mental and physical health in various ways (Hasson, et al., 2021). Americans are less physically active today than in the past, a trend impacting multiple health dimensions. Many problems prevalent before the pandemic, such as physical inactivity (Godbey, 2009), are even more prevalent today. The challenge of physical inactivity and obesity is particularly acute among US youth: 20% of children and adolescents are obese, leading to a 2-3 times greater risk of hospitalization (CDC, 2022). Obesity rates and co-morbidities are even higher within low-income communities of color (Kurian & Cardarelli, 2007). Research has revealed positive associations between proximity to parks and trails and physical activity across age groups (Boone-Heinonen et al., 2010; Cohen et al., 2007; Frank et al., 2007; Roemmich, et al., 2006). Physical health benefits for people of all ages are also associated with active use of parks and greenspaces (Cohen et al., 2007; Godbey et al., 1998; Hartig et al., 2014; Ho et al., 2003; Van den Bosch & Sang, 2017). However, reviews have shown inconsistent results across study contexts (Bancroft et al., 2015; Kaczynski & Henderson, 2007). Many park users remain sedentary (Floyd et al., 2008), and more work is needed to identify the specific attributes of parks associated with physical activity. Additional research has shown statistical associations between recreation opportunities and other physical health outcomes such as healthy weight status (Potwarka et al., 2008) and BMI (Witten et al., 2008), but disparities exist across demographic groups. For instance, communities with lower-income and/or high-minority populations often experience degraded built environment infrastructure that limits physically active park use (Dentro et al., 2014; Huang et al., 2020).

Parks and greenspace also affect psychological health. Mental health issues such as stress, anxiety, and depression increased during the pandemic (Vahratian et al., 2021). Contact with nature represents a potential antidote to these problems. Greenspace exposure can bolster mental health and well-being by reducing stress, restoring attention, and increasing subjective well-being (Bratman et al., 2019; Hartig et al., 2014). For example, Larson et al. (2016) used a holistic measure of subjective well-being that included physical, mental, and social components to demonstrate significant associations between parks and health outcomes in over 40 U.S. cities. Other research supports positive links between green space and psychological health (Beyer et al., 2014; Bratman et al., 2012; Cohen-Cline et al., 2015), cognitive functioning (Dadvand et al., 2015), and social development and interactions (Bowers et al., 2020; Holtan et al., 2015; Zelenski et al., 2015), suggesting that benefits associated with green space and time in nature extend well beyond physical activity promotion. Parks also provide various ecosystem services that provide health benefits to diverse populations (Bratman et al., 2019; Jennings et al., 2016; Kuo, 2010).

The majority of outdoor recreation and health research focuses on specific communities or neighborhoods. However, when examined at a larger geographic scale, the connection (Kaczynski & Henderson, 2007) varies by context and type of intervention (Shanahan et al., 2019). Much work has focused on urban parks, but research suggests that other types of parks (e.g., national forests, state parks) may significantly contribute to physical activity among the American public (Kline et al., 2011; Larson et al., 2014). Regardless of proximity or access, various constraints to outdoor recreation prevent interest, participation, and subsequent achievement of health benefits (Jackson & Scott, 1999; Walker & Virden, 2005). Identifying and understanding these constraints to outdoor recreation impact diverse populations is a critical component of nature-based health promotion. As recognition of the salutogenic value of nature grows (Larson & Hipp, 2022), more research is needed to explore causal mechanisms, identify optimal dosages of nature, and evaluate the impacts of policies and practices designed to leverage the health promotion potential of parks, greenspace, and outdoor recreation.

### ***Environmental literacy and stewardship.***

Increased outdoor recreation and contact with nature, often through formal and informal environmental education, can also improve environmental literacy and inspire environmental stewardship (Ardoin, et al., 2020). Early models posited that environmental literacy and stewardship behavior could be enhanced by building environmental knowledge and pro-environmental attitudes (Hines et al., 1986). Later studies have shown that knowledge is one of many components of environmental literacy (Morrone et al., 2001; Szczytko et al., 2019). More comprehensive models have revealed other key correlates of environmental literacy and pro-environmental behavior (PEB) such as demographic factors such as gender, age, and education (Cottrell, 2003; Larson et al., 2011), emotional involvement (Maitney, 2002; Nisbet et al., 2009) or personal experience in the outdoors (Kollmuss & Agyeman, 2002; Siemer & Knuth, 2001; Wells & Lekies, 2006). This latter precursor to literacy and PEB, nature-based recreation, has attracted substantial attention in the literature (Larson et al. 2018), highlighting a unique avenue for conservation action.

However, despite the potential educational and affective benefits linked to time in nature, a widespread assumption is that contact with nature - particularly among youth - is declining, leading to subsequent declines in environmental literacy (Charles & Louv, 2009). While some research supports this supposition, the results are scarce, often contradictory, and mostly correlational (Kellert et al., 2017; Larson, et al., 2019). Furthermore, while some have hypothesized direct links between outdoor recreation and conservation behavior, empirical evidence to support this relationship is limited (Kudryavtsev et al., 2012a; Larson, et al., 2018). More research is needed to examine the cause-effect relationship between outdoor recreation, environmental literacy, and PEB, and to inform the development and assessment of nature-based recreational programs and infrastructure - particularly among youth.

Early childhood experiences with nature may be particularly influential when it comes to environmental awareness and advocacy later in life (Bixler et al., 2002; Chawla & Cushing, 2007; Wells & Leikes, 2006). If contact between youth and nature is on the decline, it is important to know the consequences of this trend with respect to environmental concern and stewardship - especially at a time when global climate change is impacting human systems (Rousell & Cutter, 2020). A rising research area focuses on the interrelationships among environmental education, environmental literacy, and environmental impacts, including strategies for engaging youth, such as citizen science (Ballard, et al., 2017). This research could help address the need for long-term studies that examine the impacts of both unstructured outdoor play and significant nature-based life experiences on youth and adults from diverse backgrounds (Chawla, 1999; Stevenson et al., 2013; Wells & Lekies, 2006). A better understanding of these relationships and their implications could enhance human capacity to support and engage in pro-environmental policies and behaviors.

### ***Community resilience and vitality.***

Parks and outdoor recreation also contribute to community resilience and vitality by creating spaces for positive interaction and fostering civic participation (AIA, 2007; McManus et al., 2012). Today, many urban resilience projects focus on capacity-building by fostering connections between people and place (Berkes & Ross, 2013; Magis, 2010), acknowledging the role that parks and greenspace play in the development of thriving social-ecological systems (Murphy et al., 2019). Natural amenities promote vibrant communities by attracting visitors, new residents and businesses, as natural amenities are correlated with population growth and increased economic prosperity (Crompton, 2000; Crompton, 2007, Trinh & Cicea, 2021; Wainger & Price, 2004). For instance, studies have shown that rural areas rich in recreation amenities and nature-based tourism opportunities often fare better with respect to a variety of socio-economic indicators (Reeder & Brown, 2005) and tend to attract amenity migrants that bolster local economies (Crompton, 2007). Furthermore, urban revitalization via greenspace creation and expansion can generate green jobs, increase property values (Conway et al., 2010; Kovacs, 2012; Voicu & Been, 2008), and improve public health and quality of life (Branas et al., 2011; Kondo et al., 2015; Schilling & Logan, 2008). Thus, the resilience of human communities is intertwined with the health of ecological systems (Braubach, et al., 2017; Reynolds, et al., 2022).



The civic ecology framework (Tidball & Krasny, 2010), which promotes public engagement and social connection with greenspaces via stewardship activities such as tree planting and community gardening, illustrates concrete ways that outdoor recreation and greenspace can foster resilient social-ecological systems (Krasny & Tidball, 2015). Subsequent studies have shown that nature-based recreation activities are directly linked to participation in place-protecting or pro-environmental behavior including policy support, social forms of environmentalism, and land stewardship (Cooper et al., 2015; Larson et al., 2018). Although this evidence suggests outdoor activities can lead to tangible community impacts, more research is needed to understand why these connections exist and how they can be promoted and leveraged to support healthy and sustainable communities. The concept of sense of place, which refers to the group of cognitions and affective sentiments people hold regarding a particular locale (Farnum et al., 2005; Jorgensen & Stedman, 2006), offers potential explanations for the link between nature-based activities and conservation actions. Sense of place is often comprised of place meanings (i.e., beliefs about what a place represents) and place attachment (i.e., affective bonds that individuals form with a place), and both of these components can interact to inspire place-protecting behavior (Manzo & Devine-Wright, 2014; Larson et al., 2018; Kudryavtsev et al., 2012b). Parks, natural areas, and other types of open space have the potential to create a sense of place that yields psychological and environmental stewardship benefits (Kesebir & Diener, 2008; Peters et al., 2010). Multiple studies have found a positive association between a sense of place and pro-environmental behaviors (Halpenny, 2010; Hernandez et al., 2010; Stedman, 2002; Ryan, 2005; Scannell & Gifford 2010; Vaske & Kobrin, 2001; Walker & Chapman, 2003), and sense of place has been proposed as a centerpiece for a larger model linking recreation and conservation (Larson et al., 2018). More research is needed to explore the hypotheses that nature-based pathways to community resilience run through a sense of place.

Parks and greenspace can also help communities cope with change. Redevelopment and conversion of greyspace into greenspace (e.g., landfill to park development, rails-to-trails conversions) have become increasingly popular (Johnson et al., 2009), simultaneously building nature's resiliency and boosting quality of life (Klenosky et al., 2008; Kondo et al., 2015). The creation of outdoor spaces and sacred places (OSSP), another global trend, is often the result of spontaneous, self-organizing acts that are motivated by stewards' sense of community and need for healing rituals that are expressed through relationships with nature (Roberts, 2002; Svendsen & Campbell, 2010; Tidball et al., 2010). As such, the emergence of OSSPs is part of a socio-ecological process of disturbance and resilience (Berkes & Folke, 1998, 2002; Stedman & Ingalls, 2013). Stewards use their immediate landscape as a mechanism to foster adaptation and collective resilience in the aftermath of a crisis (Tidball 2010; Tidball & Krasny, 2013) and enhance overall ecosystem function (Folke et al., 2003; Gallopin, 2006; Tidball and Krasny, 2007). In this context, stewardship activities help to lessen feelings of isolation and disempowerment and can strengthen neighborhood attachment (Comstock et al., 2010; Townsend, 2006). Similarly, public parks can increase social cohesion and help build social capital (Jennings & Bamkole, 2019; Svendsen, 2009), even in historically marginalized communities (Mullenbach et al., 2022).

Nature is also a crucial resource for communities recovering from disaster (Miller, 2020; Ottosson & Grahn, 2008). For example, links between greenspace and resilience were especially evident during the COVID-19 pandemic, illuminating a "greenprint" for future urban growth and development (Bikomeye et al., 2021). Adverse environmental impacts can affect the attributes (i.e., natural amenities) that attract new residents and businesses, impacting the success of the "green growth machine" (DuPuis & Greenberg, 2019). Yet, despite these connections, collective understanding of the role of outdoor recreation, parks and other green spaces in developing and sustaining vibrant and resilient communities remains in a nascent stage. While some research highlights potential psychophysiological pathways to explain these connections (Hartig et al., 2014; Korpela & Ylen, 2007; Kuo & Sullivan, 2001; Wells, 2021), more research is needed to explore the processes through which change occurs, as well as unintended consequences.

### ***Equity and inclusion.***

Although parks and greenspace can provide a variety of benefits, these critical resources - and associated nature-based recreation opportunities - often remain inequitably distributed across the landscape. Neighborhoods with a large proportion of low-income or racial/ethnic minority residents typically experience limited access to parks and greenspaces (Bruton & Floyd, 2014; Nesbitt, et al., 2019; Wolch, et al., 2014). Even when parks are located in low-income communities of color, they tend to be of lower quality (Rigolon, et al., 2018) and are often used less frequently (Larson, Mullenbach et al., 2021; Powers et al., 2020). However, when greenspace - and public parks in particular - are available and accessible within disadvantaged communities (e.g., low-SES, high-minority population), they produce more health benefits than when they exist in affluent communities (Rigolon et al., 2021). Thus, greenspace offers a promising tool for promoting health equity across diverse populations.

Unfortunately, the disparities in access to parks and outdoor recreation have been exacerbated during the COVID-19 pandemic (Larson, Zhang, et al., 2021; Nay et al., 2022). As a result, the benefits that parks provide are rarely accessible and enjoyed by all segments of society (Jennings, Larson, & Yun, 2016). Research has revealed a variety of constraints that contribute to racial/ethnic and socioeconomic disparities in park use and outdoor recreation, including reasons that are individual, interpersonal, and contextual or structural (Stodolska et al., 2020). Studies have also examined the different motivations that inspire nature-based recreation across demographic groups (Whiting et al., 2017). Additional research focused on the factors that constrain or facilitate outdoor recreation, particularly in the post-pandemic era, could help to address these persistent disparities. When lower levels of park use and outdoor recreation exist in communities of color, many negative consequences arise. For example, studies have shown that park spaces are critical for the health of youth (Reuben et al., 2020) and adults (Larson et al., 2014; Rigolon et al., 2021) from racial/ethnic minority backgrounds, and opportunities for outdoor recreation could also help to build environmental literacy across historically marginalized populations (Stevenson et al., 2013). As evidence regarding these relationships continue to emerge, new research is needed to facilitate synthesis and integration across contexts to identify planning approaches, management strategies, and interventions that could lead to more equitable outcomes.

Many social justice-oriented interventions are already underway to address some of the disparities described above. However, initiatives designed to address inequalities in access to parks and greenspace often inadvertently fuel green gentrification, further displacing and excluding communities who need these resources the most (Anguelovski, et al., 2019; Mullenbach, et al., 2022; Rigolon & Collins, 2022). In other words, while the impact of green spaces is often positive, the process of greening can produce unexpected consequences. Future research should explore strategies that managers and practitioners can employ to achieve more equitable urban greening (Rigolon et al., 2020) and embrace antiracist and anti-colonial forms of urban conservation (Mullenbach et al., 2022). These realities highlight the need to consider equity and environmental justice issues when assessing the positive and negative impacts of parks and green environments across diverse populations.

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## Objectives

1. Explore the role that parks and outdoor recreation play in promoting physical activity, psychological well-being, and associated preventative health benefits.  
Comments: The purpose of extending this multi-state project is to continue to build a network of researchers conducting applied and basic research, as well as outreach, regarding benefits associated with parks and other green environments. Individual research and outreach projects will fall under the following four broad categories.
2. Explore the role that park and outdoor recreation play in promoting environmental literacy and stewardship behavior among youth and across the lifespan.
3. Explore the role that parks and outdoor recreation play in promoting community resilience and vitality.
4. Enhance efforts to increase diversity, equity and inclusion (DEI) in public parks, greenspaces, and outdoor recreation activities.  
Comments: The benefit of this multi-state approach is to exchange research methodology among project participants, moving towards more comparable study findings and cross-state analysis of results allowing for greater insight to problems faced by all states. In addition, successful outreach methods and strategies for successful collaborations with practitioners can be shared among project participants to generate the outputs, outcomes, and impacts, described below.

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## Methods

## Methods

This project is not a typical funded project with a pre-defined research methodology. The goal is to advance the topic areas listed, by 1) allowing researchers to formally participate in a multi-state project (i.e., through their experiment station), and 2) developing new collaborations among researchers. The breadth of methods used to address broader research questions will ideally be as diverse as the different disciplines and fields represented by project collaborators. The methods listed below will serve as a starting point, enabling researchers to identify with this multi-state project and potential analytical approaches yet leaving ample room for methodological adaptation and innovation.

### ***Objective 1: Health and well-being.***

A variety of methods have been and will continue to be used to evaluate the impacts of park and outdoor recreation services on physical activity and other health outcomes. For example, surveys, interviews, direct observations and protocols (e.g., SOPARC) have examined the amount and type of physical activity that occurs in parks and how those activity levels vary across demographic groups (Bancroft et al., 2015; Cohen et al., 2007; Huang et al., 2020). Spatial analysis tools (e.g., GIS, remote sensing, Google Street View) have enabled researchers to examine spatial patterns in health outcomes linked to recreation behavior and park proximity (Hunter et al., 2015). All of these conventional tools will be employed in health-related research within this multistate project.

Methods will also expand to integrate innovative strategies that have been successfully utilized across a variety of other disciplines. For instance, concentration performance tests, clinical depression diagnostic tools, GPS trackers and accelerometers, and physiological measures using standard medical instrumentation and protocols (i.e., blood pressure, pulse, nerve and brain wave activity, blood cortisol and glucose levels, immune cells) can help researchers track mental health outcomes associated with time in nature. Experimental designs, clinical trials, and large-scale studies with statistical controls, long absent in the largely cross-sectional park and greenspace literature, have been and are being employed in separate studies across the US and other countries. These designs will help researchers identify elusive causal mechanisms in the relationship between nature and health (Frumkin et al., 2017). The multistate project will incorporate and facilitate more of those approaches, enabling researchers to establish baselines and longitudinally investigate long-term health outcomes. Given the rapidly evolving knowledge based on this topic, meta-analyses of published research can be used to explore patterns and trends across a broader variety of geographic and temporal scales.

### ***Objective 2: Environmental literacy and stewardship.***

Despite the lack of long-term experimental evidence examining trends in and precursors to environmental literacy and pro-environmental behavior (PEB), researchers have developed a variety of theoretical frameworks that can be used to test hypothesized relationships. These theoretical frameworks often encourage nested research that studies humans within larger social and environmental systems. Investigation of relationships in these larger systems typically requires mixed methods and a combination of positivist (i.e., quantitative) and interpretive (i.e., qualitative) approaches (Courtney-Hall & Rogers, 2002). To assess environmental literacy and PEB, the multistate project will use a variety of research techniques such as interviews and surveys to explore connection to nature, environmental literacy, PEB, and the factors that contribute to each. Concepts and constructs identified in previous studies on environmental literacy (Wells & Lekies, 2006; Lohr & Pearson-Mims, 2005; Szczytko et al., 2019) will be used to refine survey instruments, with a particular emphasis on distinguishing between experiences in different types of natural settings. The project will also utilize instruments that assess the impacts of environmental education efforts on environmental quality (Duffin, Murphy, & Johnson, 2008; Short, 2009). Considering the rapidly expanding literature on these topics, meta-analyses of published research will be used to explore patterns and trends across a broader variety of audience and geographic and temporal scales.

### ***Objective 3: Community resilience and vitality.***

In addition to traditional quantitative and qualitative methods, research and engagement methods in this category could include community-based participatory research methods (e.g., Becker et al., 2003) or participatory modeling strategies (e.g., Chase et al., 2010). Researchers could also include economic analyses using input/output and counterfactual models designed to assess the development of tourism-based industry in rural locations. Past examples include assessments of development adjacent to high amenity resources, such as gateway communities to national parks (Krannich & Petrazelka, 2003), and analysis of economic impacts of parks and nature-based tourism (Crompton, 2007), including financial benefits associated with improved health and well-being (Buckley et al., 2019). Additional techniques for measuring community resilience and vitality include photo elicitation documenting the lived experiences of residences (Kuo et al., 1998) as well as spatial analyses that integrate a variety socio-economic variables linked to parks and greenspace, including crime (Kuo & Sullivan, 2001; Shepley et al., 2019). Organizations such as the Trust for Public Land provide a variety of resources and datasets for researchers hoping to explore these connections, some of which will be utilized in this project.

Still needed are research designs that clarify interconnections between outdoor recreation activity and indicators of resilience. Resilience is a multi-dimensional concept, so a range of resilience measures need to be applied in an outdoor recreation context (Rendon et al., 2021). Human contributions to community resilience can be measured at an individual (i.e., psychological) or a collective (i.e., social) level (Berkes & Ross, 2013). New indicators are being developed to address some research questions under the broad umbrella of community resilience (Rendon et al., 2021), and many of these could be incorporated into parks and greenspace research in the future.

### ***Objective 4: Equity and inclusion.***

A variety of methods have been employed to assess, understand, and promote diversity, equity, and inclusion in the context of parks, greenspace, and outdoor recreation. This includes many of the conventional methods described above such as surveys and interviews, which can help researchers document and characterize the experiences of diverse individuals (Stodolska et al., 2014). However, additional methodologies may be required to identify the ways in which systemic racism, unfair power structures, and a lack of cultural competence and humility affect DEI and access to quality parks (NRPA, 2021). For example, document and content analysis can help researchers understand how DEI issues manifest in multiple forms of planning and management (Mullenbach, 2022), including health impact assessments (Besser et al., 2022). Spatial analysis can also reveal inequities in access to parks and greenspace, as well as variables correlated with those inequities (Rigolon et al., 2021). Community-engaged research techniques such as participatory action research and narrative storytelling could illuminate challenges and reveal concrete strategies needed in the push for change (Rigolon et al., 2022). This multistate project will utilize different combinations of these traditional and transformative approaches to tackle social justice issues pertaining to parks, greenspace, and outdoor recreation, helping to ensure that these spaces, and the variety of benefits they provide, are accessible to everyone.

