

RESTORING THE WEST

Bridging Science & Practice

OCTOBER 22-23, 2026 | LOGAN, UT

UTAH STATE UNIVERSITY

WELCOME

On behalf of Utah State University Forestry Extension and the Utah Forest Restoration Institute, we are excited to welcome you back to *Restoring the West* on our beautiful Logan, Utah campus.

This unique event brings together practitioners and scientists from across the western United States to collaborate on practical solutions for addressing widespread land management issues. Throughout the workshop, you will have the opportunity to attend thought-provoking keynote talks and share your own perspectives and experiences with peers who share an interest in advancing the science and practice of restoration. At its core, *Restoring the West* is about connection. We are here to exchange ideas and create collaborations to address the challenges facing western ecosystems.

We are grateful for your contribution to *Restoring the West's* continued success and for your help in fostering lasting connections and discoveries. Thank you for being a part of this exciting journey.

Sincerely,

Darren McAvoy

Extension
UtahStateUniversity

Larissa Yocom

Utah Forest Restoration Institute
UtahStateUniversity.

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Associate Professor
USU Forestry Extension



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UFRI



Bradley Washa
Assistant Professor
USU Wildland Resources

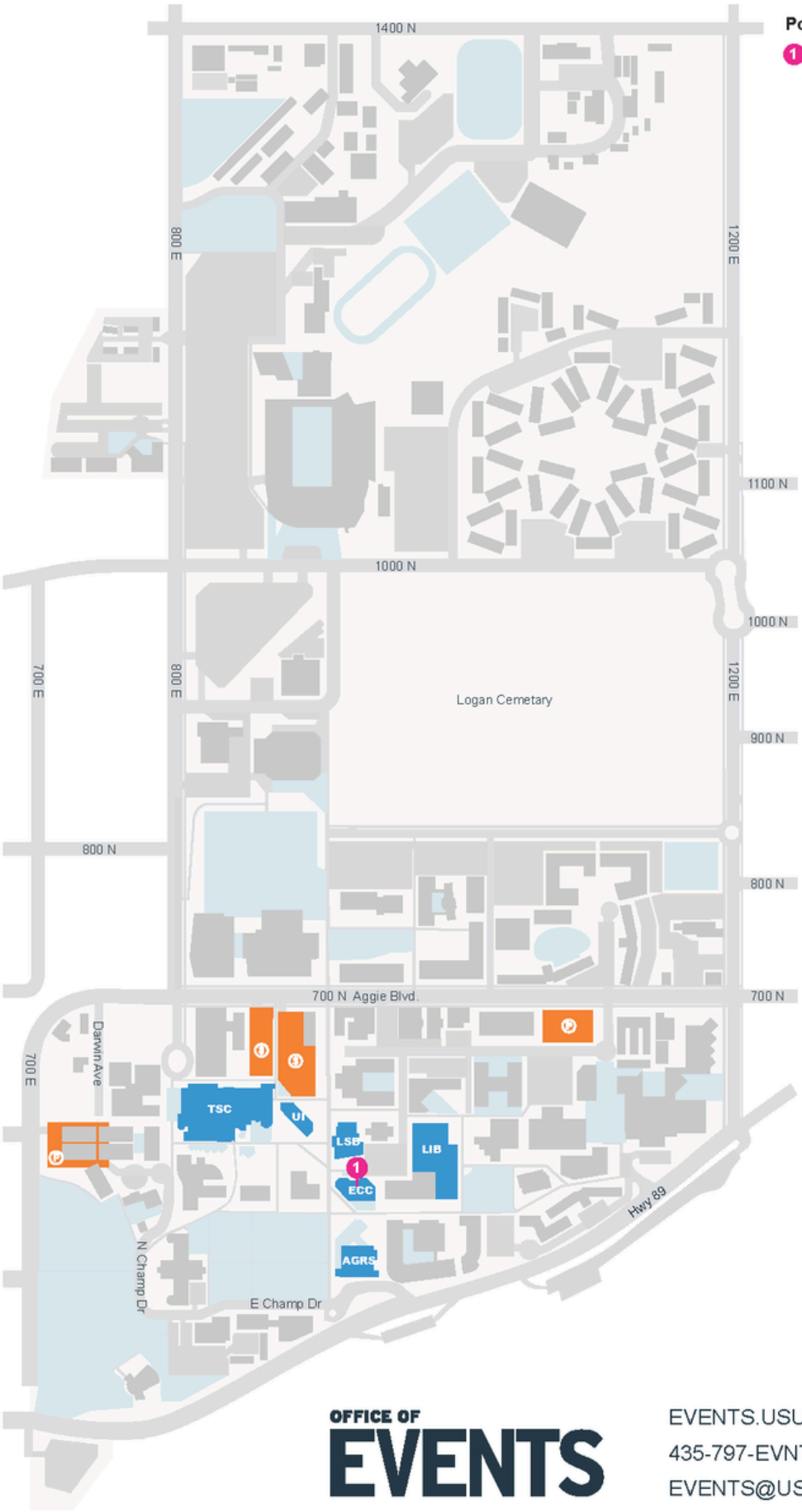


DAY 1

08:00 am	Registration Opens	ECC Registration
	Exhibitor Bump-in	ECC Lobby
08:45 am	Conference Opening & Welcome	ECC Auditorium
09.00 am	Keynote: Tony Cheng, Colorado State University	ECC Auditorium
10:00 am	Matt Redd, The Nature Conservancy	ECC Auditorium
10:30 am	Morning Break with Beverages & Snacks	ECC Lobby
11:00 am	Catrin Edgeley, Utah State University	ECC Auditorium
11:30 am	Matt Thompson, Colorado Forest Restoration Institute	ECC Auditorium
12:00 pm	Networking Lunch	ECC 205/207
01:30 pm	Kyle Rodman, Ecological Restoration Institute	ECC Auditorium
02:00 pm	Sarah Koenigsberg, Utah State University	ECC Auditorium
02:30 pm	Morgan Mendenhall, Utah Forestry, Fire and State Lands	ECC Auditorium
03:00 pm	Afternoon Break with Beverages	ECC Lobby
03:30 pm	Kris Hulvey, Working Lands Conservation	ECC Auditorium
04:00 pm	Anson Call, Ecological Restoration Institute	ECC Auditorium
04:30 pm	Wrap-up & Discussion	ECC Auditorium
05:00 pm	Poster Session	ECC 201/203