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## Measurement of Progress and Results

### Outputs

- -Regular meetings with the multistate group, including annual in-person gathering and virtual interactions throughout the year that are designed to engage existing and recruit new multistate members. Comments: The following outputs, outcomes, and impacts will be assessed at each annual meeting. The annual meeting will be used to recognize successes, identify opportunities for improvement and/or new avenues of inquiry, and develop a plan for continued success. The outcomes and impacts of the project will be evaluated through the annual report, which is compiled after the annual meeting. Each member of the project is required to submit their outcomes and impacts each year. The annual report will facilitate synthesis of projects outcomes and impacts on our list and identification of shortcomings or strategies for improvement. In addition, project outcomes will be evaluated for evidence of participatory research methods, as appropriate.
- -Centralized website that serves as a hub for project activities, including a repository for research studies, instruments, and measures related to focal themes
- -Development, implementation, and refinement of reliable and valid instruments and methods for measuring: (a) health outcomes associated with outdoor recreation and parks, (b) connection to nature, environmental literacy, and pro-environmental behavior, (c) components of community resilience and measures of vitality (e.g., sense of place, social cohesion, economic development), and (d) success of efforts to increase diversity, equity and inclusion (DEI) in public parks and greenspaces
- -Synthesis papers and presentations for professional associations, such as the Society of Outdoor Recreation Professionals (SORP) & National Recreation and Park Association (NRPA), and for dissemination to practitioners
- -Factsheets on study findings to be distributed to recreation program managers at various government agencies (local, state and federal) and nongovernmental organizations.
- -Workshops, symposia, or conference sessions/presentations that connect researchers, extension specialists, and practitioners to present the mechanisms by which parks and other green environments support the focal themes
- -Increased student participation and engagement in the Multistate Group to enhance networking and professional development opportunities
- -Proposals designed to generate external funding from agency, foundation, and/or corporate sponsors to support Multistate research efforts and objectives
- -Peer reviewed publications and professional conference presentations related to focal research themes
- -Edited book focused on the "Transformative Power of Parks" that synthesizes the current state of knowledge across four themes and includes contributions from authors around the world

### Outcomes or Projected Impacts

- -Enhanced national coordination and scientific capacity to address contemporary problems in parks and recreation by applying and revising state-of-the-art knowledge
- -Creation and cultivation of relationships with potential research funding partners, including federal agencies, non-governmental organizations, and foundations
- -Development of forecasts for park use and recreation visitor volume and trends, and plans for appropriate recreation management responses
- -Increased understanding of the multifaceted health benefits associated with recreation in parks and other green environments
- -Increased understanding of the causal mechanisms through which health benefits occur in parks
- -Increased understanding of the relationships between unstructured and structured contact with nature and environmental literacy
- -Increased understanding of the role of outdoor recreation in enhancing positive youth development
- -Increased awareness among researchers and providers of methods and instruments to measure concepts of community resilience and vitality related to outdoor recreation, parks and other green environments
- -Development of planning documents that emphasize community resilience and vitality via outdoor recreation and nature-based tourism
- -Increased understanding of outdoor recreation's beneficial role in larger socio-ecological systems
- -Increased understanding of participation in outdoor recreation and access to parks and greenspace across diverse populations
- -Development of strategies and interventions to increase diversity, equity, and inclusion in the outdoors
- -Transformative research that positions parks, green spaces and outdoor recreation as key components of a sustainable and healthy future
- -Creation and cultivation of relationships among researchers, government agencies, non-governmental organizations, and foundations to help support human well-being through sustainable park and outdoor recreation systems
- -Effective education, communication and promotion of the multifaceted value of parks, green spaces and outdoor recreation across diverse populations
- -Increased participation in physically active outdoor recreation across generations
- -Improved infrastructure that supports healthy and active lifestyle choices, such as increased pedestrian and bicycle transportation coordinators to schools
- -Improved health and quality of life across diverse populations
- -Integration of nature-based health promotion strategies into preventive health care
- -Increased public awareness of ecosystem services and support for environmental conservation, especially among youth
- -Increased participation in environmental education and conservation stewardship programs (e.g., citizen science)
- -Integration of experiential environmental education into national education curricula
- -Enhanced sense of place and public attachment to parks, greenspace, and natural areas
- -Increased recognition among community leaders and developers of the critical contributions of park and outdoor recreation services (including economic contributions) to community resilience and vitality
- -Improved social networks and community relationships due to increased interactions with parks and green environments
- -Increased distribution of parks, greenspace and outdoor recreation opportunities across diverse communities
- -Removal of systemic barriers and development of policies and interventions that ensure the positive outcomes associated with parks, greenspace, and outdoor recreation are available to and enjoyed by everyone, regardless of their background

## Milestones

**(2023):** ● Publish NE 1962 edited book: "The Transformational Power of Parks." ● Update the NE1962 Multistate Project website that serves multiple functions including categorized inventory of ongoing projects, documentation of contributors/partners, repository for project-related resources, and recruiting tool for new collaborators. ● Increase NE1962 engagement and participation (including the annual meeting and other virtual meetings throughout the year), potentially by identifying a new annual meeting location that better accommodates western states' participation ● Identify collaborative research and funding opportunities

**(2024):** ● Continue ongoing research collaboration, including development, implementation and refinement of instruments, scales, and methods for assessing key outcome variables. ● Publish ongoing research. ● Coordinate pursuit of research and funding opportunities (i.e., proposal writing). ● Engage in outreach and information dissemination of existing projects, including resources for extension specialists on project website. ● Coordinate conference session and/or panel discussion that highlights NE1962 Multistate Project (or NE1962 book) and outcomes related to at least one project objective. ● Annual meeting (location TBD).

**(2025):** ● Continue ongoing research collaboration, including development, implementation and refinement of instruments, scales, and methods for assessing key outcome variables. ● Publish ongoing research. ● Coordinate pursuit of research and funding opportunities, with successful acquisition of at least one collaborative, externally-funded grant. ● Engage in outreach

and information dissemination of existing projects, including resources for extension specialists on project website. ● Annual meeting (location TBD)

(2026):● Continue ongoing research collaboration, including development, implementation and refinement of instruments, scales, and methods for assessing key outcome variables. ● Publish ongoing research. ● Coordinate pursuit of research and funding opportunities, with successful acquisition of at least one collaborative, externally-funded grant. ● Engage in outreach and information dissemination of existing projects, including resources for extension specialists on project website. ● Annual meeting (location TBD)

(2027):● Continue ongoing research collaboration, including development, implementation and refinement of instruments, scales, and methods for assessing key outcome variables. ● Publish ongoing research. ● Coordinate pursuit of research and funding opportunities, with successful acquisition of at least one collaborative, externally-funded grant. ● Engage in outreach and information dissemination of existing projects, including resources for extension specialists on project website. ● Annual meeting (location TBD) ● Renewal of Multistate Project

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## Outreach Plan

### Outreach Plan:

Research results from NE1962 are of interest to academic audiences and many other stakeholder groups, including park and recreation professionals, urban planners, community and youth leaders, formal and non-formal educators, and a variety of policy- and decision-makers. NE1962 members will make research results available through scientific journals, extension publications, fact sheets, popular press news articles, and appropriate websites and social media outlets. In addition, NE1962 members will present at national and international conferences as well as regional and local workshops and meetings. A listing of publications by NE1962 members will be updated annually and posted on the official NE1962 website. Internal communication related to NE1962 will be facilitated by the annual meeting, official website, and google group. Throughout the project, efforts will also be made to invite participation of extension faculty and specialists to integrate formal outreach programming into the project, helping to ensure that key findings are accessible to relevant audiences, including those that have been historically marginalized. Efficacy in disseminating results of research, and other outreach efforts, will be evaluated at the annual meeting and through the annual report.

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## Organization/Governance

### Organization and Governance:

The organization of project NE1962 was established in accordance with the Manual for Cooperative Regional Research. A Technical Committee will be formed that grants voting membership for elections. One representative from each participating organization, agency or institution can serve on the Technical Committee, with appointments made through appropriate administrative channels of the organization, agency or institution. In the first year, a Chair will be elected to serve a one-year term. Primary duties of the Chair include: scheduling and organizing the annual meeting, managing participant contact information lists, and managing the communication network, including the website. A Chair-Elect will be elected in years 1, 2, 3, and 4, serving a one-year term before serving as the Chair in the subsequent year. Duties of the Chair-Elect include: serving as secretary and drafting and submitting the annual report. All appointments (chair, chair-elect, and technical committee) will be annual, beginning October 1. Each year a 1-2 day annual meeting will be held in a location chosen by the chair, offering a combination of in-person and virtual participation.

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### Literature Cited

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## Land Grant Participating States/Institutions

AK,RI,IL,CT,WV,MS

## Non Land Grant Participating States/Institutions

### Participation

Participant	Is Head	Station	Objective	Research						Extension	
				KA	SOI	FOS	SY	PY	TY	FTE	KA
Butler, Peter	Yes	West Virginia - West Virginia University	3	608	530	3111	0.10	0.00	0.00	0	0
Fix, Peter J		Alaska - University of Alaska Fairbanks	1,4	134 724	530 599	3070 0	0.30	0.70	0.40	0	0
Gallo, Cory		Mississippi - Mississippi State University	1,2,3,4	134 724 112	530 6099 6099	3111 3111 3111	0.27	0.00	0.00	0	0
Jones, Madison		Rhode Island - University of Rhode Island	2,3	134	530	3030	0.10	0.10	0.00	1	134
Kuo, Ming	Yes	Illinois - University of Illinois	1,2,3,4	724	6020	3070	0.10	0.00	0.00	0	0
Park, Sohyun	Yes	Connecticut -Storrs	3	134 0	530 599	3111 2060	0.10	0.80	0.00	0	0

## Combined Participation

Combination of KA, SOI and FOS	Total SY	Total PY	Total TY
134-530-3070	0.15	0.7	0.4
724-599-0	0.15	0.7	0.4
134-530-3030	0.1	0.1	0
724-6020-3070	0.1	0	0
0-599-2060	0.05	0.8	0
134-530-3111	0.05	0.8	0
608-530-3111	0.1	0	0
112-6099-3111	0.09	0	0
134-530-3111	0.09	0	0
724-6099-3111	0.09	0	0
<b>Grand Total:</b>	<b>0.97</b>	<b>1.60</b>	<b>0.40</b>

Program/KA	Total FTE
0	0
134	0.33
0	0
0	0
0	0
0	0
<b>Grand FTE Total:</b>	<b>1</b>



## Appendix G: Peer Review (Submitted)

Status: Complete

**Project ID/Title:** NE\_TEMP1962: Outdoor Recreation, Parks and Other Green Environments: Understanding Human and Community Benefits and Mechanisms

### Rate the technical merit of the project:

1. Sound Scientific approach:

Approve/continue project with revision

2. Achievable goals/objectives:

Fair

3. Appropriate scope of activity to accomplish objectives:

Fair

4. Potential for significant outputs(products) and outcomes and/or impacts:

Fair

5. Overall technical merit:

Fair

### Comments

This is a well-written and ambitious proposal that attempts to encompass the dominant research questions related to the growing field of nature and health. The authors are knowledgeable about the recent and seminal papers in this field as well as the directions/questions that scholars and practitioners are discussing as crucial next steps in understanding this relationship and implementing it in public health and policy. The expected contributors have a proven track record of high-quality and well-regarded scientific papers in this field as well.

The proposal could have been strengthened by adding specificity to what will be done, and how it will be done. The concrete deliverable is an edited book, which the authors must already have started to publish in 2023. The rest of the deliverables are commonplace in any working group - presenting, meeting, publishing, applying for grants, etc. I would have liked to see what the authors hope to accomplish first, second, and so forth, in regards to the four research domains. I also think they could have been more intentional about linking research methodologies with domains/questions - the current mix is an umbrella saying "we might do just about anything to answer these topics." That is my reading, at least. My apologies for oversimplifying it. Also lacking are especially novel datasets, populations/cohorts, or methodological approaches. It seems "more of the same" will be done. That can be successful but is not particularly exciting to this reviewer (and probably to funders as well).

Overall, I recommend the authors attempt to extract from the laundry list of possible methods/questions in each of the four research domains a plan that shows how they will navigate each of these simultaneously or sequentially, and what specific sources of data and funders could enable each to be accomplished. This is no small feat I realize but would allow external audiences to better grasp what might be done when (beyond the book).

Your Recommendation:

Approve/continue project with revision

## Appendix G: Peer Review (Submitted)

Status: Complete

**Project ID/Title:** NE\_TEMP1962: Outdoor Recreation, Parks and Other Green Environments: Understanding Human and Community Benefits and Mechanisms

### Rate the technical merit of the project:

1. Sound Scientific approach:

Approve/continue project with revision

2. Achievable goals/objectives:

Fair

3. Appropriate scope of activity to accomplish objectives:

Unacceptable

4. Potential for significant outputs(products) and outcomes and/or impacts:

Good

5. Overall technical merit:

Fair

Comments

The scope of this project is so broad that its contribution to the literature, impact on decision-making and policy, and technical merits are scattered and its merits not easy to identify, yet alone evaluate. The proposal is structured across four directions for research – health and well-being, environmental literacy and stewardship, community resiliency and vitality, and equity and inclusion. Each of these directions reflects a broad swath of theory, methods and interdisciplinary lines of thinking. The proposal treats these directions as discrete and does not provide depth to discussion that would connect and synthesize. Indeed, each of these directions has a history of research that spans across disciplines and paradigms, yet are not well integrated themselves. How will this project make sense of the pluralism in conceptual and methodological frameworks that it covers?

A secondary problem is the expert-based positioning of the proposal. The research does not appear to democratize its knowledge base, engage citizens in ways that empower, or otherwise trouble itself with connecting evidence, communities and decision-making. Rather the goals reflected in the “outcomes or projected impacts” are squarely aligned with experts and professionals making decisions from a top-down perspective of policy and information flow. Such positioning for research with aims for “healthier people, communities and natural environments” seems out-of-step with current trends in governance and roles for research.

Another concern is the advocacy orientation of the text that does not distinguish the process of greening from the impact of greenness. A lesson learned from the planting of street trees in Detroit almost a decade ago, was that the socio-political process that led to green infrastructure was critically important to the health and well-being of residents. Stated differently, the community-based impact of green infrastructure is influenced by the process in which it came to be. With its advocacy to build green infrastructure coupled with expert-based positioning of decisions, the impacts of the research from this project may reproduce the folly experienced by Detroit.

The inclusion of a multi-state effort with a cadre of researchers at research universities would no doubt support a production of research articles. However the collective impact of the effort is an open question given the expansive scope, omnibus set of issues, and research objectives. Without a more specified problem, the aspirations for a defined impact of the project are not clear.

It may be that the project is purposely written to be broad to provide a nimble basis to engage researchers. The diversity of topics and generic objectives are meant to address an array of fronts

useful to show relevance to a diverse constituency. Rather than depth, the project is meant for breadth. If so, the concerns for focus and directed impact of research are misplaced. However the open point remains about the top-down orientation and lack of concern for community-based impacts and engagement.

Your Recommendation:

Approve/continue project with revision

## Appendix G: Peer Review (Submitted)

Status: Complete

**Project ID/Title:** NE\_TEMP1962: Outdoor Recreation, Parks and Other Green Environments: Understanding Human and Community Benefits and Mechanisms

### Rate the technical merit of the project:

1. Sound Scientific approach:

Approve/continue project with revision

2. Achievable goals/objectives:

Fair

3. Appropriate scope of activity to accomplish objectives:

Fair

4. Potential for significant outputs(products) and outcomes and/or impacts:

Good

5. Overall technical merit:

Fair

Comments

The proposal is hard to evaluate because the objectives are very broad and the methods need a more detailed description in order to be evaluated. I would suggest that the objectives be re-organized and specified to the greatest extent possible. I assume that this is possible given that the main milestone is the edited book, which should already have a coherent goal in mind.

The literature reviewed in defining the problem is a bit dated. For example, there has been an explosion of research connecting health and recreation during the pandemic. Th literature exploring pro-environmental behavior has also developed tremendously in the 2010s.

Outputs/outcomes-I appreciate the idea of developing a a comprehensive workshop to examine the objectives in a wholistic manner. However, I am not convinces another meeting is needed. I would suggest working within existing organizations to create a synergy among the topics and among diverse stakeholders: researchers, mangers, extension specialists, and the interested public.

Milestones-I am impressed with the idea of the edited book, a needed resource in the parks and recreation field. Although, should the intended audience be the choir (researchers) or should it be managers and the public? The remaining milestones lack specificity to be evaluated.

I applaud the goal of the outreach plan to include formal outreach programming, but need more details to fully evaluate the impact of these activities.

Your Recommendation:

Approve/continue project with revision

## Appendix G: Peer Review (Submitted)

Status: Complete

**Project ID/Title:** NE\_TEMP1962: Outdoor Recreation, Parks and Other Green Environments: Understanding Human and Community Benefits and Mechanisms

### **Rate the technical merit of the project:**

1. Sound Scientific approach:

Approve/continue project with revision

2. Achievable goals/objectives:

Excellent

3. Appropriate scope of activity to accomplish objectives:

Excellent

4. Potential for significant outputs(products) and outcomes and/or impacts:

Excellent

5. Overall technical merit:

Good

Comments

It is good timing to revisit the relationship between humans and nature in the wake of the COVID-19. While this proposal is well written and organized, findings from the literature on parks, greenspace, outdoor recreation, and wellbeing as related to COVID-19 are not cited sufficiently despite a plethora of studies on COVID-19 and urban greenspace have been conducted worldwide. For example, Urban Forestry & Urban Greening published a special issue on "COVID-19 and the importance of urban green spaces" in 2021. Recently, Land also published a special issue "Effects of the COVID-19 Pandemic on the Use and Perception of Urban Green Space". A review of recent literature on COVID-19 and urban green space will provide information on the status quo, justifying the research gaps and future research needs described in the proposal.

Another minor concern is the methods described, not considering the use of big data, particularly unstructured data from social media (user generated content) which provide a huge amount of information on how people perceive and use urban parks before, during, and after COVID-19.

Your Recommendation:

Approve/continue project with revision

## Appendix G: Peer Review (Submitted)

Status: Complete

**Project ID/Title:** NE\_TEMP1962: Outdoor Recreation, Parks and Other Green Environments: Understanding Human and Community Benefits and Mechanisms

### Rate the technical merit of the project:

1. Sound Scientific approach:

Disapprove/terminate project

2. Achievable goals/objectives:

Unacceptable

3. Appropriate scope of activity to accomplish objectives:

Unacceptable

4. Potential for significant outputs(products) and outcomes and/or impacts:

Unacceptable

5. Overall technical merit:

Unacceptable

Comments

The objectives are not clear. They include: “Demonstrate and expand the evidence for the role of park and outdoor recreation services in...” However, it is not clear what “demonstrate the evidence for...” means. Does this mean conduct a literature review?

“Expand the evidence for...” is a very general statement/objective. In the final objective, what does “demonstrate the evidence and efforts to...” mean? Does that mean do a survey of management practices? In the objective description, the authors suggest they might use PAR to identify strategies to push for change, but not to achieve change. There is no mention of examining whether strategies or programs were successful at meeting certain goals.

In general, the project outcomes do not connect to the stated objectives. In particular, given the stated objectives and methods, it is unclear how the following stated outcomes would come from this project:

-Development of planning documents that emphasize community resilience and vitality via outdoor recreation and

nature-based tourism

-Creation and cultivation of relationships among researchers, government agencies, non-governmental organizations,

and foundations to help support human well-being through sustainable park and outdoor recreation systems

-Increased participation in physically active outdoor recreation across generations

-Improved infrastructure that supports healthy and active lifestyle choices, such as increased pedestrian and bicycle

transportation coordinators to schools

-Improved health and quality of life across diverse populations

-Integration of nature-based health promotion strategies into preventive health care

-Increased public awareness of ecosystem services and support for environmental conservation, especially among youth

-Increased participation in environmental education and conservation stewardship programs (e.g., citizen science)

-Integration of experiential environmental education into national education curricula

-Enhanced sense of place and public attachment to parks, greenspace, and natural areas

-Improved social networks and community relationships due to increased interactions with parks

and green environments

-Increased distribution of parks, greenspace and outdoor recreation opportunities across diverse communities

-Removal of systemic barriers and development of policies and interventions that ensure the positive outcomes

associated with parks, greenspace, and outdoor recreation are available to and enjoyed by everyone, regardless of their background

In addition, it is unclear what the role of the non-academic would be in this project. It seems that the methodological challenges and goals are stated, but are not necessarily grounded in what land and recreation managers experience.

The objectives, and methods are research-focused. Yet the outcomes and projected impacts imply that partnerships will be developed. Which objectives and methods will be used to build partnerships?

Your Recommendation:

Disapprove/terminate project

Appendix G: Peer Review (Submitted)

Status: Complete

**Project ID/Title:** NE\_TEMP1962: Outdoor Recreation, Parks and Other Green Environments:  
Understanding Human and Community Benefits and Mechanisms

**Rate the technical merit of the project:**

1. Sound Scientific approach:

Approve/continue project

2. Achievable goals/objectives:

Good

3. Appropriate scope of activity to accomplish objectives:

Excellent

4. Potential for significant outputs(products) and outcomes and/or impacts:

Good

5. Overall technical merit:

Excellent

Comments

Very comprehensive proposal. I agree that an edited book would be a very helpful contribution that would tie the four focal themes together well, in addition to the other proposed outputs. Under the Outreach Plan section, one suggestion is to think more strategically and practically about how the team will really make an impact to the public (as opposed to academic). Identify more specifically the targeted "public" audience(s), and how to reach them.

Your Recommendation:

Approve/continue project



NE 1962 Project Proposal Start Date” October 1, 2022; End Date September 30, 2027.  
Response to Peer Review

We would like to thank the reviewers for taking the time to review the proposal and provide thoughtful, substantive comments. Our responses are below.

### **Methods**

Several reviews made comments about the methodology being vague. Related was a concern regarding how we would address pluralism in the field. A final related concern was whether new methods were proposed or if it was “more of the same.”

RESPONSE: We agree the methods are vague. But as one of the reviewers stated: “It may be that the project is purposely written to be broad to provide a nimble basis to engage researchers.” That sentence accurately, and elegantly, captures the intent of the proposal. One purpose of the proposal is to attract new participants to the multi-state project. Participants do not necessarily need to conform to a specific methodology. Rather they can fit their studies into the project. This will facilitate collaboration across geographic and disciplinary boundaries, helping to achieve broader project objectives.

The following is the preface to the methodology section. That section has been revised to clarify.

Original wording: “As this project seeks to develop collaborations and new research that will involve a variety of disciplinary perspectives and stakeholders, a specific methodology is not yet defined. The methods listed below will serve as a starting point for advancing methodology.”

Revised wording: “This project is not a typical funded project with a pre-defined research methodology. The goal is to advance the topic areas listed, by 1) allowing researchers to formally participate in a multi-state project (i.e., through their experiment station), and 2) developing new collaborations among researchers. The breadth of methods used to address broader research questions will ideally be as diverse as the different disciplines and fields represented by project collaborators. The methods listed below will serve as a starting point, enabling researchers to identify with this multi-state project and potential analytical approaches yet leaving ample room for methodological adaptation and innovation.”

REPSONSE: Regarding the concern about novel research methods, the individual projects associated with previous editions of this project have been novel and have demonstrated positive impacts to the public. The purpose of this proposal is to allow to collaboration/integration among participants (i.e., researchers, extension agents) and scaling up of those novel projects. As such it is intentionally broad and does not specify one specific method.

### **Outcomes/products/milestones/outreach plan/impact to the public**

Several reviewers noted a lack of specificity in the objectives, products, and milestones. Related, concern was expressed regarding ensuring the project makes an impact to the public.

RESPONSE: The following text was added to clarify how the outcomes, products, and milestones would be measured.

“The following outputs, outcomes, and impacts will be assessed at each annual meeting. The annual meeting will be used to recognize successes, identify opportunities for improvement and/or new avenues of inquiry, and develop a plan for continued success. The outcomes and impacts of the project will be evaluated through the annual report, which is compiled after the annual meeting. Each member of the project is required to submit their outcomes and impacts each year. The annual report will facilitate synthesis of projects outcomes and impacts on our list and identification of shortcomings or strategies for improvement. In addition, project outcomes will be evaluated for evidence of participatory research methods, as appropriate.”

RESPONSE: The following was added to the outreach plans section to clarify how we will assess the extent of the project’s public impact.

“Efficacy in disseminating results of research, and other outreach efforts, will be evaluated at the annual meeting and through the annual report.”

#### **Specific comments not addressed above**

“I would suggest working within the existing organizations to create synergy among the topics and among diverse stakeholders” researchers, managers, extension specialists, and the interested public.”

RESPONSE: Members of this multi-state group are diverse, including extension agents. In addition, we’ve made a point to include managers in our annual meetings, though hope is to add more managers and practitioners as direct research collaborators as the project progresses.

“Should intended audience of book be researchers or managers and the public.”

RESPONSE: The book is intended to be accessible to non-academics, whether that be managers or policymakers/elected officials. It should also be of interest to researchers, as well as being valuable for university curriculum.

“Expert-based positioning of the proposal.”

Reply: Given this is a Hatch Multi-state project, there is definitely an applied component to the research. Members of the project who are participating through an agricultural and forestry experiment station must report specifically on how the results have been disseminated to the community of interest. Likewise, participants must report on training and professional development that has resulted. While not every project participant has reporting requirements to their experiment station (and hopefully this project results in research and outreach not tied to a specific agricultural and forestry experiment station), the multi-state annual report requires documentation of “Training, professional development, and information dissemination” and “impacts.” While not explicitly stated in the methods, effective applied research should incorporate participatory research methods. We have now added a note to the output/outcome/impact section explaining how the annual report and meeting will serve as an assessment of outreach and impacts. That note also mentions we will assess project outcomes for evidence of participatory research methods.

“Advocacy orientation of the text that does not distinguish the process of greening from the impact of greenness.”

RESPONSE: The entire equity and inclusion section of the proposal focuses on disparities and potential negative impacts of greening, including gentrification. In other words, these legitimate concerns are already discussed in detail. To clarify the relationships suggested by the reviewer, we added the following sentence to the equity and inclusion section:

“In other words, while the impact of green spaces is often positive, the process of greening can produce unexpected consequences.”

We have also added the following reference in that section:

Rigolon, A., & Collins, T. (2022). The green gentrification cycle. *Urban Studies*. DOI:10.1177/00420980221114952.

Reviewers expressed concern about the literature being outdated, especially related to Covid. One reviewer mentioned a special issue of *Urban Forestry & Urban Greening* and another in *Land* that might be consulted.

RESPONSE: Based on the reviewers suggestions, we have added some more recent references – especially pertaining to the role of parks and greenspace during the COVID-19 pandemic. However, we could not add too many more due to space limitations. These include:

Li, H., Browning, M. H., Dzhambov, A. M., Zhang, G., & Cao, Y. (2022). Green Space for Mental Health in the COVID-19 Era: A Pathway Analysis in Residential Green Space Users. *Land*, 11(8), 1128.

MacKinnon, M., MacKinnon, R., Pedersen Zari, M., Glensor, K., & Park, T. (2022). Urgent Biophilia: Green Space Visits in Wellington, New Zealand, during the COVID-19 Lockdowns. *Land*, 11(6), 793.

Nay, A., Kahn Jr, P. H., Lawler, J. J., & Bratman, G. N. (2022). Inequitable Changes to Time Spent in Urban Nature during COVID-19: A Case Study of Seattle, WA with Asian, Black, Latino, and White Residents. *Land*, 11(8), 1277.

Pipitone, J. M., & Jović, S. (2021). Urban green equity and COVID-19: Effects on park use and sense of belonging in New York City. *Urban Forestry & Urban Greening*, 65, 127338.

In terms of contemporary references, it should be noted the updated proposal draft includes 46 references published in 2019 or later.

“objectives not clear. ‘what does demonstrate and expand the evidence for’ mean?”

RESPONSE: The following section was changed:

Original wording: “The purpose of extending this project (NE1962) is to provide evidence for the role of and mechanisms by which parks and other green environments provide benefits to people”

Revised wording:

“The purpose of extending this multi-state project is to continue to build a network of researchers conducting applied and basic research, as well as outreach, regarding benefits associated with parks and other green environments. Individual research and outreach projects will fall under the following four broad categories.

1. Explore the role that parks and outdoor recreation play in promoting physical activity, psychological well-being, and associated preventative health benefits.
2. Explore the role that park and outdoor recreation play in promoting environmental literacy and stewardship behavior among youth and across the lifespan.
3. Explore the role that parks and outdoor recreation play in promoting community resilience and vitality.
4. Enhance efforts to increase diversity, equity and inclusion (DEI) in public parks, greenspaces, and outdoor recreation activities.

The benefit of this multi-state approach is to exchange research methodology among project participants, moving towards more comparable study findings and cross-state analysis of results allowing for greater insight to problems faced by all states. In addition, successful outreach methods and strategies for successful collaborations with practitioners can be shared among project participants to generate the outputs, outcomes, and impacts, described below.”

“use PAR to identify strategies to push for change, but not to achieve change.” How will programs be examined to determine if programs were successful at meeting certain goals?

RESPONSE: See sections on Outputs/Outcomes/Impacts and Outreach Plan. This will be assessed and annual meetings. In some cases, specific intervention studies may be designed to examine the efficacy of programs.

“Project outcomes do not connect to the stated objectives. “...unclear how the following stated outcomes would come from this project”

RESPONSE: See the revised Objectives and the updated (and now more contextualized) sections on Outputs/Outcomes/Impacts and Outreach Plan. This should help to clarify these connections. Our outcomes will stem directly from collaborative multi-state efforts exploring the contributions of parks and greenspaces in each of the key study areas (health and well-being, environmental literacy and stewardship, community resilience and vitality, equity and inclusion). Advancing the science – and implications for policy and practice - around each of themes will help to ensure that project goals are achieved.

“Unclear what the role of the non-academic would be in this project. It seems that the methodological challenges and goals are stated, but are not necessarily grounded in what land and recreation managers experience.”

RESPONSE: As highlighted in the Outputs/Outcomes/Impacts and Outreach Plan sections, many participants are associated with an agricultural and forestry experiment station. Some participants have extension positions, and many projects have strong applied focus. As such, the roles of non-academic collaborators will vary depending on the focal topic/objectives and context. The multi-state proposal is written to ensure a variety of diverse collaborative opportunities and partnership models remain possible.

“Objectives and methods are research-focused. Yet the outcomes and projected impacts imply that partnerships will be developed. Which objectives and methods will be used to build partnerships?”

RESPONSE: We have reworded the objectives to signify that they are not exclusively research based... they are designed to explore the contributions of parks and greenspace across multiple social arenas. Part of that process is advancing the evidence, but part of that is also identifying specific strategies and interventions (including partnerships) that might be developed to realize and maximize these potential benefits. Because these strategies and interventions are highly contextualized, we have not prescribed any specific approaches. However, we have reiterated that partnerships are the essence of the multi-state project: "...working with another State agricultural experiment station, the Agricultural Research Service, or a college or university, cooperates to solve problems that concern more than one State." (See: <https://www.nifa.usda.gov/grants/programs/capacity-grants/hatch-act-1887-multistate-research-fund>) Partnerships will be facilitated through the annual meetings, other multi-state group functions, and multi-state group communications.

# NE\_TEMP2201: Mycobacterial Diseases of Animals

**Status:** Submitted As Final

**Duration** 10/01/2022 to 09/30/2027

**Admin** [\[Matthew E Wilson\]](#)

**Advisors:**

[\[Kathe Bjork\]](#) [\[Michelle](#)

**NIFA Reps:**

[Colby\]](#)

## Statement of Issues and Justification

The proposed multi-state initiative will focus on two of the most important mycobacterial diseases affecting animals; paratuberculosis (Johne's disease; JD) and the *Mycobacterium tuberculosis* complex (TB). These two mycobacterial diseases represent some of the most prevalent and economically significant infections of livestock, and each has a long and rich history. A brief background, including significance and need for work, on each of these diseases, is provided below.

Johne's Disease (JD) is a chronic granulomatous inflammatory intestinal disease that results from infection with *Mycobacterium avium* subspecies paratuberculosis (MAP). JD is recognized as a serious economic and animal health issue in domesticated ruminants including dairy and beef cattle, sheep, and goats throughout the world. The disease results in more than \$200 million of annual losses to the United States (US) dairy industry each year, with additional losses incurred by the other species. Additionally, recent evidence of the presence of *M. paratuberculosis* in retail milk sources has led to concern about milk quality. The growing recognition of MAP infection in wildlife species and their living environments is also of considerable concern, with contaminations being found within abiotic factors that affect us all, such as grassland, soil, and water-supply systems. Despite considerable efforts, JD remains a major concern for producers, having very high prevalence rates (68% of all US dairy herds and 95% of those with over 500 cows have at least one JD positive animal) based on culturing of fecal samples. MAP and JD are now considered endemic in the US and in most dairy producing nations, and without major breakthroughs, efforts at controlling the pathogens are likely to remain salutary and the disease will continue to spread unabated.

Considerable ongoing efforts have been and are being made to identify knowledge gaps, define research priorities, and develop recommendations for implementing JD control measures in the field. For instance, a 2003 report from the National Research Council of the US National Academies of Sciences on JD comprehensively reviewed the literature, identified major gaps in knowledge, and provided clear recommendations for future research priorities and strategies for the prevention and control of JD. In brief, the report concluded that JD is a significant animal health problem whose study and control deserves high priority from the USDA. It was recognized that the problems associated with JD stem from: (i) difficulties in diagnosis because of an unusually long incubation period and a lack of specific and sensitive diagnostic tests for detecting early infections; (ii) a lack of vaccines or other effective measures for infection control; and (iii) general lack of awareness of the disease and its true economic and animal health consequences by producers and veterinarians. The report made 25 specific recommendations including: implementation of strategies for the control of JD, educating and training of producers and veterinarians, and filling of key gaps in knowledge relating to JD. In 2005 and 2006, the USDA-APHIS-VS and the Johne's Disease Integrated Program (JDIP; <http://mycobacterialdiseases.org/>) formulated specialty working groups to review knowledge gaps and opportunities for research, extension, and training in JD.

The specialty working groups identified the following community needs: (i) the development of new and improved diagnostics and candidate vaccines; (ii) improvement of research efficiencies by developing shared resources and guidelines for basic and translational research in JD; and (iii) development of strong education and extension programs. While considerable progress has been made in all areas, the proposed multi-state initiative is necessary to fulfill the remaining unmet needs.

The *Mycobacterium tuberculosis* complex is a group of genetically related bacterial species that cause tuberculosis infection in humans and animals. Tuberculosis infection in livestock results mostly from the specific mycobacterium pathogens of *M. bovis* and *Mycobacterium avium* subspecies *avium* (MAA). These organisms can cause disease in multiple livestock and wild animal species and can be readily transmitted to humans. *M. bovis*, whose disease and infections will be the primary focus of the activities proposed in this multi-state initiative, is closely related to the organism that causes human tuberculosis, *Mycobacterium tuberculosis* (MTB).

TB is a disease of antiquity that has resulted in considerable economic losses to animal agriculture and, as a zoonotic disease, contributed greatly to human suffering prior to the widespread requirement for milk pasteurization. In fact, at the turn of the 20th century, *M. bovis* was considered to be the cause of greater economic losses in livestock production than all other infectious diseases combined. The implementation of rigorous control and disease eradication programs, including test and slaughter or test and segregate programs, have reduced or eliminated tuberculosis in cattle in the US and most developed countries. However, reservoirs in wildlife have precluded complete eradication. TB continues to be a significant recurring concern in many countries, including Ireland, the United Kingdom (UK) and New Zealand. In addition, both bovine tuberculosis and *M. bovis* infections in humans remain common in less developed countries, resulting in considerable economic losses due to disease and trade restrictions.

While TB incidence in the US remains low, there is considerable concern that we may be experiencing a resurgence of this disease in livestock and wildlife species. In 1994, a white-tailed deer (WT deer) from northeastern Michigan was found to be infected with *M. bovis*. This led to the wide-scale testing of cattle and deer with subsequent identification of *M. bovis* in both populations within this area. The spread of *M. bovis* in Michigan was slowed by a strict policy of total herd depopulation upon identification of positive cattle, as well as large-scale hunter education programs and a massive testing initiative in WT deer. Still, in Michigan, over 650 cases of *M. bovis* infection in WT deer and 49 positive cattle herds have been identified to date. Alarmingly, *M. bovis* has now spread to other states. *M. bovis* was recently detected in 27 WT deer and 12 cattle herds in Minnesota and has been confirmed in cattle from Colorado, Nebraska, Indiana, Kentucky, North Dakota, South Dakota, New Mexico, and California. Detection of *M. bovis* infection has led to quarantine and depopulation of all nearby affected herds. Clearly, this disease is continuing its resurgence throughout the US, particularly where cattle and WT deer commingle.

A second major source of *M. bovis* infected cattle in the US is imported animals from other countries where the disease is endemic, particularly Mexico. Indeed, molecular epidemiology studies have demonstrated that *M. bovis* cases in all states other than Michigan are likely of Mexican origin. Although USDA regulations stipulate that imported cattle must be tested within 60 days of import, the low sensitivity of most approved *M. bovis* diagnostic tests suggests that some infected animals will be missed. Since cattle are only held at the border for 48 to 72 hours, there is little time to conduct additional testing at the point of entry. In addition, the lack of mandatory animal identification in the US limits the ability to track cattle after they have entered the country. Clearly, it is crucial to have rapid diagnostics with improved sensitivity that could be deployed at points of entry. It is equally important to improve information on cattle movements after importation to track *M. bovis* infected cattle.

*M. bovis* is of significant concern to government agencies and cattle industries due to associated economic, social and potential public health problems. The inclusion of *M. bovis* research, teaching and extension in this multi-state project will address serious concerns from cattle industry representatives, government agencies, and public health officials. Their major concern is that the US is experiencing a resurgence of *M. bovis* that will have devastating economic effects, cause a disruption or severe restrictions in movements of cattle including exports, and have profound effects on producers, who own positive herds and must suffer depopulation or quarantine.

The generation of new knowledge relative to the diagnosis, management, and control of mycobacterial diseases of animals is critical if we are to prevent the spread, lower the prevalence and minimize the impact of the diseases in our livestock populations. USDA NAHMS studies and other work, including the National Dairy Producer Johne's survey, have shown that while producers are increasingly aware of the diseases, they often lack knowledge relative to their management and control. Therefore, there is a critical need for developing coordinated approaches for education and outreach programs related to mycobacterial diseases of animals.

Taken together, the proposed multi-state initiative described below will facilitate the development of shared research as well as the leveraging of intellectual and physical resources to address some of the most important mycobacterial diseases of animals.

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## Related, Current and Previous Work

The proposed multi-state initiative will focus on two of the most important mycobacterial diseases of animals; paratuberculosis (Johne's disease; JD) and the bovine tuberculosis complex (TB). These two mycobacterial diseases represent some of the most prevalent and economically significant infections of livestock, and each has a long and rich history. A brief background, including the significance and need for work, on each of these diseases is provided below. Johne's Disease (JD) is a chronic granulomatous inflammatory intestinal disease that results from infection with *Mycobacterium avium* subspecies *paratuberculosis*. JD is recognized as a serious economic and animal health problem in domesticated ruminants including dairy and beef cattle, sheep, and goats throughout the world. It results in more than \$200 million in annual losses to the United States (US) dairy industry each year with additional losses incurred by the other species. The growing recognition of *M. paratuberculosis* infection in wildlife species is also of considerable concern. Similarly, recent evidence of the presence of *M. paratuberculosis* in retail milk sources is of concern from a milk quality and potential food safety standpoint. The growing recognition of MAP infection in wildlife species is also of considerable concern, as well as contaminations in environments such as grassland, soil, and even water-supply systems. Despite considerable efforts, JD remains a major concern for producers with very high prevalence rates (68% of all US dairy herds and 95% of those with over 500 cows have at least one JD positive animal) based on culturing of fecal samples. MAP and JD are now considered endemic in the US and in most dairy producing nations, and without major breakthroughs, efforts at controlling pathogen are likely to remain salutary and the disease will continue to spread unabated.

There have been considerable ongoing efforts made to identify knowledge gaps, define research priorities, and develop recommendations for implementing JD control measures in the field. For instance, a 2003 report from the National Research Council of the US National Academies of Sciences on JD comprehensively reviewed the literature, identified major gaps in knowledge, and provided clear recommendations for future research priorities and strategies for the prevention and control of JD. In brief, the report concluded that JD is a significant animal-health problem whose study and control deserve high priority from the USDA. It was recognized that the problems associated with JD stem from: (i) difficulties in diagnosis because of an unusually long incubation period and a lack of specific and sensitive diagnostic tests for detecting early infections; (ii) a lack of vaccines or other effective measures for infection control; and, (iii) general lack of awareness of the disease and its true economic and animal-health consequences by producers and veterinarians. The report made 25 specific recommendations regarding the implementation of strategies for the control of JD, educating and training of producers and veterinarians, and filling of key gaps in knowledge relating to JD. In 2005 and 2006, specialty-working groups were formulated by the USDA-APHIS-VS and the Johne's Disease Integrated Program (JDIP; <http://mycobacterialdiseases.org/>) to review knowledge-gaps and opportunities for research, extension and training in JD.

Some of the community needs that were identified as gaps included: (i) the development of new and improved diagnostics and candidate vaccines; (ii) improving research efficiencies by developing shared resources and guidelines for basic and translational research in JD; and, (iii) developing strong education and extension programs. *While considerable progress has been made in all areas, the proposed multi-state initiative will facilitate meeting remaining major unmet needs.*

The TB complex of diseases of livestock results from infection of animals with mycobacterial pathogens, primarily *M. bovis* and *Mycobacterium avium* subspecies *avium* (MAA). These organisms can cause disease in multiple livestock and wild animal species and can be readily transmitted to humans. *M. bovis*, whose disease and infections will be the primary focus of the activities proposed in this multi-state initiative, is closely related to the organism that causes human tuberculosis, *Mycobacterium tuberculosis* (MTB).

TB is a disease of antiquity that has resulted in considerable economic loss to animal agriculture and, as a zoonotic disease, contributed greatly to human suffering prior to the widespread requirement for milk pasteurization. In fact, at the turn of the 20th century, *M. bovis* was considered to be the cause of greater economic losses to livestock production than all other infectious diseases combined. The implementation of rigorous control and disease eradication programs, including test and slaughter or test and segregate programs, have reduced or eliminated tuberculosis in cattle in the US and most developed countries. However, reservoirs in wildlife have precluded complete eradication. TB continues to be a significant recurring concern in many countries, including Ireland, the United Kingdom (UK) and New Zealand. In addition, both bovine tuberculosis and *M. bovis* infections in humans remain common in less developed countries, resulting in considerable economic losses due to disease and trade restrictions.



While TB incidence in the US remains low, there is considerable concern that we may be experiencing a resurgence of this disease in livestock species, primarily cattle. In 1994, a white-tailed deer (WT deer) from northeastern Michigan was found to be infected with *M. bovis*. This led to wide-scale testing of cattle and deer with subsequent identification of *M. bovis* in both populations within this area. The spread of *M. bovis* in Michigan was slowed by a strict policy of total herd depopulation upon identification of positive cattle, as well as large-scale hunter education programs and a massive testing initiative in WT deer. Still, in Michigan, over 650 cases of *M. bovis* infection in WT deer and 49 positive cattle herds have been identified to date. Alarmingly, *M. bovis* has now spread to other states. *M. bovis* was recently detected in 27 WT deer and 12 cattle herds in Minnesota and has been confirmed in cattle from Colorado, Nebraska, Indiana, Kentucky, North Dakota, South Dakota, New Mexico, and California. Detection of *M. bovis* infection has led to quarantine and depopulation of nearly all affected herds. Clearly, this disease is continuing its resurgence throughout the US, particularly where cattle and WT deer commingle.

A second major source of *M. bovis* infected cattle in the US is imported animals from other countries where the disease is endemic, particularly Mexico. Indeed, molecular epidemiology studies have demonstrated that *M. bovis* cases in all states other than Michigan are likely of Mexican origin. Although USDA regulations stipulate that imported cattle must be tested within 60 days of import, the low sensitivity of most approved *M. bovis* diagnostic tests suggests that some infected animals will be missed. Because cattle are only held at the border for 48 to 72 hours, there is little time to conduct additional testing at the point of entry. In addition, the lack of mandatory animal identification in the US limits the ability to track cattle after introduction into the country. Clearly, it is crucial to have rapid diagnostics with improved sensitivity that could be deployed at points of entry. It is equally important to improve information on cattle movements to control importation of *M. bovis* infected cattle.

1. *bovis* is of significant concern to government agencies and cattle industries due to associated economic, social and potential public health problems. The inclusion of *bovis* research, teaching and extension in this multi-state project will address serious concerns from cattle industry representatives, government agencies, and public health officials that the US is experiencing a resurgence of *M. bovis* that will have devastating economic effects, cause a disruption or severe restrictions in movements of cattle including exports, and have profound effects on producers, who own positive herds and must suffer depopulation or quarantine.

Finally, the generation of new knowledge relative to the diagnosis, management and control of mycobacterial diseases of animals is critical if we are to prevent the spread, lower the prevalence and minimize the impact of the diseases in our livestock populations. USDA NAHMS studies and other work, including the National Dairy Producer John's survey, have shown that while producers are increasingly aware of the diseases, they often lack knowledge relative to their management and control. Therefore, there is a critical need for developing coordinated approaches for education and outreach programs related to mycobacterial diseases of animals.

Taken together, the proposed multi-state initiative described below *will facilitate the development of shared research as well as the leveraging of intellectual and physical resources to address some of the most important mycobacterial diseases of animals.*

In terms of prior and current related work, during the fall of 2004, the USDA-CSREES-NRI's Coordinated Agricultural Projects (CAP) helped bring *together leading scientists in the field of JD to form a comprehensive, multi-institutional, interdisciplinary John's Disease Integrated Program for research, education, and extension, or JDIP.* We started with a team of approximately 70 scientists from two-dozen leading academic and government institutions in the US, who represented the diverse disciplines of microbiology, immunology, pathology, molecular and cellular biology, genomics, proteomics, epidemiology, clinical veterinary medicine, public health, extension, and public policy. Since its inception, membership in MDA has grown to more than 220, and the program has become international in scope.

Based on the success of the program, JDIP was renewed in 2008, and the Multistate Initiative program in the Mycobacterial Diseases of Animals-Multistate initiatives enabled JD research, education, and extension to rapidly move forward in a manner that would not be possible through traditional funding mechanisms from the USDA. In particular, the founding and continued support of MDA has enabled the community, for the first time since JD was described more than a century ago, to develop an integrated and coordinated program with a focus on developing a strong translational pipeline of new diagnostic tests, vaccine candidates, strategies to manage, prevent and control the disease, and the formulation of an outstanding education and training program. As detailed in the sections below, in the brief period since the founding of the program, JDIP investigators have conducted path-breaking research and development that has resulted in:

A better understanding of *paratuberculosis* on-farm transmission dynamics that is helping identify critical control points in the transmission chain.

The development of alternative sampling and testing strategies for detection of infected animals and herds that are being adopted by the national voluntary control program for JD.

The optimization and standardization of laboratory protocols for *paratuberculosis* culture and PCR for reducing timelines for rapid and sensitive detection of infected animals.

Characterization of genetic differences between isolates of *paratuberculosis* for molecular epidemiologic analyses and tracking of strains in infected animals and the environment.

Development of standards for animal challenge models with *paratuberculosis* for the evaluation of vaccine efficacy. Identification of key genes, proteins and lipids unique to *paratuberculosis* for development of the next generation of diagnostic tests and vaccines.

Development and widespread use of an on-line JD veterinary certification program.

Development of educational modules for producers as well as field and laboratory technicians providing milk ELISA tests for producers.

Development of community resources including *paratuberculosis* isolates, serum samples and other clinical material for the development and validation of diagnostic tests, genomic microarrays, recombinant proteins, and mutant strain banks of *M. paratuberculosis* for identification of potential vaccine candidates.

Development an individual-based dairy herd model by incorporating basic herd dynamics in a closed herd environment where no new animals have been bought from outside.

Development of a useful platform for gene discovery and analysis by isolating three novel mutants for each transposon. Establishment of high quality longitudinal data collection which turned out to be an essential tool in our understanding of pathobiology and epidemiology of MAP infections in dairy herds

Development of a peptide-based vaccine for cattle using the PLGA NP delivery systems

Evaluation of the Bovine Leukemia Virus and Mycobacterium avium subsp. paratuberculosis relationship with Shiga Toxin-Producing Escherichia coli Shedding in Cattle

Evaluation of the humoral immunity and atypical cell-mediated immunity in response to vaccination in cows naturally infected with bovine leukemia virus

Screen the bovine serum samples with MTB and MAP protein microarray for antigen discovery

Research on the evaluation of prevention of infection by stimulating innate response using *Mycobacterium bovis* as the model of infection.

Establishment of model systems that can be used to obtain crucial information that would unveil key aspects of MAP pathogenesis, and would enable the researchers to compare the different phases of the disease between in vitro and in vivo systems.

Determining the role of luxR homolog gene in invasion of MAP into epithelial cells using *Mycobacterium smegmatis* as a model of infection.