08:00 am	Registration Opens	ECC Registration
08:30 am	Keynote Panel: Patrick Shea, Dave Whittekiend, Brad Washa	ECC Auditorium
09:30 am	Kelly Cornwall, U.S. Forest Service	ECC Auditorium
10:00 am	Larissa Yocom, Utah State University	ECC Auditorium
10:30 am	Morning Break with Beverages & Snacks	ECC Lobby
11:00 am	Sara Goeking, U.S. Forest Service	ECC Auditorium
11:30 am	Dustin Doane, U.S. Forest Service	ECC Auditorium
12:00 pm	Conference Wrap-up & Evaluation	ECC Auditorium
12:30 pm	Boxed Lunch & Networking	ECC Lobby
01:00 pm	Charting a Roadmap of Wildfire Research and Policy in Utah	ECC Auditorium
04:30 pm	Workshop Adjourns	ECC Auditorium
	Exhibitor Bump-out	ECC Lobby
	Poster Tear-down	ECC 201/203





Point of Interest

1 Restoring the West

Venues

Indoor Venues

AGRS	Agricultural Sciences Building
ECC	Eccles Conference Center
LIB	Merrill Cazier Library
LSB	Life Science Building
TSC	Taggart Student Center
UI	University Inn

Parking

Aggie Parking Terrace
Big Blue Parking Terrace
Gateway Parking Terrace
TSC Visitor Lot

Legend

Indoor Venue

Parking Lots

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LOGISTICS

Parking

Restoring the West attendees may park their vehicles in the orange lots shown on the included map. The lots are *Aggie Parking Terrace*, *Big Blue Parking Terrace*, *Gateway Parking Terrace*, and *TSC Visitor Lot*. USU guest parking costs **$10** per day.

Wi-Fi

Free Wi-Fi is available to *Restoring the West* attendees. When you select "USU Guest," a page will open in your internet browser. Type in your name and agree to the terms of service to activate Wi-Fi.

Water Refill

Water refill stations are located between bathrooms on all floors in the main hallway of the Eccles Conference Center (ECC). Catering-provided drink stations are in the lobby.

Accessibility

Elevators in ECC are across from the bathrooms at the building's northwest end. If you need assistance or additional accommodations, please speak with USU Office of Events staff at the registration desk.

KEYNOTES

TONY CHENG

Senior Research Scientist
Colorado State University, Colorado Forest Restoration Institute

'Go big or go home? Working through the paradox of scale in restoration

The restoration challenges in the West are daunting in their scope and scale, from invasive species and abandoned minelands to restoring fire resilience to millions of acres of forests. An oft-heard clarion call is to 'go big or go home.' Indeed, ecologists have long advocated for planning and implementing restoration activities at the scale of ecological processes—species migration, watersheds, so-called "firesheds." In my world of forest and wildland fire risk reduction, the phrase "accelerate the pace and scale of treatments" is commonplace. What does this actually look like? Research on behavioral decision-making demonstrates that humans have tendencies to reduce complexity into simple cognitive heuristics and that cooperative collective action is most likely to succeed at smaller, more localized scales. In short, we overcome paralysis in the face of overwhelming challenges by devoting our energies to work at local scales. Two of my academic forebearers, Robert Lee and George Stankey, referred to this as the "paradox of scale," stating that effective large-scale management of ecological processes arises when people and organizations co-produce place-based knowledge and mobilize resources to work at local spatial scales. Rather than presenting results from recent research, I explore ways in which place-based collaborative restoration can be scaled to achieve larger-scale impacts, what social-organizational and information systems are needed to achieve impact, and offer hope and possibility to students and future restoration stewards in face of overwhelming restoration challenges.

ABOUT TONY



Tony Cheng is a professor at Colorado State University in the Forest & Rangeland Stewardship department and Director Emeritus of the Colorado Forest Restoration Institute (CFRI), a congressionally designated program to bridge scientific research and on-the-ground practitioners to address forest and wildland fire resilience challenges. His research focuses on conditions and strategies influencing collaborative stewardship of forests. During his 16 years as CFRI Director, Tony oversaw programs of work to translate science into locally relevant and actionable knowledge to address forest resilience and wildfire risk management goals. Born and raised in Pullman, Washington, in the heart of the Palouse region, he received his undergraduate degree in Political Science at Whitman College in Walla Walla, Washington holds an MS in Forestry from the University of Minnesota and a PhD in Forestry from Oregon State University. In addition to his academic training, Tony served as a Forest Policy Research Fellow at American Forests in Washington, DC. Tony has been at Colorado State University since 2000.

Federal land management in the West: yesterday, today, and tomorrow

Former federal agency leaders will share highlights and lessons learned from their careers in land management, discuss the current state of land stewardship, and explore how today's management decisions are influencing the future of our public lands.



PATRICK SHEA

Former Director
Bureau of Land Management

Patrick is an attorney, legal scholar, author, and retired government official who served as director of the Bureau of Land Management in 1997 and 1998. Patrick earned a BA from Stanford University, a Rhodes Scholarship at Oxford University, and a Juris Doctor from Harvard Law School. He has taught at several universities, including Brigham Young University, the University of Utah, Harvard, and Stanford, and worked on political campaigns for Walter Mondale, Michael Dukakis, and Bill Clinton. Patrick ran for governor of Utah in 1992 and was Utah's Democratic nominee for the U.S. Senate in 1994. As an attorney, Patrick has represented clients in several high-profile cases and is known for his work on freedom-of-the-press cases.



BRAD WASHA

Assistant Professor
Utah State University

Brad is an Assistant Professor of Wildland Fire Science in the Wildland Resources Department at the Quinney College of Agriculture and Natural Resources with USU Extension. With more than 33 years in wildland fire management, including over 400 wildland fires, Brad retired from the federal wildland fire service in 2021 after working with the Bureau of Land Management, U.S. Forest Service, The Nature Conservancy, and the National Park Service. Brad's extension, teaching, and research efforts focus on landscape and community resiliency, including prescribed fire and treatment effectiveness, smoke management, risk analysis, strategic planning, and dispelling wildland fire misinformation.