Investigation of the phenotypic diversity in the immune response against *Mycobacterium avium paratuberculosis* in MAP-infected dairy cows.

Identification of several candidate MAP proteins of potential utility for the early detection of MAP infection. Detection of pathogens and control pathogen transmission, both within-herd transmission and between-herd transmission.

Development of a quantitative methodology for incorporating whole genome sequence (WGS) data into bacterial transmission models for infectious diseases incorporating *ecology, economics, molecular biology, and epidemiology*. Better understanding of the principles and dynamics governing transmission of mycobacterial infection.

Development, assessment, and implementation of vaccines for JD and bTB.

Providing veterinarians, producers of potentially impacted species, state and federal policy makers, and other stakeholders with accurate, high quality, up to date, and easy to access information and education to assist efforts that will effectively address mycobacterial diseases.

In addition to our research accomplishments, we have developed a strong communications and extension plan that includes workshops, newsletters, regular conference calls, and an annual conference of JD researchers. Hence, MDA has brought together scientists and stakeholders with a shared vision and well-defined plan to support and facilitate research, extension and education activities and enhance animal health through biosecurity by addressing well-documented and emerging needs in JD.

#### Workshop on Accelerating bovine Tuberculosis (bTB) Control in Developing Countries

With funding from Bill & Melinda Gates Foundation, The University of Georgia, Cornell University, and The

Pennsylvania State University, a Workshop on Accelerating bovine Tuberculosis (bTB) Control in Developing Countries was conducted on December 8-10, 2015 in Rabat, Morocco. The workshop was a representation of the collective efforts of a committed and diverse global group of bTB experts who convened to develop a shared vision and forward-looking research agenda for developing and implementing effective bTB control strategies in developing countries.

The workshop was co-chaired by Vivek Kapur (Penn State, US), Martin Vodermeier (Animal and Plant Health Agency, UK), Yrjo Grohn (Cornell, US), and Fred Quinn (UGA, US). The workshop brought together a diverse group of 40 leading bTB investigators from 16 countries, which worked with policy makers and funding agency representatives to develop a shared vision and strategic framework for the implementation of bTB control programs in developing countries in which the disease is endemic in livestock, humans, and wildlife.

Participant presentations and discussions provided key insights on seven topical areas including: (1) vaccines and diagnostics, (2) the zoonotic impact of bTB, (3) bTB control efforts that have worked to date, (4) the World Organization for Animal Health (OIE) perspective, (5) the African perspective, (6) implications of bTB in wildlife, and (7) the India and China perspectives. Participants generated an initial 175 insights and 154 questions through discussions, and an "idea sorting" round-robin exercise worked to enhance the robustness of the knowledge base and identify the top five most critical insights and questions for each topic area. The group developed an integrated strategy map and detailed five-year action plan to help meet these three key inter-dependent and inter-related needs: (i) Establishment of the business case through rigorous bTB risk and economic impact assessments and the development of advocacy tools for bTB control programs, (ii) Establishment of technical capabilities to ensure the widespread availability of and access to fit-for purpose diagnostic tests and vaccines, (iii) Establishment of key market and public investment operational drivers and the creation of value-chain for bTB control by small-holder farmers.

Hence, the renewed multi-state proposal seeks to continue to build the considerable progress we have made during the past two phases of JDIP so that we can continue to leverage the financial and scientific resources even after the completion of the second Phase of the program. We are convinced that the accomplishments of this CAP project thus far have created a momentum that will continue to grow through the proposed multi-state initiative that expands the focus from JD to include TB and mycobacterial diseases in animals.

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## Objectives

1. Objective 1 will focus on understanding the epidemiology and transmission of JD and TB in animals through the application of predictive modeling and assessment of recommended control practices. Comments: To accomplish our overall objective of developing a better understanding of the epidemiology and transmission of JD and TB.
2. Objective 2 will seek to develop and implement new generations of diagnostic tests for JD and TB. Comments: Improved methods for the rapid, specific, sensitive, and cost-efficient diagnosis of JD or TB-infected remain a major priority.
3. Objective 3 will focus on improving our understanding of biology and pathogenesis of Mycobacterial diseases, as well as the host response to infection  
Comments: It is well recognized that the ability to identify the route of invasion and the host-pathogen interactions at a molecular level is important for the future development of strategies to prevent infections or to limit the spread of the infection. Similarly, the elucidation of gene products specific to in vivo growth holds great promise in identifying new antigens for diagnostics or vaccine development, as well as products essential to pathogenesis. Hence, as part of the proposed multi-state initiative, we envision studies of the basic biology of the causative organisms of JD and TB and their interaction with the host. Specifically, we anticipate studies that will employ state-of-the-art microbiological, molecular biology, genomic, proteomic, metabolomic, immunology, and or bioinformatic approaches.
4. Objective 4 will focus on development of programs to create and evaluate and develop new generations of vaccines for JD and TB.  
Comments: Under the auspices of this multi-state initiative, we propose specific research projects to help achieve each of the 4 objectives and include a strong education and extension plan. We envision many of the projects to be crosscutting in nature (i.e. cut across objectives and/or address both diseases) that will together help address the major animal, human, and societal issues surrounding detection and control of mycobacterial diseases in animals. It is important to note that our research objectives are closely linked and coordinated with our education, extension and outreach plan.

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## Methods

Objective 1 will focus on understanding the epidemiology and transmission of Mycobacterial diseases in animals. To accomplish our overall objective of developing a better understanding of the epidemiology and transmission of JD and TB, we propose studies that include:

Continued development of mathematical models of JD and TB transmission dynamics, including within-host, between individuals, within and between domesticated dairy and beef herds and wildlife, as well as on an ecological scale. For example, several investigators have initiated the process of development of mathematical models for JD and TB (2-4) and we will continue the process with studies such as estimating the performance of JD vaccines, defining the impact of wildlife infection on JD and TB dynamics, analyzing the spread of JD and TB through cattle trading networks, and finding economically optimal JD and TB control strategies. Examples of the types of investigations that will be carried out are presented in(5-7).

Characterization of herd and environmental distribution of specific genotypes of *paratuberculosis* and *M. bovis* using state-of-the-art methods for strain differentiation using simple sequence repeats and or single nucleotide-based typing approaches and applying this knowledge to characterize the genetic diversity and molecular epidemiology of *M. paratuberculosis* and *M. bovis* infections;

Delineation of mycobacterial disease transmission dynamics, including *paratuberculosis* transmission within calf-rearing systems, risk of *M. paratuberculosis* transmission from infected dams to daughters, and risk of *M. paratuberculosis* infection associated with 'super-shedders' and calf-to-calf transmission;

Clarification and delineation of critical management practices for control, prevention, and eradication of mycobacterial diseases; and,

Identification and optimization of surveillance methods and strategies.

Taken together, these studies will significantly advance our understanding of the epidemiology and transmission dynamics of mycobacterial diseases of animals.

Objective 2 will seek to develop and implement new generations of diagnostic tests for JD and TB. Improved methods for the rapid, specific, sensitive, and cost-efficient diagnosis of JD or TB infected remain a major priority. Hence, as part of this multi-state initiative, we anticipate carrying out investigations that include:

Development of methods for the early detection of *paratuberculosis* and *M. bovis* infected animals, including newer generations of molecular, serological and microbiological assays with greater sensitivity, specificity, speed, and or ease-of-use, by using state-of-the art molecular biological, immunological, and materials science and engineering methods and approaches; and,

Development of resources for validation and standardization of diagnostic assays, including well-accessioned biological sample collections (strains, tissue, clinical samples, etc.), and processes to make these accessible to the scientific community.

Together, these studies and efforts will facilitate the development, validation, and implementation of the next-generation of improved diagnostic tests for mycobacterial diseases of animals.

Objective 3 will focus on improving our understanding of biology and pathogenesis of Mycobacterial diseases of animals, as well as the host response to infection. Our understanding of the basic biology and mechanisms of pathogenesis of

1. *paratuberculosis* and *M. bovis* is far from complete. It is well recognized that the ability to identify the route of invasion and the host-pathogen interactions at a molecular level is important for the future development of strategies to prevent infections or to limit the spread of the infection. Similarly, the elucidation of gene products specific to *in vivo* growth holds great promise in identifying new antigens for diagnostics or vaccine development, as well as products essential to pathogenesis.

Hence, as part of the proposed multi-state initiative, we envision studies of the basic biology of the causative organisms of JD and TB and their interaction with the host. Specifically, we anticipate studies that will employ state-of-the art microbiological, molecular biology, genomic, proteomic, metabolomic, immunology, and or bioinformatic approaches to carry out studies that include:

Investigations into the basic mechanisms of pathogen invasion of host cells and tissue using state-of the art methods in mycobacteriology, cell biology, and genomics;

Identification of mycobacterial genes and proteins whose inactivation or alternated expression results in reduced virulence. This will be accomplished by screening large libraries of mutants, as well as by characterizing these mutant strains using state-of-the art genomics and proteomics based methods and will also lead to the identification of genes associated with the ability of the pathogen to survive in the host as markers for virulence and pathogenicity; and, Characterization of the microbial factors that contribute to the innate and adaptive immune response using sophisticated *in vitro* cellular immunologic assays and animal models of infection.

Exploitation of knowledge from immune response studies to create new methods of diagnosis.

Taken together, we anticipate that these investigations will reveal important insights on the basic biology of the causative organisms of JD and TB and their interaction with their hosts.

Objective 4 will focus on the evaluation and development of new generations of vaccines for JD and TB. It is well recognized that defining the host genetic, cellular and molecular events associated with susceptibility to JD and TB is essential for the development of candidate vaccines and host genetic selection for resistance. For TB in particular, the experience in the UK and elsewhere have shown that traditional test/slaughter and abattoir inspection campaigns fail to control the spread of bovine TB (bTB), most likely due to the presence of a wildlife reservoir. Vaccine research must become a priority. Similarly, in the US where a wildlife reservoir exists, control efforts have not eradicated bTB and are unlikely to do so. Hence, the development of a vaccine against bTB is required to control disease. Under the auspices of this multi-state initiative, we envision projects that will seek to develop candidate vaccines, identify genes and markers associated with susceptibility of animals to mycobacterial infection, and define the cellular and molecular events associated with development of immune responses to *M. paratuberculosis* and *M. bovis* in cattle. Specifically, we anticipate the development of projects that will:

Analyze the early immune response to infection as well as the host response to animals at different stages of disease using well-characterized *in vitro* models and animal experimentation;

Develop and validate animal models for vaccine development;

Identify genetic markers for susceptibility to infection in cattle using genome wide association studies with well-defined resource populations. A combination of candidate gene identification with whole genome SNP typing promises to rapidly identify a set of markers that could be used to select for resistance to disease caused by mycobacteria;

Compare the efficacy of candidate vaccines in animal models of infection. We hypothesize that live attenuated vaccines are likely to elicit a protective response superior to the response elicited by currently available killed vaccines. However, it will be essential to develop vaccine candidates that are able to differentiate vaccinated from naturally infected animals.

To test this hypothesis, we anticipate studies that include: (a) use of flow cytometry, long-oligo microarrays, and real time RT-PCR to compare immune responses elicited by candidate mutant vaccines; (b) Determine if mutant vaccines elicit development of effector memory CD4 and/or CD8 T cells that kill infected autologous macrophages or arrest replication of intracellular bacteria; and, (c) Determine if animal immunized with mutant vaccines are protected against challenge; Evaluate the ability of recombinant or vector expressed proteins and mycobacterial lipids to elicit effector T cells with the capacity to kill infected macrophages or arrest replication of intracellular bacteria. The working hypothesis is that modification of mycobacterial antigens by attachment of Trojan peptides will selectively enhance development of long-lived memory CD4 and/or CD8 effector T cells and may be suitable candidate antigens for use as subunit vaccines; and, Determine the role of regulatory T cells in the immunopathogenesis of mycobacterial infections in animals. The working hypothesis is that dysregulation of the immune response to *paratuberculosis* and *M. bovis* is, at least in part, attributable to development of regulatory T cells (Tregs). Evidence suggests that Tregs may be responsible for down-regulating effector memory CD4 cells in an antigen-specific manner. This hypothesis will be tested by characterizing cell surface markers of Tregs using flow-cytometric and expression analysis techniques.

Taken together, we anticipate that these investigations will reveal important insights into the immune response of animals to mycobacterial infections, as well as lead to the identification and evaluation of candidate vaccines.

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## Measurement of Progress and Results

### Outputs

- Research data, methods Comments: The outputs, including research data, methods Comments: a. A better understanding of the epidemiology and transmission of JD and TB in animals, and the development of predictive models of infection; b. New generations of diagnostic tests for JD and TB that are sensitive, specific, rapid, and cost-efficient; c. Improved understanding of the biology and pathogenesis of mycobacterial diseases of animals, as well as the host response to infection; d. Development and evaluation of new generations of vaccines for JD and TB; e. Development of shared resources and protocols; and, f. Development of education materials and delivery plan to provide veterinarians, producers of potentially impacted species, state and federal policy makers and other stakeholders with accurate, high quality, up to date, and easy to access information related to mycobacterial diseases of animals.

### Outcomes or Projected Impacts

- Outreach Plan We recognize and appreciate that outreach and education efforts are vital components in achieving the objectives of this multi-state initiative, as described above. The underlying mission of our outreach plan is to provide veterinarians, producers of potentially impacted species, state and federal policy makers, and other stakeholders with accurate, high quality, up to date, and easy to access information and education to assist efforts that will effectively address mycobacterial diseases. To accomplish this, we need to better understand the factors that encourage or deter veterinarians and their producer clients from adopting JD and TB control or eradication practices, as well as the educational needs of these populations, to develop educational materials based on current, evidence-based information and deliver these materials in a flexible, convenient, cost-effective, and readily available manner.

- objectives for the education and outreach component of this multi-state initiative Create an internet portal to provide access to information related to mycobacterial diseases, specifically JD and bTB. Internet access provides the most rapid, cost effective means to sharing information with a widely distributed audience. The site will provide convenient access to information generated through the initiative and seek to be as comprehensive as possible by sharing previously developed information through links to existing sites such as jdip.org, www.johne.org, and www.johnesdisease.org. Links to international sites will allow US scientists, producers, and policy makers access to information on the success of domestic herd and wildlife control programs, such as the badger vaccination program in Ireland. These sites already exist and are supported from various extramural and intramural sources, and we anticipate that we will continue to seek funding for the development, management, and curation of these web-sites. Encourage, monitor and increase awareness of the publication of work of initiative collaborators in peer-reviewed journals and through other scientific outlets. Publication of research results in peer reviewed journals is important to the initiative and to those who collaborate in the effort, since it validates the credibility of the work and makes it more widely available. The Education/Outreach team will strongly encourage publication of initiative research in appropriate journals. We will seek to make others in the industry aware of work as it is published and also monitor the publications for work that may be shared with producers and others through the initiative. Current Johne's efforts have developed a strong international network of scientists and interested professionals, through the International Association for Paratuberculosis (IAP), who are effectively sharing information as they work to address this world-wide disease. Efforts in other nations are also looking to address a wider range of mycobacterial diseases, so this initiative will fit well into expanding international efforts. We will seek to maintain and enhance current working relationships and explore new ones that will allow the most effective use of existing resources. Enhance and strengthen working relationships and communication links with producer and professional organizations. While many good working relationships currently exist, expanding these networks will increase awareness of the initiative, build confidence in the results and help to make them more readily available to our target audiences.
- Activities to reach our goals

  - Partnering with the Animal Health committee for the Joint Annual Meeting (JAM) of the American Dairy Science Association and the American Society of Animal Science to include specific oral and poster presentation sections for mycobacterial diseases at the JAM. Include, as appropriate, mycobacterial sessions/symposia in the scientific sessions of the American Association of Bovine Practitioners (AABP), the Association of Veterinary Consultants (AVC) and the American Veterinary Medical Association (AVMA). This will provide an opportunity to reach large and very important target audiences in a cost effective manner. It will also assure inclusion of abstracts of the work presented in highly respected journals that are readily available nationally and internationally.
  - Holding "Interest Group" meetings at the JAM, the annual meeting of the American Association of Bovine Practitioners (AABP), the Association of Veterinary Consultants (AVC) and similar meetings to reach extension and industry professionals with interests in this area by providing them with information from the initiative, seeking input on current and planned activities, and inviting their participation in the initiative.
  - Coordinate preconference seminars, or clinical forums, on a periodic basis at the annual conference of the AABP to reach professionals who are on the farm with timely information and solicit their input on additional needs that the initiative is equipped to address.
  - Facilitate discussion with government and industry to consider expansion of the National Johne's Work Group (NJWG), currently a subcommittee of the US Animal Health Association (USAHA)'s Johne's Disease Committee, to become a Mycobacterial Disease Work Group, working with the Tuberculosis and other appropriate USAHA committees. It is anticipated that this group would meet annually at the USAHA's annual meeting and "as needed" at the annual meeting of the National Institute for Animal Agriculture (NIAA) to share information and identify additional research and education needs.
  - Partner with relevant organizations in organizing scientific and educational information sessions for producers focused on relevant topics. Potential collaborators include:
    - NCBA Cattlemen's College
    - National Dairy Herd Information Association (NDHIA)

- **Joined Efforts World Dairy Expo 1.** The Joint Annual Meeting of the National Milk Producers Federation (NMPF), the National Dairy Board (NDB) and the United Dairy Industry Association (UDIA) **2.** Dairy and beef breed associations **3.** The American Farm Bureau Federation (AFBF) **1.** Partner with USDA to assist in training programs on related diseases **2.** Organize, with industry, extension, and government agency collaboration, a national symposium on mycobacterial diseases of animals every five years **3.** Develop and conduct webinar's on "high interest" topics in conjunction with extension and or other industry partners **Provide convenient access to comprehensive, high quality, and consistent education materials for veterinarians, producers and others.** We will seek out and use existing tools, such as those currently available at [http://ce.vetmed.wisc.edu/Johnes\\_Disease](http://ce.vetmed.wisc.edu/Johnes_Disease), that are developed and reviewed by experts in the field. Additional information that is needed will be identified and resources/collaborators needed to produce and deliver the material will be identified. Materials will be delivered electronically, but will include supporting material that can be printed locally. Leverage existing information/education delivery mechanisms to more comprehensively reach target audiences with information about mycobacterial diseases. We will work actively with trade media and partner with groups like the Johnes's Education Initiative (JEI), DAIReXNET, the eXtension Wildlife Damage Management Community of Practice, and the Internet Center for Wildlife Damage Management (ICWDM) in this effort. Reach non-traditional audiences, including policy makers and interested members of the public, with accurate and timely information relative to mycobacterial diseases in livestock and serve as a point of contact for further information needs. Social media tools such as "Linked In" and "Facebook" will be used to reach these audiences. We will seek to partner with and draw on expertise from industry groups to make the most effective use of these tools in a timely manner as this effort moves forward. ICP – Coauthored presentation on JD programs in the U.S. 2016 JAM Annual Meeting – MDA interest session, material available in press room and registration World Dairy Expo – met with 10 dairy trade publications, material available USAHA – Display and presentations to JD Committee, State, extension and Federal vets

## Milestones

(0):We anticipate the following programmatic milestones. A) Each of the four objectives and the outreach and education plan will start during year 1 and continue through the duration of the project. B) An annual meeting of investigators. C) During year 3, working in concert with our stakeholders, we anticipate carrying out a needs assessment for both the research and outreach components of the program. D) Year 4 will involve a comprehensive evaluation of progress of the multi-state initiative, and focus on developing renewal applications.

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## Outreach Plan

## Organization/Governance

Taken together, the above approach will help us achieve our objectives of providing veterinarians, producers, and other stakeholders with high-quality, up-to-date information and education to foster a cost-effective approach of managing JD and TB risk and preventing and controlling mycobacterial diseases in animals.

### Organization/Governance

We build on our experience with the JDIP and TB-CAP initiatives and have formulated a robust plan for the administration of the multi-state initiative.

In brief, we have proposed the formation of an Executive Committee that will be responsible for all strategic, scientific, and management policy decisions for this multi-state initiative, and serve to advise the Administrative Advisor of the program. The Chair of the Executive Committee is responsible for the implementation and facilitation of programmatic goals and will serve as the primary liaison with the USDA, Experiment Station Directors, and external stakeholders. We also propose the formulation of an External Advisory Board, which will consist of public and private stakeholders (regulatory agencies, members of industry, and prominent scientists from related disciplines and Experiment Station Directors), to provide advice on programmatic matters, and ensure that the initiative stays true to its mission. The Chair of the External Advisory Board will be a member of the Executive Committee. The composition, membership and voting structure of the Executive Committee is described below:

Executive Committee. The initial Executive Committee will be comprised of a total of nine members, representing individuals with leadership in Mycobacterial disease research, extension, and education, a documented commitment to helping the community realize a shared vision, and a history of working together as a team. The proposed members of the Executive Committee are:



- John Bannantine (National Animal Disease Center, USDA-ARS).
- Luiz Bermudez (Oregon State University, OR).
- Paul Coussens (Michigan State University, MI).
- Yrjö Gröhn (Cornell University, NY).
- Vivek Kapur (Penn State, PA). Initial Chair of the multi-state initiative.
- Don Lein. (Cornell University, NY). Initial Chair of the External Advisory Board.
- Kenneth Olson (KEO Consulting, IL).
- Scott Wells (University of Minnesota, MN).
- Rebecca Smith (Cornell University, NY).

#### Governance of the Executive Committee:

**Chair:** The chair of the committee is responsible for organizing the meeting agenda, conducting the meeting, and assuring those task assignments are completed. The chair will be elected for at least a two-year term to provide continuity and be eligible for reelection.

2. **Chair-elect:** The chair-elect will succeed the chair, and is expected to support the chair by carrying out duties assigned by the chair-elect and serves as the chair in the absence of the elected chair. Normally the chair-elect is elected for at least two years and be eligible for reelection.
3. **Secretary:** The secretary is responsible for the distribution of documents prior to the meeting and is responsible for keeping the minutes, and preparing the accomplishments report (i.e., the SAES-422). The secretary will succeed the chair-elect and be eligible for reelection.
4. **Responsibilities of the Executive Committee:** The Executive Committee is responsible for the overall management and administration of the program and will make all responsible efforts to achieve unanimous consent or make decisions through a simple majority vote. The executive committee may appoint sub-committees (that may comprise of any member of the multi-state initiative) whenever needed in order to make flexible and informed decisions and provide guidance to the program chair and executive committee and will nominate and vote on the composition of the external advisory board.

**Program Members:** In addition to carrying out the agreed research collaboration, research coordination, information exchange, or advisory activities, project members are responsible for reporting progress, contributing to the ongoing progress of the activity, and communicating their accomplishments to the committee's members and their respective employing institutions.

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### Land Grant Participating States/Institutions

PA,NE

### Non Land Grant Participating States/Institutions

#### Participation

Participant	Is Head	Station	Objective	Research						Extension	
				KA	SOI	FOS	SY	PY	TY	FTE	KA
Barletta, Raul G	Yes	Nebraska - University of Nebraska	1,2,3,4	311	4010	1100	0.20	0.25	0.00	0	0
Kapur, Vivek	Yes	Pennsylvania - Pennsylvania State	1,2,3,4	311	3410	1090	0.75	0.00	0.00	0	0
				311	3410	1100					
				311	3410	1170					

## Combined Participation

Combination of KA, SOI and FOS	Total SY	Total PY	Total TY
311-3410-1090	0.25	0	0
311-3410-1100	0.25	0	0
311-3410-1170	0.25	0	0
311-4010-1100	0.2	0.25	0
<b>Grand Total:</b>	<b>0.95</b>	<b>0.25</b>	<b>0.00</b>

Program/KA	Total FTE
0	0
0	0
<b>Grand FTE Total:</b>	<b>0</b>

Appendix G: Peer Review (Submitted)

Status: Complete

**Project ID/Title:** NE\_TEMP2201: Mycobacterial Diseases of Animals

**Rate the technical merit of the project:**

1. Sound Scientific approach:

Approve/continue project with revision

2. Achievable goals/objectives:

Fair

3. Appropriate scope of activity to accomplish objectives:

Good

4. Potential for significant outputs(products) and outcomes and/or impacts:

Fair

5. Overall technical merit:

Fair

Comments

The present project is relevant since it addresses two major mycobacterial diseases of animals: John's disease and tuberculosis. Objectives are well outlined, although they lack specific details. The project plan is fairly organized, and the executive committee is composed of individuals with great knowledge and experience in the field of mycobacteria with plenty of capacity of developing the project. After carefully reading the proposal, my enthusiasm fell short because the objectives are not novel but a repetition of what has already been in place for controlling these diseases. In addition, since I do not have access to the budget associated with the project and duration of the work (timetable), it is impossible to evaluate the feasibility of the proposed objectives.

Your Recommendation:

Approve/continue project with revision

Appendix G: Peer Review (Submitted)

Status: Complete

**Project ID/Title:** NE\_TEMP2201: Mycobacterial Diseases of Animals

**Rate the technical merit of the project:**

1. Sound Scientific approach:

Approve/continue project

2. Achievable goals/objectives:

Good

3. Appropriate scope of activity to accomplish objectives:

Excellent

4. Potential for significant outputs(products) and outcomes and/or impacts:

Excellent

5. Overall technical merit:

Excellent

Comments

This project addresses one of standing disease issues in animals with potential public health impact - that being mycobacterial disease. Although the focus of this project is Johnes and bovine TB, outcomes could have positive impacts on other mycobacterial diseases of animals. The components of this project that have the likelihood to have the most impact are the development of new diagnostics and vaccines. The team assembled has a long history of doing research on the immunology and pathobiology of Mycobacterium and are well positioned to continue moving the science forward. NOTE: I am making the assumption that the members of the "executive Committee, listed in the organization/governance are also participants in the project. Only Vivek Kapur was listed as a participant under the participant tab. Their work as part of the JDIP CAP project made significant progress on both M. bovis and MPTB science. I would expect that momentum will continue forward in this project.

Your Recommendation:

Approve/continue project

Appendix G: Peer Review (Submitted)

Status: Complete

**Project ID/Title:** NE\_TEMP2201: Mycobacterial Diseases of Animals

**Rate the technical merit of the project:**

1. Sound Scientific approach:

Approve/continue project

2. Achievable goals/objectives:

Excellent

3. Appropriate scope of activity to accomplish objectives:

Excellent

4. Potential for significant outputs(products) and outcomes and/or impacts:

Excellent

5. Overall technical merit:

Good

Comments

Mycobacterium avium subspecies paratuberculosis (MAP) is a common, yet often neglected, zoonotic pathogen, whereas Mycobacterium tuberculosis complex (TB) is of significant concern to federal agencies and livestock industries. These pathogens are associated with the economic, social, and public health concerns. This multidisciplinary proposal is well planned and address various area of these challenging chronic diseases. The proposed work is continued efforts of this research team to show the combined efforts to further build on the ongoing program. This team has formulated a strong plan for the administration of the multi-state initiative. The team also propose to add an External Advisory Board, which will consist of public and private stakeholders including members from the regulatory agencies, industry, academics, and experiment station, "to provide advice on programmatic matters, and ensure that the initiative stays true to its mission." Objectives of the proposed studies are well defined. Including a timeline frame for each objective would have been easy to keep track of the progress. However, these investigators are well experienced with a very productive network, thus completion of the tasks under each objective could be assumed to carry out in the project time-period as defined in the sections "Measurement of Progress and Results and Milestones."

Continued efforts of this diverse team are of high value. The proposed multi-state initiative to broaden the scope of ongoing work is very timely during the era of "One Health Initiative".

Your Recommendation:

Approve/continue project

# NE\_TEMP2204: A regional network of social, behavioral, and economic food systems research

**Status:** Submitted As Final

**Duration** 01/20/2023 to 09/30/2027

**Admin** [\[Kumar Venkitanarayanan\]](#)

**Advisors:**

**NIFA Reps:**

## Statement of Issues and Justification

The global food system will need to feed 10 billion people by 2050, but currently, more than 10% of American households are food insecure, and global food insecurity has increased by over 30% because of the COVID-19 pandemic (Coleman-Jensen et al., 2020; Baquedano et al., 2021). Rapid population growth, shrinking farmland, dwindling natural resources, erratic climate, and shifting market demand will push the global agricultural production system into a new paradigm (FAO, 2017). This development implies that the food system must become more productive in output, efficient in operation, resilient to climate change, and sustainable for future generations (Vaio et al., 2020).

Artificial intelligence (AI) holds promise in addressing the challenges of this new paradigm by advancing agricultural technologies, improving supply chain management, and generating new knowledge regarding the functioning, interactions, and consequences of the U.S. food system (Liu, 2020). Yet, most AI innovations in agriculture are limited to production data collection and analysis, with some post-farmgate applications targeting product traceability and quality monitoring (Kakani et al., 2020; Misra et al., 2020; Paul et al., 2021). This constraint indicates a clear need for new research that builds on AI and big data beyond the farmgate to answer research questions of national scope related to marketing (including supply chain logistics), food retailing, and consumer behavior.

Interdisciplinary approaches have been recommended for topics including health and agriculture (Waage et al., 2019), food security (Acevedo, 2011; Foran et al., 2014), rural economy and land use (Lowe and Phillipson, 2006), and agri-food science (Horton et al., 2017). The complexity of the social, economic, and environmental interactions in the food system requires problems to be addressed through an interdisciplinary lens (Duffy et al., 1997; Foran et al., 2014). A consequence of not taking a systems approach, and instead pursuing siloed research projects, is that it leads to an incomplete framing of the problem and the development of inadequate research priorities (Lowe and Phillipson, 2006).

Big data, such as the location and description of points of interest (POIs), including grocery stores, restaurants, health facilities and centers, and indoor and outdoor physical activity locations, provides an exciting opportunity to understand and measure the nuances of a 'healthy' neighborhood and access to related POIs (Gibson et al., 2014; Wilkins et al., 2019; Shannon et al., 2021). This potential of big data and related data science techniques extends the current work on 'neighborhood and health' as neighborhoods can now be measured with rich and detailed multidimensional data. This research will benefit a variety of stakeholders, including policymakers, consumers, and agribusinesses.

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## Related, Current and Previous Work

While interdisciplinary work on big data has been increasing because of improved and more affordable processing, storage, and transmission capabilities (National Academy, 2005), this work has progressed more slowly within the agricultural domain. Most discussions of agricultural data innovations involve production data collection and analysis, with some post-farmgate applications targeting product traceability and quality monitoring (Kamilaris et al., 2017; Klerkx et al., 2019). This limitation indicates a clear need for increased use of big data to answer questions related to marketing (including supply chain logistics), food retailing, and consumer choices.

Mobility big data and AI systems can play a critical role in advancing food production, processing, and consumption systems (Misra et al., 2020). Such data hold substantial potential for research into food systems because mobility profiles allow researchers to understand agent behavior, interactions, and incentives, a fundamental goal of social science research (Kakani et al., 2020). Mobility data also enables us to evaluate the impact of public policies and the implications for human health, providing new and potentially revolutionizing insights into the structure and conduct of the food system and its consequences for the social, economic, and health well-being of U.S. society. There is an expressed need for frontier research that builds on modern AI systems and big data beyond the farmgate to develop new insights into the agriculture and food system. Although technological developments play a critical role in advancing the efficiency and sustainability of the food system, a substantial advancement of knowledge is to be expected from research that expands the current research paradigm beyond the farm gate (Paul et al., 2021). Multi-domain mobility big data are a critical innovation that holds significant promise in this research area. Social science research enabled through AI systems and the mobility big data will help improve the efficiency and sustainability of the previously unimaginable food production, processing, and consumption system due to data and methods limitations, academic silos, and missing opportunities for transdisciplinary engagement and collaboration in the food systems sciences. The proposed research and network initiatives will help close this gap by providing an innovative platform for transdisciplinary research, collaboration, and engagement to foster food systems research and generate new knowledge that can inform policymakers and other stakeholders through new insights from modern AI systems and mobility big data.

Despite its potential to generate new knowledge in the food domain, the use of AI systems in the social sciences is in its infancy, which is primarily due to data constraints and limited research collaboration between computer science and the social sciences (Athey, 2019; Storm et al., 2020). Recent studies point toward the benefits of big data and AI for socioeconomic analysis (Einav and Levin, 2014; Varian, 2014; Bajari et al., 2015; Grimmer, 2015; Monroe et al., 2015; Athey and Imbens, 2016) and business management (Raj et al., 2015; Shekhar et al., 2017; Coble et al., 2018; Kamilaris and Prenafeta-Boldú, 2018). Although the rising use of AI techniques in the social sciences is encouraging, little systematic work has been done to advance our knowledge of the functioning and conduct of the U.S. food system.

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## Objectives

1. Create an interdisciplinary network of researchers that use mobility big data to address questions related to the food system, agriculture, health, and the environment.
2. Assess the impact of economic and social shocks, such as COVID-19, competitor market entry, and public policies, on consumer, producer, and supplier behavior.
3. Analyze the degree to which the community food landscape and neighborhood characteristics interact to analyze a) consumer behavior regarding traditional and non-traditional retailers and other points of interest and b) firm behavior regarding entry, exit location choice, and competition.

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## Methods

This research will capitalize on a unique dataset of 200 million cell phone users. To assess the usability and quality of the mobility big data, we initiated procedures to access critical databases for this research project. This cell phone location data will come from Veraset (2021), one of the leading location data companies in the United States. Veraset provides a real-time feed of accurate mobility data for more than 200 million mobile devices. The average device reports its location 150-200 times a day, mainly during the daytime, with an accuracy of 25 cm evaluated using multiple sensors, relying primarily on GPS information, Beacons, and WiFi signals for cross-validation. Every location signal is examined for quality and origin and then flagged to validate point of interest (POI) visits. All device data are fully anonymized, and no personal information can be inferred from the database.

A core team of researchers in agricultural economics, geography, supply chain logistics, and computer science has already begun working with this data. While computer scientists will primarily complete data cleaning and manipulation, this project intends to coordinate research collaborations using cleaned and refined data. Specifically, this multistate hatch will *engage students, professionals, universities, and the public and private sectors* in food systems research. While we provide examples of research questions and analytical techniques for each objective based on the interest of the current research team, it is expected that this will expand as the number of participants grows.

#### Objective 1:

The primary goal of this multistate Hatch project is the facilitation of networking amongst potential collaborators, including both academics and practitioners interested in food systems research. Potential disciplines include business economics, local and regional food systems, geography, supply chain management, computer science, systems science, food retail marketing, nutrition, health, and food policy. The mobility data provides location-based movement information, which researchers can combine with other food and agricultural datasets, including NETS, Nielsen, and USDA's food atlas. Following FAIR standards, we will share code and data through a public webpage and GitHub. These shareable data products will promote the integration of visualization and analytic methods to support discovering and analyzing trends and policy-relevant findings concerning food and agriculture.

A key focus of this collaborative network is to address relevant, stakeholder-driven research questions across the entire food system. Priorities can be developed through outreach to policymakers, Extension staff, producers, and food and agricultural organizations. For instance, interest has been expressed in using this mobile data to assess whether a sub-state marketing effort led to increased traffic at direct-marketing establishments.

To create and sustain interest in the network, we will establish an annual symposium and virtual seminar series through UConn's Zwick Center for Food and Resource Policy. The emphasis will be on presenting policy-relevant research findings that appeal to various audiences. To engage students in this interdisciplinary project, a part of the symposium will be dedicated to undergraduate and graduate student networking and professional development.

#### Objective 2:

The COVID-19 pandemic is expected to have long-lasting effects on agricultural supply chains and food access, local agricultural systems, and consumer choices and health. The longitudinal nature of our data will also allow us to assess the impacts of COVID-19 on various parts of the food system as we will have information on consumer movement in 2019 (pre-COVID), 2020-2022 (during COVID), and 2023-2025 (post-COVID). This type of modeling has been applied to leisure activities (Brey, 2020), understanding social distancing activities (Brzezinski et al., 2020; Tian et al., 2021), and healthcare utilization (Cantor et al., 2021). However, despite the mentioned technical advances and growing use of phone mobility data, there is a lack of systematic, comprehensive, and fine-grained consumer choice research related to consumer food retailer choice and supply logistics.

Frontier research methods (Freyaldenhoven et al., 2019; Borusyak and Jaravel, 2020; Clarke and Schythe 2020) will be used to measure the impact of economic and social shocks on consumer choice. A count data regression model (e.g., Poisson PML) can be used to analyze how visits to various points of interest change due to a shock, such as COVID-19 or the entrance or exit of new retailers. Combined with machine learning, this will also allow for assessing complementary behavior and the interplay with sociodemographic characteristics.

#### Objective 3:

Prior research demonstrates a clear relationship between neighborhood socioeconomic characteristics and location outcomes (Lytle and Sokol, 2017), with healthier or more diverse food stores located in higher-income neighborhoods (Zenk et al., 2005; Zhang et al., 2015). This disparate level of food access has long been a concern of policymakers targeting both the supply and demand side. Researchers can use mobility big data to dig deeper into social justice questions and assess whether neighborhood-level racial/ethnic segregation and poverty are associated with various individual-level choices, including food shopping behavior, restaurant patronage, and healthcare utilization. This DEI framework will be incorporated into each of the following sub-objectives.

##### *Objective 3a: Consumer Behavior*

Researchers can answer whether people living in segregated neighborhoods (tract or block groups) can visit retailers and other points of interest within their communities. Through mobile data, we can identify the neighborhood demographics of all patrons and travel distance to their chosen outlets. Researchers can identify the effect of distance on consumer choices and assess moderation and interaction effects. AI systems allow for identifying visitors to retailers/restaurants, complementary behavior, and general patterns. At the same time, computer scientists and other data science researchers may design and execute the machine learning algorithms, and all partners can develop research questions around access, choice, and health.



To understand consumer behavior concerning retailers, theory traditionally suggests that consumers will choose the combination of establishments in multi-purpose trips that maximize total utility (Marianov et al., 2018). By applying machine learning to mobility big data we can take advantage of complex models of consumer product preferences that assess demand for different types of stores and specific stores within each category simultaneously (Donnelly et al., 2021). Through nested factorization, this approach overcomes the data problem that on any given day, the probability of going to a particular store or restaurant is relatively low while also accounting for the correlation between demand for different establishments. Machine learning is well-suited to this type of analysis, and we can explore potential heterogeneous impacts by separating nearby businesses by industry.

For food away from home, an extensive literature links the choice to visit a restaurant, the amount spent, and consumer characteristics (e.g., Anderson and Matsa, 2011; Eckert and Vojnovic, 2017; Athey et al., 2018). Equity concerns in restaurant location choice, including whether neighborhood-level racial/ethnic segregation and poverty are associated with consumer restaurant choice, can be assessed. Depending on the researcher's interests, this analysis can be extended to other points of interest, including healthcare utilization and visits to open spaces and exercise facilities.

AI systems and mobile big data allow researchers to answer questions about agricultural direct marketing not previously possible due to data constraints. Most studies of agricultural direct marketing operations have relied on either survey data or case studies, which are primarily localized and rely on sample sizes of less than 500 respondents, calling into question their external validity and the ability for causal inference (see, e.g., Govindasamy et al., 1998; Eastwood, 2001; Andreatta and Wickliffe, 2002; Hunt, 2007; Velasquez et al., 2005; Baker et al., 2009; Alonso and O'Neill, 2011; Ruelas et al., 2011; Dodds et al., 2014; Gumirakiza, 2014; Jilcott Pitts et al., 2014). This is a concerning gap as the prevalence of local foods has proliferated in the past decade (Martinez, 2010; USDA, 2013; Tropp, 2014), and local food access provides benefits to consumers, producers, and the local community (see, e.g., Loureiro and Hine, 2002; Feenstra et al., 2003; Govindasamy et al., 2003; Otto and Varner, 2005; Boyle et al., 2008; Carpio et al., 2008; Darby et al., 2008; Henneberry et al., 2008; McCormack, 2010; George et al., 2011; Young et al., 2011; Fang et al., 2013; Richards, 2014; Hughes and Massa, 2015; Fedorowicz et al., 2020; Hadavas, 2020). Of particular concern to policymakers, stakeholders, and Extension personnel striving to support smaller farming operations, the number of direct-marketing operations has continued to grow over the last two decades without noticeable changes in sales, suggesting a saturation of the market (Low et al., 2015; Helmer, 2019). We can identify the neighborhood demographics of all patrons and travel distance to their chosen establishments and combine this with other datasets on locational characteristics. This allows us to assess the degree to which retail store availability and neighborhood characteristics interact to predict the procurement of products through agricultural direct marketing establishments such as farmers' markets or farm stands, which has implications for producers and policymakers. Following other work on retail store choices (Fox et al., 2004; Singh et al., 2006; Dong and Stewart, 2012) we can use a two-stage utility-maximizing decision-making process to analyze both establishment choice and time spent. Researchers can assess this consumer behavior regarding distinct marketing arrangements on a national level, including attributes that impact consumer market choice and potential spillover effects.

### *Objective 3b: Firm Behavior*

A highly innovative aspect of this research is the ability to define market size. Researchers make arbitrary assumptions by defining markets based on ZIP codes and county borders due to data constraints (e.g., Basker, 2005; Allcott et al., 2019; Chenarides and Jaenicke, 2019). However, these assumptions can mask potential interactions between stores/locations and who is going there. Similarly, studies of competitive behavior (e.g., Bresnahan and Reiss, 1991) have concentrated on rural and isolated counties to allow for identification. Mobile data allows us to calculate travel distance to distinct types of establishments and identify the home neighborhoods of patrons. AI systems and machine learning allows us to not only define markets for each retail store and assess competition effects but also link to questions concerning equity and access to SNAP and other food assistance resources.

Defining boundaries also allows us to study the competitive behavior of firms. Any market structure study begins with carefully defining market boundaries (Bresnahan and Reiss, 1991; Berry, 1992; Mazzeo, 2002), often using proxies such as isolated counties or highway exits. We can build on this literature by using data-driven analytical methods to construct market boundaries based on consumer choices. As we observe the dwelling of each visitor to the point of interest, we can use that information to estimate the spatial and temporal boundaries of each consumer market using a spatial boundary construction algorithm. We can then assess the impact of a new entrant on not just firm behavior but also consumer choice.

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# Measurement of Progress and Results

## Outputs

- Annual in-person research symposia.
- Monthly virtual presentations and networking opportunities.
- Trained students in multidisciplinary methods.
- Geospatial cyberinfrastructure system that will pave new directions for the research community in food production, processing, and consumption systems through our novel AI applications.
- A user-friendly database combining research results will be made available to the public through a dedicated web interface and GitHub that integrates visualization and statistical methods.

## Outcomes or Projected Impacts

- Developing a sustainable network of collaborators on big data and food systems, resulting in increased consumer and producer welfare. Metrics will include the number of collaborators, attendance at seminars and symposia, and the number of research publications and presentations.
- Increase in stakeholder-driven research in food systems. Metrics will include the number of projects that address a research question identified by stakeholders, the number of publications with a non-academic co-author, and the number of extension reports, policy briefs, and stakeholder presentations.
- Improved understanding of consumer and producer spatial interactions in the food system. Will be assessed through surveys of participants on the perceived significance of research findings and citation counts of publications.

## Milestones

(2024): The first research symposia will be held in the Spring of 2024

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## Outreach Plan

Research through this project will lead to new knowledge regarding the structure and functioning of food production, processing, and consumption systems based on newly collected data and rigorous statistical assessment enabled through mobility big data and innovative AI systems. This research will improve our understanding of the relationship between public policies, food production, retailing, and consumer choices. The project will have a dedicated community-facing webpage on the University of Connecticut system. There will be separate sections for research findings and conclusions, policy-specific reports and stakeholder presentations, student engagement, and the research network. An example can be found at <https://cannabis.cahnrc.uconn.edu/>.

Through partner Extension offices and producer groups, stakeholder input will be solicited in developing research questions and disseminating results. Producers and other food systems stakeholders will be actively recruited to participate in the research symposia, and listening sessions will be held to understand the research needs of these communities.

The project team will explore ways to actively disseminate research and network findings of national scope through the media. General interest articles will be published in *Nature* or *Choices*. Extension and outreach reports will be published through UConn's Zwick Center for Food and Resource Policy. Collaborations with the USDA will be used to inform the legal and executive branches about research findings. All non-proprietary data and research methods will be made available to the food systems community through web access to datasets and codes via the dedicated project webpage and GitHub. All datasets and the procedures for processing and analyzing the data have the potential to be particularly useful for future research. The research will also be presented at academic conferences and industry workshops (AAEA, ASSA, NBER, ACM UbiComp, WWW) and published in well-recognized academic journals, such as *Land Economics*, the *American Journal of Agricultural Economics*, *IEEE Transactions on Mobile Computing*, and *IEEE Transaction on Knowledge and Data Engineering*.

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## Organization/Governance

All members of this multi-state HATCH project are eligible for office. The organization is as follows:

**Officers:** The chairperson is elected by the voting members to a one-year term and may be re-elected for additional terms of office. In consultation with the administrative advisor, the chairperson notifies the committee members of the time and place of meetings, prepares the agenda, and presides at the committee and executive committee meetings. They are responsible for preparing the annual report of the project. Following the chairperson's term, the project secretary will become the chairperson.

**Secretary:** The secretary records the minutes and performs other duties assigned by the committee or the administrative advisor. They are elected by the voting members to a one-year term and will become the committee's chair. A new secretary for the new committee will be elected for a one-year term as secretary and then will become chair in the following year.

**Subcommittees:** The Project will have an executive committee designated to conduct the committee's business between meetings and perform other duties. It consists of the Project chairperson, secretary, and two other committee members. These two members are elected by the committee's voting members to one-year terms and may be reelected for additional terms of office. The chairperson names other subcommittees as needed for specific assignments such as developing procedures, planning conferences, and preparing publications.

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## Land Grant Participating States/Institutions

## Non Land Grant Participating States/Institutions

### Participation

Participant	Is Head	Station	Objective	Research			Extension	
				KA	SOI	FOS	SY	PY

### Combined Participation

Combination of KA, SOI and FOS	Total SY	Total PY	Total TY
<b>Grand Total:</b>	<b>0</b>	<b>0</b>	<b>0</b>

Program/KA	Total FTE
<b>Grand FTE Total:</b>	<b>0</b>

## Appendix G: Peer Review (Submitted)

Status: Complete

**Project ID/Title:** NE\_TEMP2204: A regional network of social, behavioral, and economic food systems research

### Rate the technical merit of the project:

1. Sound Scientific approach:

Approve/continue project with revision

2. Achievable goals/objectives:

Fair

3. Appropriate scope of activity to accomplish objectives:

Unacceptable

4. Potential for significant outputs(products) and outcomes and/or impacts:

Good

5. Overall technical merit:

Fair

Comments

I have significant concerns about the viability of this project. In general, the project proposal uses a lot of buzzwords without describing how it plans to actually implement analysis over the "big data" that the Project Editor appears to already have access to. I have serious personal reservations about mobility data in general when it is in the expertise of the individual analyzing the data (so maybe I was not a good person to request to review this proposal, in retrospect); however, I am especially wary given that this does not seem to be the expertise of the list of Prospective Participants (admittedly, I do not know the individuals in the Department of Computer Science and Engineering and Operations and Information Management, though, at the same time, I have to question what their motivation for participating on a Multistate Research Project, given that they are not in a College of Agriculture -- I have to assume that they were co-PI's on an already funded grant proposal that was not mentioned in this multi-state proposal?).