DAVE WHITTEKIEND

Former Forest Supervisor
U.S. Forest Service

Dave is a natural resource leader with more than 35 years of public service, dedicated to managing America's public lands. He spent over a decade as the Forest Supervisor for the Uinta-Wasatch-Cache National Forest, directing large-scale restoration, wildlife management, and complex wildfire and fuels management initiatives across 2.2 million acres. His extensive career with the USDA Forest Service spans multiple leadership roles, grounding him in federal policy and grassroots land administration. He holds degrees in Wildlife Biology and Botany from Colorado State University and Brigham Young University. After retiring from federal service, he continues his commitment to resource stewardship as a board member of the Utah Stream Access Coalition.

SPEAKERS

ANSON CALL

Ecological Restoration and Resilience Program Manager
Ecological Restoration Institute, Northern Arizona University

Where are the fuel treatments, and what difference do they make? Using TWIG data to answer managers' questions

Fuel treatments are one of the few tools land managers have for proactively managing forest health and wildfire risk. Yet, simply keeping track of fuel treatments can be tough, let alone measuring their success. To make better management decisions in the future, we need to know what fuel treatments were implemented in the past, whether they worked, and why. The Treatment and Wildfire Interagency Geodatabase (TWIG), which combines federal and state fuel treatment records with wildfire data, is now the most comprehensive source for nationwide fuel treatment information. Managers are asking questions such as: Which types of fuel treatments are most effective? When will treated areas need re-treatment? Are fuel treatments still effective in worst-case fire weather conditions? Researchers are now using TWIG data to answer them. In this talk, I'll explain what's in TWIG and how researchers and managers can use it. I'll then walk through a case study of the 2020 Mangum fire in northern Arizona, where I used TWIG data to show which fuel treatments effectively reduced fire severity and challenged a common assumption about how long treatment effects can last.

DUSTIN DOANE

Assistant Director, Fuels, Intermountain Geographic Area
U.S. Forest Service

Establishing a common operating picture

The Common Operating Picture (COP) presentation outlines the evolution of an integrated fire, fuels, vegetation, and wildlife management approach to land management. It begins by identifying major landscape threats—uncharacteristic fire resulting from fire exclusion, insects and disease, invasive species, and climate change—and emphasizes the need to focus on the controllable aspects of these challenges. From 2009 to 2015, ecological connections between programs proved the most effective drivers of active management. In 2016, the forest unified its fuels program under a simple, powerful goal: don't miss a burn day. This clarity significantly improved prescribed fire operations and demonstrated the value of coordinated communication. By 2017, cultural shifts were underway as leaders encouraged long-term thinking about forest conditions and personal legacy. A phased integration process in 2018 brought vegetation, wildlife, fire, fuels, and line officers together in shared exercises that developed understanding, ownership, and clear role definitions. Establishing COP-based annual goals allowed the forest to expand output, achieving 24,000 acres of prescribed fire and over 40,000 acres of treatments in 2019, and increasing other program accomplishments, such as timber stand improvement. The presentation stresses that acres alone are not meaningful metrics; success requires

prioritizing the right treatments in the right locations. It concludes with recommendations focused on internal alignment, partner engagement, workforce development, long-term planning, adaptability, and cultivating the culture necessary to support a resilient landscape and a community capable of living with fire.

CATRIN EDGELEY
Assistant Professor
Utah State University

Advancing community wildfire adaptation: what works?

Science, policy, and practice surrounding how human communities navigate wildfire adaptation continue to evolve across changing social, political, economic, and ecological contexts. The latest era of community wildfire adaptation science emphasizes shared responsibility for risk reduction, collective action through coordinated mitigation efforts, and strategic allocation of resources to support larger, more concerted behavioral and environmental modifications in at-risk places. Fluctuations in funding, staffing, and resource availability to advance these efforts underscore the value of frequent reflection and adjustment to ensure that current adaptation approaches align with the social conditions under which wildfire adaptation is occurring. Taking stock of successes and challenges, both locally and externally, can reveal commonalities and nuances to existing community-based strategies and partnerships. This presentation shares several wildfire adaptation vignettes from recent studies with at-risk communities across the US West, showcasing opportunities to improve alignment between social conditions and adaptation strategies. Findings from these studies reveal best practices for working with communities, opportunities to improve or adapt policies and programs to better support local collaboration, and a need for greater investment in social science research to untangle local wildfire adaptation dynamics.

SARA GOEKING
FIA National Program Manager
U.S. Forest Service

Tradeoffs of multi objective forest management for forest and hydrologic resilience

Forest cover, disturbance, and climate interact to influence the resilience of both forests and water supplies. This presentation draws on the results of several studies to synthesize what we currently know about how these interactions affect snowpack and water supply in the western US. Our findings tell a cautionary tale to forest managers who seek to increase water yield by thinning forests in the Intermountain West. While reductions in forest cover sometimes result in increased water yield, they often decrease water yield in arid watersheds or provide only short-term water benefits. Disturbance severity and site factors can influence both the sign and magnitude of changes in streamflow, snowpack accumulation, soil moisture, and other hydrologic fluxes that determine water supply. The interaction of disturbance severity with aridity and solar radiation strongly influenced streamflow in semi-arid to arid watersheds. Collectively, these studies show that forest cover loss—including thinning treatments—does not consistently result in decreased evapotranspiration or increased water yield. Fuels reduction treatments, including mechanical thinning and

prescribed fire, have been shown to increase forest resilience (i.e., by decreasing tree mortality) or increase water yield, but typically not both, and evaporative demand may determine the direction of the outcome. Thus, forest management objectives that seek to optimize forest resilience are unlikely to increase water yield as a co-benefit. However, active management can reduce the risk that severe wildfire poses for water supplies due to its complete removal of vegetation and subsequent likelihood of increasing erosion and sedimentation.