The Project Editor has not updated their CV since moving from their previous institution (they still list California Polytechnic State University as their home department on the CV downloadable from their faculty page), so it is possible that they have been engaging with this type of research in the subsequent years since their move, but it is not clear to me that they would be successful in completing this project. I see maybe two additional journal articles that the Project Editor has published since arriving at their new institution when I search Google Scholar; neither is related to the proposed Multistate Research Project. Much of their previous research is related to local foods, so I do believe that they have some expertise in the broad topic being presented; however, the core of the proposal seems to be a methodological contribution (specifically, the analysis of big data and AI in the food domain), for which the Project Editor does not appear to have a demonstrated expertise in. Discussion is not provided on how the Potential Project Participants will fill in this gap (I personally find just a list of collaborators insufficient for the Projected Participation section, without commitment letters and a discussion of their specific roles, but that might be beyond what is expected for such a proposal submission). I would like to see significantly more discussion over how the assembled team plans to implement the proposed research for me to recommend approval.

My overall conclusion about the project is that I have serious concerns that it has a high probability of failure, given the materials included in the proposal. If the assembled team can successfully implement the project, then I think there is likely strong scientific merit and potential for significant outputs to come from the analysis performed. I am more than happy to review a revised version of



the proposal that alleviates some of my concerns about the ability of the researcher to conduct the proposed analysis. But given the information I was provided in the submission, I, unfortunately, would have to elect to disapprove of the project (I was very torn between selecting between revision and disapproving; however, since my concern is over a very specific issue and can easily be addressed with additional information that was absent from the initial submission -- assuming that the qualifications are there --, I am willing to give the proposal the benefit of the doubt).

Your Recommendation:

Approve/continue project with revision

## Appendix G: Peer Review (Submitted)

Status: Complete

**Project ID/Title:** NE\_TEMP2204: A regional network of social, behavioral, and economic food systems research

### Rate the technical merit of the project:

1. Sound Scientific approach:

Approve/continue project with revision

2. Achievable goals/objectives:

Fair

3. Appropriate scope of activity to accomplish objectives:

Good

4. Potential for significant outputs(products) and outcomes and/or impacts:

Excellent

5. Overall technical merit:

Good

Comments

There are a number of great and innovative ideas here, but it was challenging to review as the proposal's flow was choppy and moved too abruptly between discussion of data challenges, innovation in methods, issues to be considered and no clear examples of findings and outcomes that would address specific policy or issue debates currently occurring.

If the proposal is refined to nest a few key industry dynamics (location of businesses, supply chains), and then new data or method innovations to inform each of those, and then a couple current issues influenced by those behaviors (equity, local), that would flow better and be better integrated. Plus, it may give a better idea of what interdisciplinary sciences and members you would have involved (since none appear to be listed).

Overall, this feels like it is too speculative in what you hope might be found, without a clear connection to previous work of members and how it will elevate the literature already cited in these areas, but there are great ideas worth building on.

Your Recommendation:

Approve/continue project with revision

## Appendix G: Peer Review (Submitted)

Status: Complete

**Project ID/Title:** NE\_TEMP2204: A regional network of social, behavioral, and economic food systems research

### **Rate the technical merit of the project:**

1. Sound Scientific approach:

Approve/continue project

2. Achievable goals/objectives:

Excellent

3. Appropriate scope of activity to accomplish objectives:

Excellent

4. Potential for significant outputs(products) and outcomes and/or impacts:

Good

5. Overall technical merit:

Excellent

Comments

The goal of “A regional network of social, behavioral, and economic food systems research” is to use AI and big data beyond the farmgate to examine marketing (including supply chain logistics), food retailing, and consumer choices. The scientific approach outlined in the proposal is sound, although it is important to keep in mind that AI and big data are changing rapidly, which may create new opportunities not currently captured in this project. The goals and objectives seem achievable, given the scope of activity. There is great potential for significant outputs and outcomes, however the outcomes could be strengthened with greater emphasis on outreach beyond the academic community.

Your Recommendation:

Approve/continue project

## **Response to Reviewer 1**

*[Mobility data] does not seem to be the expertise of the list of Prospective Participants...the core of the proposal seems to be a methodological contribution (specifically, the analysis of big data and AI in the food domain), for which the Project Editor does not appear to have a demonstrated expertise in. Discussion is not provided on how the Potential Project Participants will fill in this gap.*

To provide additional context, the initial research team received a grant from NIFA to purchase mobility big data from 2019-2025 and develop a network of researchers interested in using this data to food systems questions. Two of the collaborators (Dr. Suining He and Dr. Dongjin Song) are computer scientists with experience using mobility data, and they will be cleaning and reorganizing the data into a format usable by non-data science experts (including creating csv files and GIS feature classes). They will also collaborate on machine learning and AI applications. We now mention this in the “Methods” section and provide additional detail in Appendix E.

*The project proposal uses a lot of buzzwords without describing how it plans to actually implement analysis... I would like to see significantly more discussion over how the assembled team plans to implement the proposed research.*

We originally wanted to keep the descriptions general to ensure that potential collaborators with different research questions or proposed methods would see this as a viable project in which to participate. We have clarified the objectives and provided specific descriptions of proposed projects and analytical techniques in the Methods section. We hope this alleviates your concern about the lack of a clear methodological plan.

## **Response to Reviewer 2**

*Proposal's flow was choppy and moved too abruptly between discussion of data challenges, innovation in methods, issues to be considered and no clear examples of findings and outcomes that would address specific policy or issue debates currently occurring.*

We have revised the proposal for improved clarity. We have now created more general objectives and then provided examples in the Methodology section. This includes better making clear the policy implications of our findings. Specifically, objective two addresses concerns about the impact of COVID, and objective three addresses policies concerned with increasing food access and siting local food establishments.

*If the proposal is refined to nest a few key industry dynamics (location of businesses, supply chains), and then new data or method innovations to inform each of those, and then a couple current issues influenced by those behaviors (equity, local), that would flow better and be better integrated. Plus, it may give a better idea of what interdisciplinary sciences and members you would have involved (since none appear to be listed).*

Because a key element of this proposal is to encourage interdisciplinary collaboration among scholars and stakeholders, we have revised the proposal to clarify this. First, we now have more general objectives that can apply to various researchers. In the Methods section, we detail examples of issues and approaches that could be covered. Second, in both Appendix E and the start of the Methods

section, we make clear that interested researchers are from several disciplines and detail the role they would play in the research.

*Overall, this feels like it is too speculative in what you hope might be found, without a clear connection to previous work of members and how it will elevate the literature already cited in these areas.*

We intended to keep the proposal general so that researchers from various disciplines could apply the mobility data to their questions and methods. However, to make the scope of potential work clearer, we now have broader objectives and include specific examples in the Methods section.

### **Response to Reviewer 3**

*There is great potential for significant outputs and outcomes, however the outcomes could be strengthened with greater emphasis on outreach beyond the academic community.*

We have clarified that the goal is to conduct stakeholder-driven research and present findings that various audiences can understand. Specifically, we provide the example of a sub-state analysis of a marketing program proposed by the leader of that initiative and include more examples of the outreach we would conduct through the symposium.

# NE\_TEMP2206: Green Stormwater Infrastructure and Agriculture

Status: Submitted As Final

Duration 10/01/2022 to  
09/30/2027

Admin [Wendie Cohick]

Advisors:

NIFA Reps:

## Statement of Issues and Justification

The federal Clean Water Act (CWA) is 50 years old this year. The two fundamental goals of the CWA were to: 1) eliminate the discharge of pollutants into the nation's waters (zero discharge of pollutants by 1985) and 2) achieve water quality levels that are fishable and swimmable by mid-1983 (CWA, 1972). When the Act was signed into law, 60% of the waterways in the United States were not "fishable or swimmable." Today, 50% of our nation's waterways are fishable or swimmable (EIP, 2022). While much has been accomplished with addressing point source discharges through the upgrading of municipal wastewater treatment plants and elimination of industrial discharges, nonpoint source pollution that is carried to our waterways with stormwater runoff still needs to be addressed. In addition, agriculture is the leading source of impairments in the nation's rivers and lakes. About a half million tons of pesticides, 12 million tons of nitrogen, and 4 million tons of phosphorus fertilizer are applied annually to crops in the continental United States (USEPA, 2022).

Agriculture is very different from state to state. In Iowa, the average corn farm is 725 acres (Saavoss, et. al., 2021), while the average size farm in New Jersey is just 76 acres (USDA, 2020). The large farms employ agricultural management practices to reduce their environmental impacts and often take advantage of Farm Bill funding to implement these practices. The smaller niche farms found in the mid-Atlantic and Northeast Region of the United States are different types of agriculture. For example, the Northeast and Mid-Atlantic states are home to more than 428,000 horses, ponies, and mules living on about 65,000 farms (Delheimer, 2015). These farms can have far-reaching environmental effects. Poor horse pasture and trail management combined with heavy horse hoof traffic can lead to problematic soil erosion. Runoff can carry eroded sediment and pollutants (like nitrogen, phosphorus, and bacteria from horse feed, manure, and bedding) off the farm and deposit them in nearby soils and bodies of water (Delheimer, 2015). Not only can green infrastructure be used to treat stormwater runoff from the paddock areas, it also can be used to manage runoff from the impervious cover associated with the horse farms such as barns, stables, indoor riding rings, and silage storage areas. Results from a stakeholder survey in Connecticut indicated that farmers are generally interested in practices that protect downstream water quality; however, the cost of implementation, impacts to profitability, and lack of education or knowledge of practices are large barriers to actually making such improvements (unpublished data, CT NRCS-RCPP project 68-1106-16-965).

The nursery industry is another agricultural land use that can benefit from green infrastructure. If nurseries are looked upon as point sources of agricultural pollution, then the harmful substances of importance to human health and the environment are nitrogen and phosphorus compounds as well as pesticides and their metabolites. In 2019, the data showed that the nursery, greenhouse, floriculture, and sod industry continue to be New Jersey's leading agricultural sector with sales at almost \$500 million (NJDA, 2020). Nursery, greenhouse, and floriculture tend to have large expanses of impervious cover that can be managed with green infrastructure. Also, water is needed in higher amounts during propagation than during finished crop production so green infrastructure rainwater harvesting systems can be used to collect and store rainwater for propagation activities.

Finally, urban agriculture is an area where green infrastructure can be implemented to manage pollution from stormwater runoff. Urban farms often have limited space for stormwater management practices which makes green infrastructure a viable option. Diverse green infrastructure implementation practices, such as rainwater harvesting, can also be used to collect and store rainwater for irrigation prior to it becoming stormwater runoff.

There are also non-agricultural sources of nonpoint source pollution. Urbanizing communities across the nation are dealing with stormwater management issues. In urban centers, combined sewer overflows are discharging raw sewage into local waterways, city streets, and basements. In suburban communities, stormwater is polluting local waterways and causing localized flooding that disrupts and endangers the lives of the residents. Rural and agricultural communities also suffer from stormwater runoff problems. Climate change is making many of these problems worse. In a Water Environmental Federation National Survey of communities with municipal separate storm sewer systems (MS4s), there is an annual funding gap of \$8.5 billion to maintain and upgrade these systems (WEF, 2021). An economic analysis by the American Society of Civil Engineering (ASCE) shows a water-related infrastructure funding gap of \$434 billion over 10 years for drinking water, wastewater, and stormwater combined (ASCE, 2021). In New Jersey alone, it is estimated that \$9 billion is needed to keep stormwater out of the combined sewer systems in our urban areas to prevent the overflow of raw sewage into our local waterways and into the streets of these communities (NJF, 2014).

The ASCE Infrastructure Report Card indicates that “600,000 miles of rivers and streams and more than 13 million acres of lakes, reservoirs, and ponds are considered impaired,” meaning they do not meet water quality standards (ASCE, 2021). The United States Environmental Protection Agency Clean Water State Revolving Fund (CWSRF) provides funding for water infrastructure projects. In 2012, more than \$58 million was requested by municipalities across the nation for stormwater projects, but this amount has dramatically increased. In 2019, the requested amount was \$387 million. In 2017, the funds requested from the CWSRF for green stormwater infrastructure projects (approximately \$45 million) exceeded requests for traditional gray infrastructure stormwater projects. Every year since, requests for funding for green stormwater infrastructure have been equal to or more than requested for gray infrastructure projects (USEPA, 2021). The demand for green stormwater infrastructure is increasing.

Green stormwater infrastructure is effective at reducing bacteria, sediment, and nutrient loads to waterways (Dietz, 2007). Another benefit of green stormwater infrastructure is that it can also be used to reduce localized flooding (Dietz and Arnold 2018). In most cases, green stormwater infrastructure is being used in urban and suburban areas to retrofit existing developed areas with stormwater management. Although constructed wetlands are being used in the Midwest to intercept discharges from tile drains on agriculture lands, other applications of green stormwater infrastructure to agricultural stormwater issues have been limited. Much more research in adapting green stormwater infrastructure for agriculture lands is needed.

Due to limited space in developed areas, the efficiency of green stormwater infrastructure needs to be improved along with a stronger understanding of the maintenance required to keep the systems functioning at an optimum level. Green stormwater infrastructure also needs to be adapted to address climate change. There is also a need for research to better understand cost effectiveness and ecosystem services that these systems provide. Finally, since many of these systems are being incorporated into developed areas, there is a social dimension that needs to be explored to determine the best methods to encourage adoption of green stormwater infrastructure by residents, corporations, businesses, developers, and municipal officials.

### **The Technical Feasibility of the Research**

The Agricultural Experiment Stations and their Cooperative Extension Service are in a unique position to aid these communities to address these stormwater problems. The land grant universities have been conducting research on green stormwater infrastructure practices for many years and can address the research needs identified above. Researchers are currently working on identifying how green stormwater infrastructure can reduce flooding and peak flows from sewer systems, reduce pollution, and improve our water quality. Extension is playing a key role in disseminating knowledge from the universities to encourage communities to adopt green stormwater infrastructure and to help them with the planning and design of these systems. Whether these practices are being built for the agricultural community or in developed areas, farmer engagement and community engagement are key components to encourage the installation of green stormwater infrastructure.

Many of the land grant universities across the county have the expertise to conduct the green infrastructure research. The expertise needed for the research includes engineering, environmental sciences, landscape architecture, economics, and social/human dimension science. Many of the local, state, and federal regulations use the science generated by the land grant university researchers. The research generated at these universities are also used to model the environment’s reaction to future development conditions and climate change conditions. The research has determined the effectiveness of standard green stormwater infrastructure systems and how various alterations in design can improve the effectiveness. There has also been research on how to increase the adoption of green stormwater infrastructure and best practices to engage the public. All these efforts illustrate the technical feasibility of the research and suggest that the land grant universities are in the best position to conduct the research.

### **Advantages of a Multistate Effort**

Over last several years, there have been several regional green stormwater infrastructure meetings at the University of Connecticut. The goals for these meetings included:

1. Sharing of information about ongoing research and Extension at each university
2. Development of objectives for a Multi-State Hatch Proposal around green stormwater infrastructure
3. Development of a proposal for a regional or possibly a national green stormwater infrastructure initiative that can be submitted to private foundations, which have shown a great interest in this work

These meetings demonstrate a strong desire for researchers and Extension professionals to focus on green stormwater infrastructure and to work together. Working together allows researchers to build upon each other's efforts more quickly and can accelerate the production of results that can be disseminated to the public to solve their problems.

Representatives from Cornell, University of Maryland, Rutgers University, University of Connecticut, University of Vermont, University of New Hampshire, Penn State, and University of Rhode Island all participated in the meeting. Listed below are draft objectives that came from these meetings.

### **Potential Impacts**

The short-term impacts would be to successfully complete research that can be used by Extension professionals to increase people's knowledge and awareness of green stormwater infrastructure. This will empower farmers and communities to more quickly adopt green stormwater infrastructure and install green stormwater infrastructure in appropriate locations. A long-term result would be successful research that can increase the cost effectiveness of green stormwater infrastructure that can be used to retrofit farms and existing development, thereby reducing flooding, improving water quality, increasing climate resilience, and enhancing ecosystem service, ultimately improving the quality of life of our nation's residents.

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### **Related, Current and Previous Work**

Research on green stormwater infrastructure has proven that practices such as bioretention are highly effective at reducing runoff volume and removing of nutrients, pathogens, and other contaminants such as metals (Dietz, 2007; UNH Stormwater Center, 2021). Although some research has been done on green stormwater infrastructure in agricultural settings (Ergas et al., 2010; Dietz, 2016), the adaptation of green stormwater infrastructure to agricultural applications is still nascent. Higher concentrations of nutrients, pathogens, and solids pose serious challenges to traditional green stormwater infrastructure designs. This proposed work would seek to address this issue by utilizing the combined expertise of green stormwater infrastructure researchers in this region to develop creative adaptations to green stormwater infrastructure design.

Dr. James Houle is the Director of the UNH Stormwater Center (UNHSC), an experienced and recognized center of excellence for applied green stormwater infrastructure implementation and research on stormwater-related water quality and quantity issues. What makes UNHSC unique is their decades of experience in designing and researching an extensive variety of different stormwater management systems and the specific properties that improve water quality, reduce runoff volumes and restore predevelopment hydrological conditions. Dr. Houle manages a robust research program with the following primary components: 1) best management practice (BMP) technology testing and development; 2) targeted research; and 3) outreach and technical training. Additionally, Dr. Houle has been on the project team of several USEPA funded green stormwater infrastructure implementation projects throughout New Hampshire, Massachusetts, and the southern New England region.

Dr. Michael Dietz is an Extension Educator at the University of Connecticut and the Director of the Connecticut Institute of Water Resources. He has been performing outreach and research on green stormwater infrastructure applications for 25 years. In his current collaborative work with other faculty from the Center for Land Use Education and Research, Dr. Dietz has been assisting Connecticut municipalities in complying with new municipal separate storm sewer system (MS4) regulations. In addition to researching urban stormwater issues, his recent work has focused on adapting bioretention to agricultural applications. Dr. Dietz has been a PI or co-PI on numerous state and federal grants.

Dr. Christopher Obropta is an Extension Specialist in Water Resources for Rutgers Cooperative Extension; he teaches environmental engineering in the Rutgers Department of Environmental Sciences, and he is the Director of the New Jersey Water Resources Research Institute. He runs a robust Extension program that conducts research on green infrastructure effectiveness and design enhancements. He has been adapting some green infrastructure for use on horse farms and nurseries in New Jersey. He also has been working to help urban communities harvest rainwater for urban farming. Dr. Obropta also conducts workforce development training on green infrastructure construction and maintenance.

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## Objectives

1. Conduct research on how to best adapt green stormwater infrastructure to address agricultural runoff
  2. Develop a better understanding of the relationship between green stormwater infrastructure design features and pollutant removal and volume reduction capabilities
  3. Develop new climate resilient design criteria for green stormwater infrastructure
  4. Develop a better understanding of the economics/cost effectiveness of green stormwater infrastructure and the ecosystem services that these systems provide
  5. Develop Extension programming for engaging communities to implement green stormwater infrastructure to address runoff from existing development
  6. Develop curriculum to educate undergraduate and graduate students and workforce development on the planning, design, and implementation of green stormwater infrastructure
  7. Develop a better understanding of the mechanisms needed to encourage adoption of green stormwater infrastructure by residents, corporations, businesses, developers, and municipal officials
-

# Methods

This multi-state partnership will be a forum to collaborate and synthesize the extensive results and expertise of its membership. As much of the expertise and science in green stormwater infrastructure already resides within the participating land grant universities, the partnership is well suited to achieve the stated objectives. The current research products produced in the partnership provide an unparalleled foundation for adapting green stormwater infrastructure designs and developing new standards for including agriculture approaches and impacts from a changing climate. Many training curricula and course work already exist and can be updated and improved through the collaboration increasing impact and the reach of land grant university science and outputs.

1. Conduct research on how to best adapt green stormwater infrastructure to address agricultural runoff

To address research needs, the partnership will develop a list of research priorities to guide future investigations. These priorities, which are expected to range from bench scale laboratory to field and farm scale research, will be adopted by those within the partnership best suited to implement them. The partnership will draw from the members vast expertise to develop design standards to address variable loading conditions related agricultural stormwater runoff. We will also partner with "niche ag industries" as well as National Resource Conservation Service (NRCS).

2. Develop a better understanding of the relationship between green stormwater infrastructure design features and pollutant removal and volume reduction capabilities

As the partner membership includes much of the national research completed to date on green stormwater infrastructure, results will be consolidated and synthesized, and national guidance will be developed based on the latest science-based BMP performance results.

3. Develop new climate resilient design criteria for green stormwater infrastructure

Climate change is a complex issue, and there is little consensus as to how it should be addressed in the realm of stormwater management. The expertise of the partner network will be used to create a constructive dialog around the future design needs regarding stormwater BMPs and climate change. This dialog will be developed into guidance for national standards and will inform a science-based approach for the states represented in the network.

4. Develop a better understanding of the economics/cost effectiveness of green stormwater infrastructure and the ecosystem services that these systems provide

As the partner membership includes much of the national implementation approaches completed to date on green stormwater infrastructure, results of implementation efforts will be consolidated and synthesized, and national guidance will be developed to assess economics, life cycle costs, and ancillary benefits of green stormwater infrastructure.

5. Develop Extension programming for engaging communities to implement green stormwater infrastructure to address runoff from existing development

The network will synthesize results of successful implementation efforts into guidance to identify and facilitate *next-to-adopt* communities. Diffusion of innovation theory will be used to develop strategies on how to engage and identify adopters and encourage more implementation of green stormwater infrastructure.

6. Develop curriculum to educate undergraduate and graduate students and workforce development on the planning, design, and implementation of green stormwater infrastructure

Many of the partners teach stormwater courses and have training modules for various curriculum related to green stormwater infrastructure. This expertise will be consolidated and synthesized and used to update and develop national and statewide training and certification programs.

7. Develop a better understanding of the mechanisms needed to encourage adoption of green stormwater infrastructure by residents, corporations, businesses, developers, and municipal officials

Extension faculty from across the nation have been doing educational programming to encourage the adoption of green stormwater infrastructure. The social dimension of this objective will be evaluated using available metrics from existing programming, resulting in the establishment of best practices to optimize adoption. The Extension faculty associated with this project will help disseminate the results so all land grant universities can benefit.

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# Measurement of Progress and Results

## Outputs

- Data (e.g., monitoring results from lab to farm scale research, survey findings, and qualitative data)
- Publications (e.g., peer-reviewed journal articles, Extension publications, web resources)
- Specific design criteria for various outcomes (e.g., designs can be modified/adapted to enhance nitrogen removal in areas where nitrogen is a pollutant of concern)
- Best practices guidance on design, installation, and maintenance
- Trained students
- Professionals certified in agricultural green stormwater infrastructure design, installation, and maintenance

## Outcomes or Projected Impacts

- Farmers, students, and professionals will have increased levels of knowledge related to water quality impacts and green stormwater infrastructure solutions in agricultural applications.
- New design criteria will further facilitate implementation of BMPs tailored to agricultural applications.
- Increased numbers of BMPs will be installed in agricultural applications, resulting in improved water quality in local waters.

## Milestones

(2023): Establishment of objective focus groups

(2024): Establishment of research areas of focus

(2025): Assembly of design guidance for agriculture and climate change

(2026): Holding an annual conference to convene end users and present outputs and deliverables

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## Outreach Plan

The participants on this project either have a partial Extension appointment or are closely linked to Cooperative Extension faculty and staff at their land grant university. This will make dissemination of the research that is generated from this project to farmers, stakeholders, and other clientele relatively easy. A combination of fact sheets, digital tools, workshops, and field days will be used to disseminate research results. For professionals in the field, peer-reviewed publications will be generated, and research will be presented at conferences across the nation. One target audience will be underrepresented communities, which might be new farmers, women farmers, minority farmers, and urban farmers. Also, green infrastructure is widely used in urban centers to reduce combined sewer overflows, which are also in underrepresented communities. Diversity, equity, and inclusion will be part of the foundation of this project, both in recruiting participants for the project and disseminating research generated by the project.

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## Organization/Governance

This project is organized by objective with each objective having one or more lead scientists. The lead scientists will prepare annual summaries of research in their objective (or sub-objective) and lead the discussion at the annual meeting. These scientists are tasked with keeping the objective moving forward, meeting the objectives in a timely manner, and tracking to ensure that each participant is keeping their part of the project going according to plan. All other participants contribute updates on their work.

The annual meetings will have a chair and a secretary who typically rotates to chair the succeeding year. The secretary for the next meeting is elected by the membership each year.

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## Land Grant Participating States/Institutions

NJ,NH,MD,VT,CT

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## Non Land Grant Participating States/Institutions

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## Participation

Participant	Is Head	Station	Objective	Research						Extension	
				KA	SOI	FOS	SY	PY	TY	FTE	KA
Davis, Allen		Maryland - University of Maryland	2,6	112	210	2020	0.10	0.00	0.00	0	0
Dindinger, Jennifer	Yes	Maryland Cooperative Extension	2,5,7	112	399	3030	0.00	0.00	0.00	0.1	112
Houle, James		New Hampshire - University of New Hampshire	1,2,3,4,5,6,7	112	210	1070	0.20	0.00	0.00	0.2	112
Hurley, Stephanie		Vermont - University of Vermont	1,2,3,7	112	210	3111	0.20	0.00	0.00	0	0
Obropta, Christopher C	Yes	New Jersey - Rutgers University	1,3,5	112	210	2020	0.20	0.00	0.00	0.2	112
Rockler, Amanda		Maryland - University of Maryland	1,5,7	112	399	3030	0.10	0.00	0.00	0.1	112

## Combined Participation

Combination of KA, SOI and FOS	Total SY	Total PY	Total TY
112-210-2020	0.2	0	0
112-210-1070	0.2	0	0
112-210-2020	0.1	0.1	0.1
112-399-3030	0.1	0	0
112-210-3111	0.2	0	0
112-210-2020	0.1	0	0
112-399-3030	0	0	0
<b>Grand Total:</b>	<b>0.90</b>	<b>0.10</b>	<b>0.10</b>

Program/KA	Total FTE
112	0.07
112	0.07
112	0.03
112	0.03
0	0
0	0
112	0.03
<b>Grand FTE Total:</b>	<b>0.7</b>

Appendix G: Peer Review (Submitted)

Status: Complete

**Project ID/Title:** NE\_TEMP2206: Green Stormwater Infrastructure and Agriculture

**Rate the technical merit of the project:**

1. Sound Scientific approach:

Approve/continue project

2. Achievable goals/objectives:

Excellent

3. Appropriate scope of activity to accomplish objectives:

Excellent

4. Potential for significant outputs(products) and outcomes and/or impacts:

Good

5. Overall technical merit:

Excellent

Comments

Green stormwater infrastructure practices have been vetted in the urban and suburban context. Many of the practices have had limited application in rural or agricultural landscapes. Site specific guidance is needed and research on how to adapt these systems to the scale of agricultural systems as well as the potential disturbance they will be subject to due to continual agricultural operations will be critical to successfully adapting these approaches. Agricultural operations present the potential for a much greater nutrient and sediment load than a suburban and urban landscape. Understanding the maintenance needs and the long term viability of green infrastructure systems in this context will be important for achieving adoption of these practices by the agricultural community.

Your Recommendation:

Approve/continue project

Appendix G: Peer Review (Submitted)

Status: Complete

**Project ID/Title:** NE\_TEMP2206: Green Stormwater Infrastructure and Agriculture

**Rate the technical merit of the project:**

1. Sound Scientific approach:

Approve/continue project

2. Achievable goals/objectives:

Good

3. Appropriate scope of activity to accomplish objectives:

Good

4. Potential for significant outputs(products) and outcomes and/or impacts:

Excellent

5. Overall technical merit:

Excellent

Comments

Summaries are clear and concise. The objectives and methods align with stated goals of the various regional meetings. I appreciate the integrated approach, much of which appears translatable to other communities/states/regions. I'm excited about the economic elements. Given the 'niche ag industries' you highlighted consider partnership with small business development as a collaboration to expand reach and increase impact.

Your Recommendation:

Approve/continue project

Appendix G: Peer Review (Submitted)

Status: Complete

**Project ID/Title:** NE\_TEMP2206: Green Stormwater Infrastructure and Agriculture

**Rate the technical merit of the project:**

1. Sound Scientific approach:

Approve/continue project

2. Achievable goals/objectives:

Excellent

3. Appropriate scope of activity to accomplish objectives:

Excellent

4. Potential for significant outputs(products) and outcomes and/or impacts:

Excellent

5. Overall technical merit:

Excellent

Comments

This is a timely and important project. The team is very experienced with Green Infrastructure and has considerable design expertise and a long history of monitoring and assessment these types of management practices. Agricultural activities in the Northeast are a major source of pollution and often the leading cause of degradation of waters due to harmful cyanobacteria blooms. Nursery systems, barnyard areas and high use areas (i.e., sacrifice areas) are the types of concentrated agricultural activities are particularly in need of and well suited to green infrastructure practices.

This is new ground -- and this is the right team at the right time to make a difference. I hope they coordinate with NRCS so that their insights are incorporated into NRCS practices allowable for cost sharing.

Your Recommendation:

Approve/continue project



**From:** [Christopher Obropta](#)  
**To:** [Richard Rhodes III](#)  
**Cc:** [Wendie Cohick](#); [David Leibovitz](#); [Jan Peter Nyrop](#); [James Houle](#); [Dietz, Michael](#); [William Miller](#); [Diane French](#)  
**Subject:** Re: NE\_TEMP2206: Green Stormwater Infrastructure and Agriculture  
**Date:** Tuesday, November 29, 2022 09:39:02 AM

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This is great news. I added the following sentence into the first item under methods: "We will also partner with "niche ag industries" as well as National Resource Conservation Service (NRCS)." This is now final and ready for review by MAC and NERA. Thanks for your help with this. Please let me know what the next steps are to gather my colleagues to begin working on this project.

Chris

Christopher C. Obropta, Ph.D., P.E.  
Extension Specialist in Water Resources  
Rutgers Cooperative Extension Water Resources Program  
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**From:** Richard Rhodes III <[rcrhodes@uri.edu](mailto:rcrhodes@uri.edu)>  
**Sent:** Tuesday, November 15, 2022 4:36 PM  
**To:** Christopher Obropta <[obropta@envsci.rutgers.edu](mailto:obropta@envsci.rutgers.edu)>; Michael.Dietz@uconn.edu <[Michael.Dietz@uconn.edu](mailto:Michael.Dietz@uconn.edu)>  
**Cc:** Wendie Cohick <[cohick@njaes.rutgers.edu](mailto:cohick@njaes.rutgers.edu)>; David Leibovitz <[david\\_leibovitz@uri.edu](mailto:david_leibovitz@uri.edu)>; Jan Peter Nyrop <[jpn2@cornell.edu](mailto:jpn2@cornell.edu)>  
**Subject:** NE\_TEMP2206: Green Stormwater Infrastructure and Agriculture

Chris, Mike, and Wendie,

We finally have three completed reviews of your NE\_TEMP2206 proposal (those are attached). The Multistate Activities Committee (MAC) now asks that the project editor and/or technical team consider each of the reviews, respond to the reviews, and revise the proposal as needed. (The proposal in NIMSS is re-opened for revision.) We'd ask that the response to the reviews be appended to the project website on NIMSS as an attachment.

Congratulations! We'd note that the reviews were good to excellent and the reviewers did not share extensive recommendations. One reviewer suggested partnering with "niche ag industries" and another hoped that you would coordinate with NRCS. As we noted above, if you wish to modify your proposal, it can now be edited in NIMSS. We'd ask that the editing be completed by

December 8. Should you edit the proposal, please include a brief description of those edits as an attachment in NIMSS. If after perusing the reviews that you wish to leave the proposal "as is" please let us know. We'll then consider the proposal ready for review by the MAC and NERA

If you need any assistance along the way, David and I are available.

Regards,  
Rick

\*\*\*\*\*

Dr. Richard C. Rhodes III

Executive Director

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\*\*\*\*\*

# NE\_TEMP2203: Legal Issues in Agriculture and Natural Resources

**Status:** Submitted As Final

**Duration** 10/01/2022 to  
09/30/2027

**Admin**  
**Advisors:** [[Puneet Srivastava](#)]

**NIFA Reps:**

## Statement of Issues and Justification

Unlike traditional areas of the law, agricultural law is not just one field of study but is made of those areas of law that impact agriculture (Schneider, 2009). Production agriculture is at the heart of agricultural law (Kershen, 2008). As has been highlighted by many agricultural law scholars, the study, research, and education related to agricultural law are necessary because agriculture is important to human existence (Schneider, 2009). Understanding the impacts of laws on production agriculture can assist policymakers, producers, and service providers to better adapt to the changing needs on agriculture.

Legal risks are pervasive in agricultural and natural resource industries. Stakeholders' decisions are often constrained by limited knowledge of laws and their impacts on operations, including environmental laws, contract laws, agricultural leasing, bankruptcy, estate planning, food safety, and others. Legal risk impacts vary across agricultural firm types, geographic regions, and government agencies, ranging from local ordinances to state laws to federal laws.

Legal risk impacts are becoming a growing concern of agriculture and natural resources operations. For example, in Maryland, 60 percent of agricultural producers and service providers responded that laws and regulations in the state affect farm businesses to a high degree. In this survey, respondents highlighted a wide range of issues impacting agricultural operations from environmental law issues, zoning and planning issues, estate planning, and USDA programs as potential areas of concern for producers (Millet-Williams et al, 2019). This is just one example in one state with other states having similar to truly unique issues depending on the conditions in that state.

While much progress has been made in understanding making decisions with legal risks, the knowledge base remains incomplete due to the continually evolving nature of U.S. law. There is a continuing need to examine both the short- and long-term effects of legal changes in agriculture and other natural resource-based industries. The ever-evolving definition of waters covered under the Clean Water Act is a good example, highlighting the importance of understanding the changing nature of the law and legal risk management. A better understanding of how legal changes affect these businesses will improve and help firm-level decision-making adapt to laws changes. Though proposed in the Northeast, one of the strengths of this project is it will bring a national scope of institutions represented by the participants and allow us to understand a breadth of the local, state, and federal laws impacting the agricultural and natural resource industries.

While many legal issues are initially driven by local and/or state interests, these may also turn into concerns in other states. In response to legal challenges involving North Carolina's right-to-farm law, in 2018, the North Carolina legislature amended that law to provide additional statutory protections to agricultural operations. Following the North Carolina amendments, several other states looked at modifying their state's right-to-farm law to provide similar protections. Pulling together a coalition of national institutions working together on these issues will help all states understand the effects of changes in agricultural law.

This proposed coalition would allow researchers to present work to a broader group of peers and allow a more successful understanding of applying these legal issues to a broader range of legal risks impacting the agricultural and natural resource industries. In addition, the information exchange format creates opportunities for researchers to interact on issues of mutual interest, fostering extramural grant-writing efforts.

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## Related, Current and Previous Work

This would be a new research project that would focus in on developing multi-state collaborations in four key research areas of agritourism, heirs' property, environmental law, and labor laws.

Agricultural law can often be a broad field taking up many areas in agriculture. From contract law (involved in planting seeds or marketing the final product), land use law, water law, and constitutional law, to name a few. Several past projects have hit upon agricultural law within CRIS.

National Agricultural Law Center Initiatives (Project No. ARK02661) is focused on the National Ag Law Center (NALC) 's outreach and educational resources at the University of Arkansas. This project's work has done a tremendous job of expanding audiences for agricultural law work. However, NALC often has limited resources developed in our four research areas, and our proposed multi-state project would allow for more timely research in these areas. In addition, our proposed multi-state work would pull in all agricultural law land grant faculty to provide deeper collaborations than the National Ag Law Center's initiatives have.

Another project, The Right-to-Farm For Small and Medium-Sized Farmers: A National Legal Analysis (Project No. KY.W-2021-10284), is focused on reviewing right-to-farm laws to determine what language works best for small and medium-sized farms. We would build upon this work further in our proposed project, determining what environmental, labor, agritourism, and heirs' property laws work best for these farming operations. Right-to-farm laws are a nuisance defense for agricultural operations, and compliance with environmental laws is often a factor in gaining the right-to-farm law as a defense. Our proposed work would build upon this project.

The term "heirs property" refers to jointly-held land passed down from generation to generation without going through probate (United States Department of Agriculture, <https://www.farmers.gov/working-with-us/heirs-property-eligibility>). However, the large numbers of owners dividing the property amongst the cotenants are more complex, and agreement on land use is more unlikely (Richardson, Jr., 2017).

Two primary concerns arise from heirs' property: the vulnerability (or displacement) concern and the wealth (or efficiency) concern (Deaton, Baxter & Bratt, 2009). The vulnerability concern refers to the fear of being forcibly dispossessed from the property through a partition sale initiated by another cotenant, whether a family member or third party (Ibid.). The wealth concern refers to the diminished ability of cotenants to use the land--whether to build a home, for agriculture or forestry, for recreation, for business, as collateral for a loan, or other reasons, without the unanimous consent of all owners (Ibid).

Heirs' property often coincides with land loss in rural communities (Parsons, et al., 2010). Although the latest Farm Bill includes a provision to make obtaining a farm number for federal programs easier (USDA Farm Service Agency, Guidance for Heirs' Property Operators to Participate in Farm Service Agency Programs) and a relending program (United States Department of Agriculture, <https://www.farmers.gov/working-with-us/heirs-property-eligibility/relending>) no program presently exists to address assess and remedy the heirs' property issue.

Agritourism operators increasingly encounter obstacles in the form of local zoning ordinances ( Brunch & Holland, 2005) and ( Eckert, 2007). Agritourism promises increasing profits for operators, but the local land use planner looks much different than production agriculture (Hall & Bachelor, 2019).

The difficulty in defining agritourism and fitting the practice into existing zoning categories has caused increased litigation on zoning compliance and the interpretation of "agritourism" and related terms (Hall & Essman, 2020). With many state definitions of lacking agritourism clarity and the creative addition of new agritourism enterprises, land use clashes involving agritourism are likely to continue to increase.

Agricultural operators continue to face increased pressures from environmental compliance. However, complying with these environmental laws can often create confusion for operators and a struggle to understand how to comply. For example, some environmental laws focus on limiting possible nutrient runoff going on to fields (Hall & Essman, 2019). Other focuses include water quality trading programs (Everhart, Huntley, & Johnson, 2020). Millet-Williams et al. have found that in Maryland, the top legal issue Maryland operators are concerned about is environmental regulations.

As it comes to labor, agricultural operations face pressures from both hiring domestic labor and non-domestic labor. In addition, depending on state laws, operations may need to consider how best to comply with state wage laws, state requirements on benefits (such as health insurance), and when agriculture exemptions from labor laws exist. The use of H-2A workers continues to rise as operations face labor shortages of domestic workers (Canales, 2022). Operations often face several legal hoops to work through to bring in H-2A workers, which can often lead to frustration.

At the same time, operations face domestic labor shortages or a domestic workforce that is less likely to have experience in agriculture. This can lead to operations not understanding how to hire appropriately, onboard, and continually train this new workforce, with many operations not having full-time human resources departments that can take this job on. Additionally, states have begun looking at traditional exemptions for agricultural workers in state labor laws and in many cases, doing away with those exemptions. New York, for example, has recently removed the exemption from overtime that existed for agricultural workers (Melfi & Duby, 2022).

## Objectives

1. Provide a scientific/professional forum to facilitate the exchange of theoretical and methodological approaches to agricultural law, and to develop original concepts and preliminary research related to agriculture and natural resources.
  2. Develop and communicate legal analysis of contract law, succession planning, nuisance, and environmental legal issues and legal risk management strategies in agriculture, including analysis of how these laws impact firm-level decisions, technology adoption, and access to information.
  3. Develop and communicate legal analysis of federal laws and regulations impacting agricultural and resource businesses.
  4. Develop and communicate legal analysis of how state laws and regulations vary among the states can impact agricultural and resource businesses.
- 

## Methods

Our research approach would be that utilized by many in applied agricultural law research. We would focus on using literature reviews, case law reviews, and comparative law reviews (both nationally and internationally). The U.S. is made up of 50 states that often adopt different state laws that will allow us an opportunity to understand better what legislative language could work in one area and potentially not in others.

The primary activity would be an annual meeting, allowing for the exchange of ideas and information about legal issues surrounding agricultural and natural resources law. Project members will hold this meeting in conjunction with the American Agricultural Law Association's (AALA) annual meeting/Extension Risk Management Educators (ERME) Conference, with individual tracks for the project members to exchange ideas and information.

Initially, we would propose four areas of agricultural law on which we would focus our research efforts. At the same time, we would be nimble enough to focus on developing issues that could impact agriculture in the region/nation, such as animal welfare, climate change, and legal issues related to public health, including nuisance issues and environmental law issues. Many growers in the region (and across the U.S.) are focused on adding agritourism and agri-entertainment options to the farm. We would propose to collaborate together on research projects related to agritourism. This would include potential liability issues, strategies to limit liability, and land use issues. We imagine that research outputs would include best practices for legislation or ordinances related to agritourism and suggestions for state policies that would allow for agritourism. At the same time, we would offer outreach to attorneys, state officials, insurance providers, and land use planners to allow these key groups to understand the issues better and work with agricultural operations looking to expand to agritourism. The group has already seen success in similar outreach efforts for these audiences by offering continuing education credit through the National Ag Law Center and typically reaching 200-plus professionals through webinars.

Labor demands in the Northeast and across the country often rely on domestic and foreign labor to work in fruit and vegetable, livestock, dairy, and poultry operations. At the same time, agricultural operations often struggle to understand the myriad of federal and state labor laws to comply with. We would propose to collaborate on agricultural labor legal issues. We would imagine that research outputs would include best practices for legislation related to labor and suggestions for state policies that would allow for improvements to the labor laws in a state.

Although often considered a problem in the South and the West, heirs' property is also a problem in the Northeast region. We would focus on comparative law analysis of state laws across the region to determine optimal solutions for heirs' property issues. We would imagine that research outputs would include best practices for legislation related and suggestions for state policies that would allow for improvements to the heirs' property regimes across the region. This research would potentially go beyond the agricultural field in the region and could also have an impact on urban areas as well. We would disseminate this information to agricultural operations, agricultural services providers, and state officials to promote better compliance with existing laws.

We would propose collaborating on research projects related to environmental law as it impacts agriculture. This research would have implications across the region and the country. This research would include information related to public health and climate change. We would imagine that research outputs would include best practices for legislation related and suggestions for state policies that would allow for improvements to the environmental law impacts on agriculture across the region.

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# Measurement of Progress and Results

## Outputs

- Journal Articles
- Book Chapters and Books
- Conference Sessions
- Organized Symposiums
- Extension Publications

## Outcomes or Projected Impacts

- Increase the ability to understand good practices with laws impacting agritourism
- Increase the ability to understand the good practices with laws impacting agricultural labor
- Increase the ability to understand and predict potential impacts in changes to environmental law policy impacting agriculture
- Increase the ability to understand and develop good practices related to heirs' property
- Increase clientele exposure to understanding of agricultural law impacts

## Milestones

(2023): Organize and conduct organized symposia and invited paper sessions at regional, national, and international professional meetings and other fora to extend the applied research results obtained within this regional research project.

(2024): Organize and conduct a major regional conference outlining the challenges and best practices in one of our four research areas

(2025): Apply for and receive major external funding related to one of our four research areas.

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## Outreach Plan

We will disseminate research and extension information to stakeholder groups through publications and presentations. We will develop a website that will provide electronic copies of all publications, presentations, and recordings of virtual meetings. We will make presentations of specific issues addressed to clientele groups as requested. The project members will collaborate on organizing sessions for the AALA's annual meeting and for professional meetings of agricultural economists and Extension faculty as needed.

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## Organization/Governance

A three-member executive committee consisting of a past project chair, project chair, and program chair will govern the project. Administrative issues will be addressed during the business meeting held in conjunction with the annual meeting. The committee will conduct elections to fill the position of program chair during the business meeting. The program chair coordinates the program for the next annual meeting and the quarterly virtual meeting sessions. The outgoing program chair becomes the project chair and is responsible for conducting the business meeting, submitting an annual report on project activities, and maintaining communication with the administrative advisor and the Northeast Association of Agricultural Experiment Station Directors. The outgoing project chair will become the past project chair to provide additional support to the executive committee. Initially, at the first annual meeting, the project team would elect project team members to fill the three executive committee positions.

We would also incorporate into this project an advisory panel of key stakeholders such as attorneys, Experiment Station Directors, agricultural operators, and other ag service providers. This advisory panel would be integrated into our annual meetings to help provide additional feedback on research to ensure it's timely and valuable to our target audience.