KRIS HULVEY
Founder & Chief Scientist
Working Lands Conservation

Innovative grazing on public lands: lessons from the Three Creeks Project

Land managers are interested in rangelands that sustainably balance cattle production with multiple other ecosystem services – such as forage, clean water, high-quality habitat for wildlife, healthy soils, and thriving ranching communities. The Three Creeks Grazing Consolidation Project is a Utah-based project where a local community developed an innovative plan for public lands grazing. Ranchers formed an LLC and developed a sustainable grazing plan to balance cattle production with wildlife habitat and stream health. Collaborating with federal agencies, state agencies, and nonprofits, they addressed challenges through NEPA reviews and infrastructure development. This talk will highlight how this partnership navigated social, logistical, and funding obstacles, and will showcase initial successes for rangelands and ranchers.

SARAH KOENIGSBERG

Filmmaker, Photographer, and Educator
Utah State University

The North American Beaver Knowledge Network: cultivating relationships and braiding knowledge across science, policy, practice, and culture

Beaver-based restoration is gaining momentum as a nature-based solution for climate resilience in North America, with benefits for drought and fire mitigation, flood attenuation, water quality, and biodiversity. Yet beaver research, policy, and management remain geographically and professionally siloed, slowing the translation of knowledge into practice. The North American Beaver Knowledge Network (NABKN), an NSF-funded Research Coordination Network, was created to bring together researchers, managers, restoration practitioners, Tribes and First Nations, and policymakers to synthesize the state of beaver science, identify how legal constraints and cultural opportunities vary across place, and facilitate bidirectional knowledge transfer across local, regional, and continental scales. This talk introduces the network and highlights three regional workshops that we hosted this past summer. As the "people person" amidst our cohort of earth scientists, I was invited to co-design the workshops and wrangle the human subjects data. I'll describe how we structured the gatherings using proven, peer-reviewed group exercise methodologies to ensure all perspectives and modalities of knowledge could be surfaced and validated. Group production of integrative insights require alternation between focused, structured activity

and open conversation, so we ordered the activities to form a coherent arc through the day, addressing different cognitive modes and engagement levels, ensuring the collection of multiple types of primary data. I'll close by sharing our preliminary insights and next steps, and our hopes for how the NABKN, grounded in the braiding of knowledge and relationship, can offer a model for bridging science and practice that extends well beyond beavers.

MORGAN MENDENHALL
Area Forester
Utah Forestry, Fire & State Lands

Reforestation of the Bear River Range

With a history of over-harvesting and insect outbreaks throughout the Bear River Range, forest stands are struggling to naturally regenerate. A variety of methods, timing, and tree species selection have been used to restore these stands and provide a new generation of forests that are adapted to our climate and able to withstand future environmental conditions. This presentation will discuss some of the methods used and lessons learned after more than 10 years and 200,000 seedlings planted across numerous State and private lands.

KYLE RODMAN
Disturbance Ecology and Recovery Program Manager
Ecological Restoration Institute, Northern Arizona University

Providing actionable research for the post-fire restoration frontier

Large, fast-moving, and high-severity wildfires are becoming increasingly common across the western United States, and recent burn areas now require substantial investments of time and resources from land managers. For many of us, this represents a new management frontier marked by significant uncertainty, creating a need for applied scientific research developed in close partnership with practitioners. At the Ecological Restoration Institute, we have a long history of collaborating with managers across the southwestern United States, particularly in the restoration of ponderosa pine (*Pinus ponderosa*) forests. In this talk, I will share lessons learned from these partnerships: what has worked, what has not, and how we are currently supporting post-fire decision-making. How can post-fire management foster ecosystems that are resilient to a changing climate and emerging fire regimes? Drawing on larger themes, I explore this question through two case studies of scientific co-development in the Sonoran Desert and on northern Arizona's Kaibab Plateau.

MATT THOMPSON
Affiliate Wildfire Scientist
Colorado Forest Restoration Institute

The role of PODs in wildfire containment

Potential Operational Delineations (PODs), a spatial wildfire planning framework originally conceived on National Forest System lands in 2016, has since expanded as a more collaborative, cross-boundary construct that is increasingly used to support pre-season

planning, vegetation management, and incident response. Here, we explore the role of PODs as a natural connection between wildfire operations and performance evaluation. We leverage the fire line effectiveness (FLE) framework, which itself has evolved from a prototype R&D tool into a systemic performance indicator with broad coverage and real-time applications. We customize the FLE framework to explore how PODs relate to containment effectiveness under different management scenarios and across varying fire conditions.

LARISSA YOCOM
Director
Utah Forest Restoration Institute

Bridging science and practice in Utah's forests: UFRI projects and plans

The Utah Forest Restoration Institute was formed by the Utah State Legislature in 2024 to collaboratively develop and deliver objective science to managers, policymakers, and communities to inform the management of healthy, fire-resilient, and climate-adapted forests and woodlands. The organization serves as a bridge between scientific research and land management implementation to help restore fire-resilient ecosystems in Utah and the surrounding region. This presentation will outline UFRI's progress to date, introduce current projects and collaborations, and present an outline of future directions and priorities for the Institute.

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- Wildfire Risk Assessment
- CWPP Development
- Project Management & Planning
- Forest Health Assessment
- Insurance Denials
- Avalanche Terrain Assessment

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- Trail Maintenance
- Cone Harvesting
- Forest Restoration
- Prescribed Fire
- Post-Fire Recovery
- Arborist
- Hazard Tree Felling
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POSTERS

NATHANIEL DUCASSE
Utah State University

POSTER #1

Evaluating soil health and water retention in perennial grass and wheat-fallow systems on cultivated, calcareous soils in northern Utah

Dryland wheat production in Northern Utah is increasingly vulnerable to climate variability, prolonged drought, and declining soil function. Growers have reported repeated crop failures in historically reliable wheat–fallow systems, while regional trends show increasing abandonment of dryland wheat acreage. Previous research in the region found that up to 80% of substantial multi-decadal yield gains from a single compost application were associated with non-nutritive improvements in soil physical function, highlighting the importance of soil carbon, aggregation, and water dynamics in sustaining productivity. This ongoing study evaluates whether perennial grass establishment can provide a lower-cost pathway to restore soil function and improve drought resilience in calcareous dryland soils. We sampled long-term wheat–fallow fields and fields under perennial grasses established for approximately 5–10, 15–20, and 40–50 years near Snowville, Utah. Across this chronosequence, we are evaluating soil organic and inorganic carbon stocks, aggregate stability, infiltration, and water retention through 60 cm of the soil profile. Preliminary results from these analyses show clear positive trends with increasing perennial grass establishment across multiple indicators of soil physical health and hydrologic function. These early findings suggest that perennial cover may progressively rebuild soil function over decadal timescales. By identifying the rate and magnitude of recovery, this research connects measurable soil improvements with practical management decisions for producers considering Conservation Reserve Program enrollment or harvestable perennial systems to reduce erosion, improve water capture and storage, and strengthen dryland resilience in the Intermountain West under increasing climatic and economic uncertainty.

TY WILSON, AMITA KAUNDAL
Utah State University

#2

Isolation of Frankia *from hybrid buffaloberry nodules*

Climate change threatens ecosystems and biodiversity, causing rising temperatures, increased carbon dioxide levels, and altered precipitation patterns that lead to droughts, flooding, and reduced crop yields (FAO, 2009). By 2050, drought is expected to be the main factor affecting plant growth. Utah, the second-driest state in the U.S., features drought-tolerant native plants such as *Ceanothus velutinus* (snowbrush ceanothus) and *Shepherdia* sp. (buffaloberry), which form symbiotic relationships with the actinobacterium *Frankia*, aiding atmospheric nitrogen fixation. These plants are useful for landscaping, but nurseries often lack *Frankia* in growing media, hindering nodulation and increasing fertilizer demands. In our preliminary study, we induced nodulation in greenhouse-grown C. velutinus

seedlings by inoculating them with soil from their native location. Microbial diversity analysis found *Frankia* in the rhizosphere and endosphere of native soil-treated plants, compared with untreated plants. Therefore, we proposed isolating *Frankia* from nodules of hybrid buffaloberry in pure culture. We tested two methods to extract *Frankia* vesicles from nodules and culture *Frankia*. First, we used sucrose gradients to separate vesicles from ground nodule extract and cultured them on *Frankia* basal and QMOD media unsuccessfully. In the second approach, we used filtration with 52 µM and 20 µM filters to collect vesicles from sonicated nodule extract. Ultimately, we successfully cultured the *Frankia* on modified BAP media with propionate, succinate, acetate, and pyruvate at pH 9.0. We are now testing nodulation in snowbrush ceanothus, silverleaf, and hybrid buffaloberry using this pure culture in greenhouse soil mixes and developing it as an inoculum for nursery production.

[1]SHANNON COURTNEY, [1]CATRIN EDGELEY, [2]TRAVIS PAVEGLIO **#3**
1. Utah State University, 2. University of Idaho

Local interpretations of state policy intervention in the wildland urban interface: a Utah case study

Wildfire-related risks to property and public safety are increasing nationwide as human development expands into the wildland-urban interface (WUI). State governments seek to address these risks at the landscape level by using regulatory and legislative tools. In 2025, the Utah State Legislature passed House Bill 48, which aims to address fire risk in Utah's WUI through a statewide fire risk map, homeowner fees and voluntary structure assessments in high-risk areas, requirements for insurance companies, and building code standards. We examine the barriers and opportunities for state wildfire policy implementation at the local level by exploring initial community perceptions of House Bill 48 in Dammeron Valley, Utah. We conducted 64 semi-structured interviews with 84 local fire professionals and community members to understand House Bill 48's reception and the outlook for its implementation in Dammeron Valley. We found that translation of state policy into local implementation was stymied by ambiguous policy structure and resident uncertainty toward risk map accuracy and insurance market impacts. Interviewees sought acknowledgment that community and ecological contexts varied state-wide and were supportive of policy design and implementation approaches that elevated local involvement. A better understanding of site-specific social factors that influence state policy implementation outcomes in Dammeron Valley can provide a blueprint for future policymakers seeking to utilize regulatory efforts to effectively reduce risk in landscapes accustomed to fire.

JACK RASMUSSEN, KENT HERSEY, DANIEL SUMMERS, ERICA STUBER **#4**
Utah State University

*Habitat restoration efforts increase patch retention times in migratory mule deer (*Odocoileus hemionus*)*

Mule deer (*Odocoileus hemionus*) populations have been declining across much of their range, often due to habitat alteration. In Utah, the expansion of pinyon-juniper woodlands

and invasion of non-native annual grasses have altered sagebrush ecosystems and reduced habitat quality for migratory mule deer. In response, land management agencies have implemented extensive habitat restoration projects aimed at restoring plant communities and improving seasonal ranges. We investigate how deer use eight common restoration treatment types across the state of Utah by quantifying patch retention time, a metric reflecting resource availability and habitat value. Using GPS data from n=593 mule deer, we developed seasonal moving-window occurrence distributions and measured the number of days occurrence distributions overlapped restoration treatments and randomly generated landscape polygons during summer and winter. Retention times were analyzed using Poisson regression. In winter sites treated to remove pinyon and juniper, both with (56.5 days, 95% CI [29.3, 108.0]) and without seeding (55.3 days, 95% CI [29.1, 105.8]), as well as sagebrush restoration sites (59.0 days, 95% CI [30.6, 114.8]), had increased retention times when compared to the landscape average (41.9 days, 95% CI [20.7, 84.1]), with effects decreasing 5+ years post-treatment. Retention times in summer were longer across all treatment types in the 2-4-year post-treatment age class (37.5 days, 95% CI [26.3, 53.1]) compared to the landscape average (28.6 days, 95% CI [25.7, 31.8]). These results demonstrate measurable effects of restoration for mule deer and provide managers with evidence to guide future treatment selection and retreatment timing.