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## Land Grant Participating States/Institutions

## Non Land Grant Participating States/Institutions

### Participation

Participant	Is Head	Station	Objective	Research						Extension	
				KA	SOI	FOS	SY	PY	TY	FTE	KA

### Combined Participation

Combination of KA, SOI and FOS	Total SY	Total PY	Total TY
<b>Grand Total:</b>	<b>0</b>	<b>0</b>	<b>0</b>

Program/KA	Total FTE
<b>Grand FTE Total:</b>	<b>0</b>



## Northeast Administrative Adviser assignments to be addressed

### December 2022

- Mark Hutton (Maine, former Assoc Director)
  - NE1943: *Biology, Ecology & Management of Emerging Disease Vectors*
  - NE1944: *Management of the Brown Marmorated Stink Bug – renewing 2022-23*
  - NE2101: *Eastern White Pine Health and Responses to Environmental Changes*
- Brad Hillman (Rutgers, retired)
  - NE1833: *Biological Improvement of Chestnut through Technologies that Address Management of the Species and its Pathogens and Pests – renewing 2022-23*
- Adel Shirmohammadi (Maryland, former Assoc Director)
  - NE1835: *Resource Optimization in Controlled Environment Agriculture – renewing 2022-23*
  - NE2045: *Onsite Wastewater Treatment Systems: Assessing the Impact of Soil Variability and Climate Change*
- Rick Rhodes (NERA Executive Director)
  - NECC1812: *Northeast Coordinating Committee on Soil Testing – renewing 2022-23*
- Eric Wommack (Delaware, former Assoc Director)
  - NECC1901: *Integrating Genomics and Breeding for Improved Shellfish Aquaculture Production of Molluscan Shellfish*
  - NE2202: *The Equine Microbiome*
- Jan Nyrop (Cornell AgriTech, retiring 12/2022)
  - NE9: *Conservation and Utilization of Plant Genetic Resources – renewing 2022-23*
  - NE1832: *Biological Control of Arthropod Pests and Weeds – renewing 2022-23*
  - NE1839: *Development and Evaluation of Broccoli Adapted to the Eastern US – renewing 2022-23*
  - NE2001: *Harnessing Chemical Ecology to Address Agricultural Pest and Pollinator Priorities*

# Northeastern Supplement to the Guidelines for Multistate Research Activities<sup>1</sup>

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## **I. Introduction**

The four regional associations of State Agricultural Experiment Station Directors (Northeast, North Central, South, and West), in cooperation with the United States Department of Agriculture National Institute of Food and Agriculture, have developed *Guidelines for Multistate Research Activities* (hereafter referred to as [National Guidelines](#)) for organizational and operational procedures that are common to all regions. The National Guidelines, however, recognize that there are regional differences in procedures and policies relative to the conduct of multistate activities, and are sufficiently important as to require the regional associations to develop supplements to the National Guidelines. The Northeastern Supplement to the Guidelines for Multistate Research (hereafter called the Northeastern

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<sup>1</sup> Revised and approved, September 28, 2022

Supplement) apply to the multistate research activities that are, or will be, sponsored by the Northeastern Regional Association of State Agricultural Experiment Station Directors (NERA). These supplementary guidelines reflect the operational procedures for the Northeastern region.

## **II. History of Multistate Research**

In 1948 President Harry S. Truman signed into law a provision to set-aside 25 percent of the Hatch Act formula funding for research that is provided by the United States Department of Agriculture (USDA) annually to State Agricultural Experiment Stations (hereafter referred to as SAES or Stations) for multistate research. An understanding of the history and evolution of multistate research is important to the tasks of being a contributor to a multistate research activity.

The establishment of the Multistate Research Fund (MRF) created a novel mechanism for the SAESs to work across state lines in ways that were previously more difficult. To coordinate the activities, the four regions formed associations of SAES directors to manage the portfolio, and to serve as the responsible body for the activities. Over time the associations have evolved to support an Office of the Executive Director (OED), which provides both staff support for multistate research activities and programmatic leadership for some aspects of the program. The region's Association of SAES Directors provides multistate research activity administration.

The MRF requires matching non-Federal funds, and is to be used to support research conducted, most simply, by two or more states. However, in practice, membership on a multistate research project's technical committee is open to participation by scientists beyond institutional, organizational, regional, and functional boundaries.

The multistate research authority was created to stimulate and facilitate interstate cooperation on research of regional and national significance. The multistate research program is flexible and allows institutions to address high priority problems, plan research activities, and coordinate scientific investigations at a level not attainable by one institution operating alone. Multistate research is a unique model that allows scientists to work freely across state boundaries, to create collaborations with institutions both public and private, and even to work with international partners when advantageous, and in ways that are not otherwise easily organized.

## **III. Definitions and Descriptions**

*Administrative Adviser (AA)* – The Administrative Adviser is a key leader in the development and management of a multistate research or an integrated research and extension activity. Administrative Advisers have access to edit and upload materials to proposals, projects, and annual reports. AAs are also responsible for the authorization of annual meetings. All Northeastern Administrative Advisers are selected by the Multistate Activities Committee (MAC), approved by NERA, and appointed by the NERA chair. (See Section V.)

*Education/Extension and Research Activity (NEERA prefix)* – These activities serve to integrate two or more functions (i.e., education, extension, or research) on a particular topic

where multistate coordination or information exchange is appropriate, have expected outcomes, convey knowledge, and are peer reviewed. These activities are distinguished from formal multistate research projects in that Multistate Research Funds may be expended only for travel.

*Multistate Activities Committee (MAC)* – The Multistate Activities Committee is responsible for recommending to the NERA membership the proper disposition of Multistate Research Project proposals and Multistate Coordinating Committees in accordance with national and regional priorities. The MAC is also responsible for reviewing and making recommendations to NERA on changes to the Northeastern Supplement.

*Multistate Research Coordinating Committee (NECC prefix)* – Multistate Research Coordinating Committees provide a mechanism for addressing critical regional issues where multistate coordination or information exchange is appropriate, have expected outcomes, convey knowledge, and are peer reviewed. They result in increased communication between faculty, avoidance of unnecessary duplication and gained efficiencies in the use of resources and shared ideas. These activities are distinguished from formal multistate research projects in that Multistate Research Funds may be expended only for travel.

*Multistate Research Project (NE prefix)* – Multistate Research Projects involve cooperative, jointly planned research employing multidisciplinary approaches in which SAES, working with the ARS, or other colleges or universities, cooperate to solve problems that concern more than one state and, usually, more than one region. There is a high level of interdependence among the cooperators.

*National Information Management Support System (NIMSS)* – The [National Information Management Support System](#) is an electronic project management tool that allows the Directors to perform all functions relative to the development, submission, review, and approval of multistate projects.

*National Institute of Food and Agriculture (NIFA)* – NIFA is a federal agency within the United States Department of Agriculture. The agency administers federal funding to address the agricultural issues impacting people’s daily lives and the nation’s future. It is responsible for the Federal oversight, accounting, and day-to-day record keeping for the Multistate Research Fund.

*Northeastern Regional Association of State Agricultural Experiment Station Directors (NERA)* –NERA is an autonomous federation of State Agricultural Experiment Stations (SAES) represented in its membership by the individual SAES directors. The Northeastern Regional Association is one of five such U.S. Regional Associations. It represents the administrators of the State Agricultural Experiment Stations (SAES) in the northeastern region (Connecticut [two stations], Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and West Virginia) in collective dealings.

*Office of the Executive Director (OED)* – The Office of the Executive Director of NERA

coordinates all aspects of the Northeastern multistate research programs. The OED is an information resource for Administrative Advisers, committee chairs, and committee members and should be contacted for assistance in developing and implementing multistate research activities.

*Project Editors* – Individuals from the technical team that have access to edit and upload materials to proposals, projects, and annual reports. Administrative Advisers and Regional System Administrators (RSA; NERA OED serves as the Northeast RSA) assign editors to proposals and projects.

*Rapid Response Multistate Research Project* – A Rapid Response Multistate Research (or series 500) Project is a special category of multistate research projects. It is a fast-track approach to form an emergency project to address an urgent problem requiring prompt action. This type of project has a 2-year duration from the date of initiation and may convert to a 5-year multistate research project or other multistate research activity, through normal procedures.

*Regional System Administrator* – The NERA OED serves as the RSA for the region. The RSA serves multiple functions in NIMSS and can add stations, add new NIMSS users, edit station information, create and update NIMSS user profiles, edit and submit Appendix Es, and assist in moving regional proposals through the approval process. The RSA can take any action in NIMSS on behalf of Administrative Advisers, project editors, Station Directors/designees and other NIMSS users.

*Technical Committee (or Team)* – The research scientists, and as applicable, extension specialists, and extension agents, participating in a multistate research project, plus the administrative Adviser and the NIFA representative make up the project's technical committee.

#### **IV. Multistate Activities Committee**

The NERA MAC is responsible for recommending to the membership the proper disposition of multistate research project, multistate research coordinating committee or education/extension and research activity proposals in accordance with national and regional priorities and procedures. This is done through the commissioning of external peer reviews, the evaluation of projects and committees, the monitoring of research progress and, as appropriate, establishing multistate priorities via broad-based issues identification and strategic planning.

The MAC shall consist of six members: four of whom will be Northeast SAES directors (including Assistant and Associate Directors) and two are Northeast Cooperative Extension directors (including Assistant and Associate Directors); all members will be appointed by the NERA Chair for a three-year term. Terms are renewable. The NERA Executive Director is an ex-officio, non-voting member of the MAC. The chair of the MAC shall be appointed by the NERA chair and serve a term of up to three years (coincident with the individual's appointment to the MAC.) The MAC meets in person or electronically prior to each NERA meeting.

## V. Administrative Advisers

The Administrative Adviser is the key person in the development and management of a new or renewing multistate research activity. Their role is to encourage team effort, advise on administrative and operational procedures, and act as liaison among the technical committee, the SAES directors, other cooperating agencies and institutions, the OED, the MAC, and NIFA.

All Administrative Advisers for Northeast multistate research activities are appointed by the NERA chair upon recommendation by the MAC and approval by NERA. The MAC and NERA will endeavor to match the expertise and interests of the Administrative Adviser with the focus of the multistate project. For multistate research committees and multistate research coordinating committees, Administrative Advisers can be SAES directors (including assistant and associate directors) of the member institutions or individuals such as senior faculty, department chairs, or other administrators who are endorsed by their institutional SAES director (these individuals are hereafter called the SAES designee.) In the case of education/extension and research activities, co-Advisers are appointed – one SAES director (or SAES designee) and/or one Academic Program director (or Academic Programs designee) and/or Cooperative Extension director (or Cooperative Extension designee.)

## VI. Development of New Projects

A. Multistate Research Projects (A summary of the critical steps to the submission of a new project proposal and the submission of a replacement/revision of a current project is listed in Section X Appendix of this document.)

1. The ad hoc Technical Committee notifies the OED of the intent to submit a new proposal. ~~The notification must identify to the two Northeastern stations supporting the proposal.~~

2. The ad hoc Technical Committee and project editors (or their SAES director or SAES designee) submits through NIMSS a [New Project Proposal](#) for either a new or revision/replacement multistate research project, coordinating committee, or education/extension and research activity. The RSA will assign a temporary project number to the proposal in NIMSS. At least two stations in the Northeast are required to be sponsors of the proposal. The project proposal must address the following:

- Issues and Justification
  - The need, as indicated by stakeholders.
  - The importance of the work, and what the consequences are if it is not done.
  - The technical feasibility of the research.
  - The advantages for doing the work as a multistate effort.
  - What the likely impacts will be from successfully completing the work.
- Related, Current, Previous Work
- Objectives
- Methods
- Measurement of Progress and Results
- Outreach Plan
- Organization/Governance
- Literature Cited
- Attachments

- List of prospective participants
- Response to peer reviews

3. Once the final “Objectives” have been posted in NIMSS, the AA or the RSA may release a nation-wide call for participants and the submission of the "Form for Reporting Projected Participation" ([Appendix E](#)) in NIMSS. The Appendix E must have approval of the participant’s station director. Most frequently, the solicitation of Appendix E participants is sent after approval of the project by NERA.

4. The MAC will review the proposal for readiness for peer review and provide feedback to the ad hoc Technical Committee. The MAC will also seek the appointment of an Administrative Adviser for the project, subject to approval by NERA at the time of final proposal approval. Once revisions have been made in response to MAC feedback, or should the MAC not seek revisions by the Technical Committee, the MAC will request from the Technical Team the names of 5 peer reviewers who are not associated with the project proposal. The minimal expectation is that each project proposal receives three complete peer reviews. The OED will solicit reviews from the list of suggested peer reviewers. (An [Appendix G](#) in NIMSS is the form used by peer reviewers to comment on the proposed.)

5. Upon completion and submission of peer reviews in NIMSS, the RSA will share the reviews with the Technical Committee and provide the opportunity to revise the proposal as suggested by the reviewers. The Technical Committee will be expected to upload a narrative (added as an attachment in NIMSS) identifying changes made to the proposal and responses to suggestions made by the reviewers. The Administrative Adviser can assist the Technical Committee to ensure incorporation of suggestions of the peer reviewers into the proposal.

6. The MAC reviews the revised and complete proposal and makes a recommendation to the membership of NERA. If NERA accepts the recommendation of the MAC to approve the project proposal, the chair of NERA will confirm the permanent Administrative Adviser and the RSA will assign a formal project number. The RSA will then submit the revised and complete project proposal and the project will then be incorporated into the national portfolio of multistate projects. The region has final approval authority of the multistate research proposal. Incorporation of the project into the national portfolio will include the addition of the project into the pull-down menus of the NIFA reporting system and the assignment of a NIFA liaison.

7. It is highly recommended that all project proposals are prepared and submitted according to the timeline and review process outlined below. This chronology allows sufficient time to address concerns that may arise at any step along the approval process.

<b>Process Step</b>	<b>Date</b>	<b>Responsible Party</b>
Notify the OED of the intent to submit a proposal	September 30 – One year in advance of anticipated October 1 start date	Technical Committee in consultation with <del>2 NERA directors (2 stations supporting the submission of the proposal)</del> supporting AES Director(s)
Technical committee submits complete draft proposal in NIMSS; suggests names of 5-7 peer reviewers	December 1	Technical committee in consultation with AA
Proposal reviewed by MAC; MAC provides feedback to Technical Committee; proposal revision	January 15	MAC
Peer reviews solicited	February 15	OED
Peer reviews submitted	March 15	OED
Proposal revised in response to peer reviews; summary of revisions and response to the reviews submitted as an attachment in NIMSS	April 15	Technical Committee in consultation with AA
MAC reviews revised proposal and response to the reviews.	May 15	MAC
MAC makes recommendations to NERA (typically at the NERA summer business meeting)	June 15	MAC
NERA Directors approve MAC recommendations	June 15	NERA
Submit NERA approved proposal for incorporation into national portfolio	June 30	OED
NIFA assigns liaison and incorporates project into drop-down menus in the reporting system	July 15	NIFA
Local station project initiation	September 15	Local stations
Project start date	October 1	Technical Committee



## B. Multistate Research Coordinating Committee or Education/Extension and Research Activity

To accommodate needed activities in the region that do not well fit into formal multistate research project the association sanctions Multistate Research Coordinating Committees and Education/Extension and Research Activities. These integrated activities are distinguished from formal multistate research projects in that Multistate Research Funds may be expended only for travel. Reporting those travel expenditures are accounted for through the administrative project, NE59. Other expenditures (e.g., operations and salaries) are not allowed by NIFA rules.

The process for developing new multistate research coordinating committees and education/extension and research activities is similar to that for multistate research projects. An ad hoc Technical Committee develops a proposal using the format as shown in Appendix B of the National Guidelines and an Administrative Adviser is identified by the MAC and approved and appointed by NERA. The proposal is required to go through peer review. The NERA review and approval process is similar to that of a research project. Importantly, Coordinating Committees and Education/Extension and Research Activities do not appear in the NIFA reporting system. The development and approval timeline is similar to that presented above.

## C. Rapid Response Multistate Research Projects

When initiating a Rapid Response Multistate Research Project, there is one important exception to the normal procedure for initiating a multistate research project. When an urgent problem requiring prompt action occurs, and the action must be taken by two or more stations for a multistate activity, a formal request can be made to the chair of the NERA to accept a proposal for a Rapid Response Multistate Research Project. This "fast-track" approach, called a Rapid Response Project, can be used to form an emergency project. One of the directors from a requesting station is designated as Administrative Adviser. The proposal is then referred to the MAC, and once the MAC approves, the proposal is considered to be approved by the region. This "fast-track" process was put in place to make sure that a quick response could be made to an urgent problem.

## **VII. Development of Revised Projects**

At the end of a multistate research project authorized duration, the project's committee members may decide to seek a revision of the multistate project, building the new research effort on the results of the previous project. In such a case, the Administrative Adviser and Technical committee would initiate a revision/replacement proposal using a similar procedure for initiating new multistate research projects (Section VI). The current Technical Committee would serve as the ad hoc Technical Committee for the development of a revision/replacement project proposal. The multistate research project number identifier will be terminated at the end of the approved period unless specifically approved by NERA. A "critical review" is required for all proposed project revisions. This critical review should provide a summary of: (1) work accomplished under the original project; (2) the degree to which the objectives have been accomplished; and (3) work that is incomplete, or areas in need of further investigation. This "critical review" should be incorporated into the "Related, Current, and Previous Work" section of the new project outline.

The timeline for development of revised projects is similar to the chronology outlined above. It is important that the revision/replacement process is initiated during the fourth year of the current project to assure that the revised project is approved prior to the termination of the current project. Otherwise, there may be a gap in funding.

### **VIII. Adding New Participants to Multistate Research Activities**

Once a multistate research project, multistate research coordinating committee or education/extension and research activity has finalized objectives in place, new participants may be added to the activity. A request by a scientist or Extension professional to participate in an existing multistate research activity will not alter the title or create a need to change the objectives of the original activity.

The petitioning scientist or Extension professional completes an Appendix E in NIMSS covering the proposed work to be undertaken from the procedures section of the proposal. The Appendix E must be approved by the director of the participant's home SAES or Cooperative Extension Service. Unless there are unusual circumstances or considerations, Technical Committees are asked not to 'vote' on admitting new members to existing activities as membership is open to all qualified scientists and Extension professionals from Land-grants and non-Land-grant institutions.

### **IX. Technical Committee Meetings**

#### **A. Meeting Authorization**

The Administrative Adviser must authorize all committee meetings using the "[Authorize Annual Meeting](#)" function in the NIMSS. This formal authorization is sent to all approved project participants and used by stations and agencies as documentation to support travel for their participants. The RSA can send a meeting authorization with the approval of the Administrative Adviser.

#### **B. Frequency of Meetings**

Committees normally meet once each year. If necessary, the Administrative Adviser may authorize more than one meeting per federal fiscal year (October 1 – September 30). The announcement should indicate that it is an additional meeting and explain why it is needed. Meeting minutes are to be recorded and are integral part of the annual report.

#### **C. Location of Meetings**

The meeting location is left to the discretion of the Administrative Adviser in consultation with the Technical Committee. The appropriateness of location and the conservation of time and travel funds should be considered in determining the location of meetings. If meetings are held in conjunction with professional society meetings, committees are encouraged to meet prior to the society meetings. Virtual meetings are also acceptable especially when travel is not practical or possible. Authorizations for committee meetings to be held outside the U.S. must be justified.

#### **D. Decision Making**

Decision making by Technical Committees and Coordinating Committees should be done by consensus whenever possible. While the National Guidelines indicate one vote per

participating station (to be cast by the Official Representative), the Administrative Adviser in conjunction with the Technical Committee should define their internal voting policies. The Northeastern Supplement recognizes that a majority vote by those present at the meeting can resolve agenda questions. The Northeastern Supplement also recognizes that this process may, in some cases permit under or overrepresentation of some participant institutions or of functions. Administrative Advisers should monitor meeting representation to assure that fairness is predominant in all decisions. In the Appendix E participation form, it is required to assign and identify one Official Representative if there are multiple participants from one Station.

#### E. Minutes

The secretary of the Technical Committee records the minutes of meetings and submits them (including attendance) as part of the SAES-422 Annual Report (Appendix D in the National Guidelines) in NIMSS. An expanded or complete set of minutes are recommended for the record by the committee itself for the purpose of assisting the committee in the management of the project. The full set of minutes should be uploaded to the meeting report on the NIMSS website ([https://www.nimss.org/meetings/available\\_projects](https://www.nimss.org/meetings/available_projects).)

### **X. Reporting and Review Requirements**

#### A. Annual Report

The Administrative Adviser for each multistate research activity, with assistance of its members, submits an annual report using the "[Draft/Edit Report](#)" function in NIMSS (SAES-422 Annual Report - Appendix D in the National Guidelines). The report is due 60 calendar days following the annual meeting. This report should highlight the milestone accomplishments, collective outputs, outcomes, and actual or anticipated impacts, resulting from the activity. The annual report should also include a summary of the minutes (including attendance) of the meeting. The full, expanded version of the minutes can be uploaded in the NIMSS annual report form as an attachment.

The SAES-422 is intended to complement a participating station's Plan of Work accomplishments reporting and should assist national activities that document the contributions of multistate activities. Participating institutions can use this report for identifying their contributions to the multistate activity.

#### B. Mid-term Review and Evaluation

During the third year of a 5-year project, the Administrative Adviser conducts a mid-term evaluation of the activities and success of the project/activity using Appendices I (for multistate research projects; [https://www.nimss.org/appendix\\_is/form](https://www.nimss.org/appendix_is/form)) and K (for multistate research coordinating committees or education/extension and research activities; [https://www.nimss.org/appendix\\_ks/form](https://www.nimss.org/appendix_ks/form).) An optional first or second year evaluation may be conducted by the Administrative Adviser if the project is scheduled for less than a 5-year term. The MAC will review these evaluations and if appropriate make recommendations for changes to NERA.

#### C. Termination Report

At the end of the project's approved time span, the Administrative Adviser, with assistance

of the project's members, submits an annual report using the "[Draft/Edit Report](#)" function in NIMSS. This special version of the SAES-422 serves as both the annual report in the final year and the termination report for multistate activities that are being completed. The emphasis in the final annual report should be on the cumulative accomplishments and impacts of the research over the duration of the activity.

Responsibility for submitting the termination report rests with the Administrative Adviser. Termination reports are distributed through the same process as the annual reports. They are an important source of information for anyone interested in the accomplishments and impacts of multistate activities. They are also used by the Experiment Station Section employed communications specialist as input in the development of final impact statements for multistate activities, many of which are archived on the [Multistate Research Fund Impacts](#) website.

## X. Appendix: Creating a new multistate research project proposal or renewing a multistate research project

### Appendix A.

1. Notify the NERA OED of your intent to submit a multistate research proposal. ~~In the notification include the endorsement of Directors from the two Northeast stations supporting the proposal.~~
2. Login into NIMSS at [www.nimss.org](http://www.nimss.org). If you haven't logged into NIMSS yet, use your email address to reset your password under Forgot Password. Going forward, use your email address as your username and new password to log in.
3. Select Project Proposals > New Project Proposal.
4. On the Basic Information page, select New. If renewing a project, select Revision/Replacement.
5. In the Form box, select Multistate Research Project (or Coordinating Committee/Rapid Response if appropriate. Do not select NRSP).
6. Type in the desired project title (for renewals, the project name can be changed to reflect new objectives) and enter the five year begin and end dates using the beginning (October 1, 2XXX) and end (September 30, 2XXX) of the federal fiscal year.
7. Enter the *Issues and Justification* in the text box then click Save and Submit. This opens access to all additional proposal form fields and alerts NERA that there is a proposal in process. Enter the remaining sections of the proposal including *Related, Current and Previous Work; Objectives; Measurement of Progress and Results; Outreach Plan; Organization/Governance; Literature Cited; and Attachments*. If the project is renewing, a critical review should be incorporated into the “Related, Current, and Previous Work” section of the new project outline. The critical review should provide a summary of: (1) work accomplished under the original project; (2) the degree to which the objectives have been accomplished; and (3) work that is incomplete, or areas in need of further investigation.
8. Once those sections are entered, the MAC will review the proposal for readiness to share with peer reviewers. If needed, the Technical Committee will have an opportunity to revise the proposal in response to comments and suggestions from the MAC.
9. The Technical Committee will also provide to the NERA OED, the names of at least 5 peer reviewers who are from outside the northeast and do not intend to participate on the multistate project. NERA will solicit the peer reviewers and, after at least three peer reviews have been completed, NERA will share the peer reviews with the Technical Committee. The Technical Committee will revise the proposal and provide written responses to reviewers concerns and a narrative of changes made to the proposal in response to the reviews. The response to the reviews and the narrative of changes to the proposal is uploaded to NIMSS as an attachment.
10. The MAC then reviews the proposal, the peer reviews, responses to the review, and changes to the proposal and formulates a recommendation to NERA. NERA directors consider the recommendations of the MAC. If approved, the project is incorporated into the national portfolio of multistate research projects.