JASON LANE **#5**
Utah State University

Integrating UAV-based remote sensing with landscape-scale vegetation monitoring to evaluate watershed restoration initiative treatment outcomes in Utah's sagebrush-steppe

Translating ecological monitoring science into actionable land management decisions requires methods that are both scientifically rigorous and operationally feasible at the landscape scale. The Utah Division of Wildlife Resources' Watershed Restoration Initiative (WRI) funds large-scale habitat treatments aimed at improving mule deer winter range across Utah's sagebrush-steppe, yet current ground-based monitoring methods (including single-point Range Trend transects and an emerging landscape-scale randomized sampling protocol) remain spatially constrained and difficult to extrapolate across full treatment polygons. This study proposes a practitioner-embedded framework for integrating unmanned aerial vehicle (UAV) imagery with concurrent field-based vegetation sampling to evaluate how well drone-derived estimates of plant cover, density, and aboveground biomass correspond to ground-collected data, with the longer-term goal of scaling monitoring outputs to satellite-based landscape assessments. The project plan includes UAV flights over established Range Trend monitoring sites for summer 2027 to evaluate imagery resolution, sensor performance, and vegetation classification feasibility across sagebrush-dominated communities. This phase will refine sensor and flight parameters while a suitable WRI treatment polygon is identified for the full paired pre/post monitoring design in a subsequent field season. Developed in direct partnership with DWR's Range Trend program, this work illustrates how graduate research within an agency context can advance both monitoring science and on-the-ground management capacity. Preliminary conceptual framework, adaptive methods development, and lessons from the 2026 field season will be presented.

ABRAHAM LUEDTKE **#6**
National Park Service

Preparing for future fire conditions in Rocky Mountain National Park

In the past several decades, Rocky Mountain National Park (RMNP) has experienced a significant increase in wildfire frequency and severity. These changes are best exemplified by the 2020 Colorado fire season, wherein the devastating Cameron Peak and East Troublesome Fires became the largest wildfires ever recorded in Colorado. Collectively, they burned 30,161 acres within RMNP, and the East Troublesome Fire became the first Colorado wildfire to spot across the Continental Divide. To aid in proactive fire management at RMNP, we synthesized data from existing climate tools and research to most accurately describe future projections of climate, fire, and vegetation conditions in RMNP by 2050. Our results indicate that by midcentury, average annual temperatures will increase by 2°F-6.9°F, average annual climate water deficit will increase by 1.2-5.2 inches, and annual extreme fire danger days will increase by 9.3-25.3 days in RMNP. Additionally, suitable prescribed burn days are projected to shift earlier into spring and later into fall. Vegetation distributions are also projected to change, with dramatically more lodgepole pine forest and less interior subalpine forest and aspen-mixed conifer stands. Based on these changes, we recommend increasing capacity for prescribed broadcast burning during early spring and late fall. We also recommend post-fire restoration to include the planting of fire-resistant *Populus tremuloides*, accompanied by long-term restoration monitoring. Finally, we recommend fire managers consider allowing naturally ignited fires in designated wilderness areas to burn under appropriate conditions, while maintaining suppression resources to respond if fire behavior threatens life and property.

MAC HAVENS **#7**
Utah State University

Impacts of variable hydrology on littoral vegetation at Utah Lake: implications for revegetation strategy

Revegetation of a lake's littoral zone—shallow, near-shore areas where sufficient light supports growth of wetland vegetation—is becoming an increasingly important tool for restoring lakewide ecosystem services in degraded systems. At Utah Lake, restoration of littoral vegetation is challenging due to many interacting factors that directly and indirectly affect the ability of native plant species to populate this area, including the presence of invasive species (e.g., common reed *Phragmites australis* and common carp *Cyprinus carpio*) and exceptionally variable hydrology. Recent lake restoration efforts have focused on the treatment and/or removal of invasive species; however, the impact of highly variable hydrology on littoral zone revegetation at Utah Lake is currently not well understood. To better understand the role of variable hydrology in the establishment of littoral vegetation over time at Utah Lake, we used generalized linear models (GLMs) to evaluate the impact of *P. australis* herbicide treatment, estimated *C. carpio* biomass, and annual/interannual hydrologic variability on littoral zone vegetation presence over a period of ten years. Our GLMs showed that hydrological factors consistently have a significant impact on littoral vegetation growth at Utah Lake across species, native status, and vegetation type (terrestrial, emergent, and submerged). This research highlights the ongoing need for

broader consideration of lakewide hydrology in management and restoration planning at Utah Lake, and that future restoration projects in the littoral zone may require more than just invasive species management for successful native revegetation.

ISIAKA AZEEZ **#8**
Utah State University

Organic amendments differ in biochemical composition and microbial community structure prior to soil application

Organic amendments are increasingly explored as a sustainable strategy for improving soil fertility, microbial activity, and overall long-term soil health in dryland wheat systems, where low organic matter content and limited nutrient availability often constrain crop productivity. The biochemical and microbial properties of the organic amendments used in an organic dryland wheat system were characterized. Organic amendments used included hardwood-dominated compost + manure, softwood-dominated compost + manure, mixed compost (slaughterhouse byproduct + manure + woodchips), wheat straw, and feather meal. Wheat straw had the highest C:N ratio (72.1) and lignin content (8.2%), while feather meal had the highest total N content (12.5%) and lowest C:N ratio (3.7). Mixed compost and feather meal had the highest phosphorus content (1.3%), compared to 0.5% in both hardwood and softwood composts and 0.07% in wheat straw. Microbial community analyses showed distinct microbial community structures among amendment types, with each representing a unique microbial inoculum. Feather meal had the highest bacterial alpha diversity, mixed compost had the highest bacterial richness, while wheat straw had the lowest bacterial richness and diversity. Relative abundance analyses showed dominance of Firmicutes, Proteobacteria, and Actinobacteriota among bacterial communities, while fungal communities were primarily dominated by Ascomycota. Laboratory incubations showed that amendment composition strongly influenced C and N cycling dynamics. Feather meal promoted rapid mineralization, while woody composts decomposed more slowly, indicating greater potential for long-term C accumulation. Overall, our results showed that amendment composition influenced bacterial and fungal communities, decomposition processes, and nutrient cycling in organic dryland agricultural systems.

JOSE BRANDAO, SARAH ERWIN, STEPHANIE VAUGHN, CLARE ENTWISTLE **#9**
Utah State University Extension

Harmful algal blooms: risks for food in Utah

Harmful algal blooms (HABs) are a problem because they can produce toxins that make water unsafe for people, animals, and the environment. In recent years, HABs have emerged as a growing concern in freshwater systems throughout Utah, including irrigation canals, reservoirs, and livestock ponds. HABs in freshwater are caused by cyanobacteria, also called blue-green algae. These microorganisms can release dangerous toxins that can harm swimmers, pets, and the food supply. Unlike foodborne pathogens, these toxins cannot be removed by boiling, cooking, or washing the food. Therefore, regular monitoring is essential to detect HABs early and reduce exposure risks. This fact sheet explains how HABs contaminate food and offers ways to reduce the risks.

[1]MAXIMO AGUILAR LAWLOR, [1]CATRIN EDGELEY, [2]TRAVIS PAVEGLIO **#10**
1. Utah State University, 2. University of Idaho

Adapting community recovery to cascading hazards: insights from implementing novel post-fire flood mitigation programs in Ruidoso, NM

The increasing prevalence of cascading hazards after wildfire has resulted in the introduction of new, exploratory recovery programs and the adaptation of existing efforts to better address outcomes. The timing, content, and structure of these new programs must intersect with more traditional wildfire recovery efforts in order to minimize the burden for affected residents and landowners navigating post-fire environments. Limited research examines the implementation of new and modified post-fire recovery programs or the challenges and opportunities associated with their use in affected communities. We explore this gap through 78 semi-structured interviews with 105 professionals and residents associated with the 2024 South Fork and Salt Fires and subsequent post-fire floods in Ruidoso, NM. Two new municipal and federal recovery programs were introduced, one with the intent to penalize uncleared lots and another to offer market value buy-back for properties in newly-formed floodplains. Interviewees indicated that timelines between the programs were incompatible, making it unclear which program was best suited to their specific property conditions. Additionally, communication issues regarding program eligibility and execution emerged, leading to resident hesitation to participate and distrust in government entities organizing these programs. Furthermore, perceived absence of community involvement in program implementation, paired with longer recovery time frames associated with government assistance, created tensions between residents and officials as flooding continued to occur. We present insights for improving recovery program sequencing after wildfires with cascading hazards, concluding with suggestions and research directions for improved disaster planning, response and recovery in post-fire environments.

MALOREE MCDONALD **#11**
Utah State University

Wrestling the Bear Lake monster: navigating the challenges of herbicide use for aquatic weeds

Aquatic invasive plants like *Myriophyllum spicatum* (Eurasian watermilfoil) and *Potamogeton crispus* (curly-leaf pondweed) can impede aquatic recreation and compete with native species in Bear Lake (UT-ID). Efforts to control such plants in Bear Lake have been met with unique challenges like reduced herbicide efficacy due to water exchange rates. In the greenhouse, we studied the effect of penoxulam, fluridone, triclopyr, and flurpyrauxifen benzyl on several plant species in response to reduced exposure times. Penoxulam generally reduced new growth in all treatments in comparison to the control. Triclopyr reduced overall plant biomass in *M. spicatum* and *M. sibiricum* in only the second trial. Fluridone provided the most dramatic reduction of overall plant biomass. We also studied the dissolution of fluridone and triclopyr (granular herbicides) in Bear Lake water. Both herbicides required several days to reach target concentration in static water. Past, current, and future research on these herbicide's effect on invasive aquatic plant species will continue to inform management in Bear Lake and other fresh water bodies throughout the west.

MARTHA ROSE DAWSON **#12**
Utah State University

The human dimension deficit: exploring the gap between agency rhetoric and social science capacity in state wildlife management

Human Dimensions of Wildlife (HDW) is an interdisciplinary field examining how human attitudes, behaviors, and social systems intersect with wildlife management. This fairly novel discipline has emerged as a means to help wildlife agencies navigate the social science needs that often accompany ecological issues. Research has shown that integrating social science and human dimensions expertise into wildlife management produces better outcomes for both wildlife and the public at large. In some states, wildlife agencies have built dedicated human-dimensions programs and social science staff capacity while others have very limited or no capacity in this area, often due to funding structures and staffing models that were established before human-related demands became a significant part of the agency's day-to-day work. As the population in the West expands, so does the need for human dimensions work. We conducted 30 key informant semi-structured interviews with social scientists and human dimensions specialists at 23 different state agencies, assessing the status of social science integration in their agencies and the barriers that perpetuate their current capacity. We expect our findings to demonstrate that effective human dimensions units rely on social science literacy, expanded funding models, and agency value placed on social science.

EMILY SANTOS, KEITH HAMBRECHT, KARIN KETTENRING **#13**
Utah State University

Passive and active restoration in Utah Lake shoreline wetlands

Seasonal water-level fluctuations can shape wetland restoration by influencing seed bank contributions to passive recovery. Along Utah Lake, whether seed banks alone can support recovery following invasive species management remains unclear. To evaluate passive recovery and active seeding, we established a multi-year study along the north shore of Utah Lake. We assessed passive recovery potential by germinating soil seed banks collected along a shoreline gradient spanning submerged to upland positions. Native seedling emergence varied nonlinearly, with greatest emergence at intermediate positions above the waterline, indicating that seed bank contributions may depend strongly on shoreline position. We also compared unseeded plots with plots seeded with low- and high-diversity native mixes and monitored vegetation over two years. Seeding increased native cover by up to 66% and reduced bare ground by up to 40%. Low-diversity seeding showed benefits only in the second year, whereas high-diversity seeding consistently supported greater total and native species richness, even despite substantially lower water levels and a shift toward higher non-native cover in the second year of monitoring. Ongoing experiments are testing seed bank resilience to flooding, drying, and fluctuating water levels, while a final year of field monitoring will assess persistence of seeding effects. Together, these preliminary results suggest that reliance on the seed bank alone may provide uneven restoration outcomes across the shoreline and could be further influenced by changing hydrologic conditions, while active seeding, particularly with high-diversity native seed mixes, promotes native vegetation establishment.

MATTHEW PEÑA #14
Utah State University

Causes and consequences of cheatgrass invasion

Sagebrush steppe ecosystems are threatened by encroachment from pinyon-juniper woodlands and cheatgrass (*Bromus tectorum*) invasion. Restoration of pinyon-juniper woodlands back to sagebrush steppe could mitigate these effects, but it involves disturbance, which could promote cheatgrass invasion. While overstory thinning creates high light environments with minimal competition for desired restored species, those conditions may also benefit cheatgrass. Similarly, successful seeding of perennial herbaceous species may limit cheatgrass by increasing resource competition, but it also creates soil disturbance. My study explores how different thinning intensities and restoration seeding strategies affect cheatgrass population growth. I am taking advantage of an existing U.S. Forest Service project in the Pine Valley Mountains, southwest Utah, that crosses large-scale overstory thinning treatments with aerial and hand seeding of desirable perennial species. If high intensities of thinning and hand seeding cause significant disturbance, then those treatments will increase cheatgrass establishment relative to lower thinning intensities and/or aerial seeding. However, thinning and seeding treatments that maximize competition with cheatgrass should decrease cheatgrass fecundity and survival rates. To evaluate treatment effects on cheatgrass establishment, I collected data on volunteer cheatgrass densities. To evaluate treatment effects on cheatgrass survival and fecundity, I planted and monitored locally sourced cheatgrass seeds on toothpicks. Population models will be developed to investigate net treatment effects on cheatgrass population growth rates over time. Early results show that mastication promotes cheatgrass establishment the most. Seeding treatments currently show no significant differences. The results from this experiment will provide guidance about better methods of sagebrush steppe restoration.

GABRIEL OYEBODE, JENNIFER REEVE, ASTRID JACOBSON, EARL CREECH #15
Utah State University

Indicator-specific soil health responses to compost legacy under first-year Kernza and annual wheat in an organic dryland cropping system

Compost amendments can improve soil function in dryland agroecosystems, but it remains unclear whether responses persist similarly across soil health indicators, application rates, and cropping systems. This study evaluated soil responses to compost rate and years since application under first-year Kernza and annual wheat in an organic dryland cropping system. The study was conducted within a long-term field experiment in Snowville, Utah, using a randomized complete block split-plot design with four replicates. Cropping system was the whole-plot factor, and compost rate (0, 12.5, 25, and 50 Mg/ha) was the subplot factor. Amended treatments followed a staggered-entry design, representing 3, 7, and 11 years since application at 2026 sampling, while the unamended control was maintained since establishment. Readily mineralizable carbon (RMC), basal respiration (BR), microbial biomass (MB), aggregate stability (AGG), and bulk density (BD) were evaluated using

mixed-effects models. Responses varied among soil health indicators. RMC showed a cropping system × years-since-application interaction (P = 0.035). BR was affected by compost rate (P = 0.0063), with greater respiration at 25 Mg/ha than 50 Mg/ha (Tukey-adjusted P = 0.0055). MB showed no significant treatment effects. AGG was affected by cropping system (P = 0.038) and showed compost rate × years-since-application interactions (P = 0.041). At 3 years, AGG was greater at 50 Mg/ha than the lower rates. BD differed between cropping systems (P = 0.017). Overall, compost legacy effects were soil-function specific, with aggregation showing the strongest dependence on years since application, while biological indicators showed weaker, indicator-specific responses.

JOSHUA DAY, KARI VEBLEN **#16**
Utah State University

*Effects of soil, ungulate exclusion, and elevation on big sagebrush (*Artemisia tridentata*) density and herbaceous cover in the Colorado Plateau*

Big sagebrush (*Artemisia tridentata*) populations are at risk of decline in the Colorado Plateau due to climate change. Increased temperatures and altered precipitation regimes may create unfavorable conditions for sagebrush, which are already on the southern end of their historic range, and threaten to cause shifts in the herbaceous community. As resources become more limited, competition (both inter- and intraspecific) will likely increase, and the effects of herbivory on sagebrush may also be exacerbated. Our study aims to understand how potential interactions between drought and biotic factors may affect sagebrush density and herbaceous cover in the Colorado Plateau. We sampled 33 pairs of ~100 m^2 plots, distributed across three sites in southeast Utah. In 2016, one of each pair was fenced to exclude large ungulates. We sampled shrub densities by size class in all plots in 2016 and 2024, and measured herbaceous cover in the unfenced plots in both years. We found that sagebrush density decreased across all sites between 2016 and 2024, which encompassed a drought period. In 2016, elevation was not a significant predictor of sagebrush density; however, by 2024, elevation was positively correlated with sagebrush density in both small and large sagebrush. Sagebrush density decreased more over time in lower-elevation plots than in higher-elevation plots. Cool-season perennial grass cover was recorded in fewer plots in 2024 compared with 2016. Exotic invasive cover was found more often in lower-elevation plots compared with higher-elevation plots.

EMERALD DARBY, CATRIN EDGELEY **#17**
Utah State University

Wildfire social science in Utah: a review of existing research and future directions

Wildfire has become an increasingly prevalent concern among residents, managers, and policymakers in Utah over the past decade. Progressing wildfire adaptation relies on rigorous social science to advance and empower community-driven progress that acknowledges diverse local contexts. Although the broader social science literature emphasizes the importance of understanding place-based social dynamics, social science

that seeks to advance wildfire adaptation in Utah remains underdeveloped in comparison to other western U.S. states. We conducted a review of the wildfire social science literature to systematically document what is known about human adaptation to wildfire adaptation in Utah. This poster will review the wildfire social science landscape of Utah, showcasing key literature, common themes, and emerging needs to support a fire-adapted future for the state. Findings will describe common methodologies, scales, and locations of research to identify underrepresented social conditions and geographic regions. Our intent is to determine future directions and areas for investment in wildfire social science that can contribute to adaptation progress across the states' diverse conditions.

EMMELIN HIMES **#18**
Utah State University

Green roof suitability in Salt Lake County

As urban density increases in Salt Lake County, surface area available for green space becomes more limited. A high concentration of paved areas increases the risk of flash floods, emphasizing the need for on-site stormwater management. One potential solution to assist in stormwater management is converting the often-overlooked surface area on rooftops into green spaces. As the most densely populated county in Utah, Salt Lake County would benefit from increased green roof implementation. Therefore, this study will determine the most suitable locations for green roofs in Salt Lake County. For greatest impact and spatial optimization, green roofs should be installed on tall commercial buildings located in the highest development density, farthest away from dense tree canopy. Commercial buildings will be the most likely to have larger roof area. Buildings within the high-density areas have the greatest need for on-site stormwater management, as they will be most likely to be surrounded by the most paved surfaces. These areas are at high risk during flash flooding because of the lack of absorbing surfaces. A density map created in GIS from the NLCD pulls the high, medium, and low intensity development zones, revealing the areas of the most impervious surfacing. Datasets of building height, commercial buildings, tree canopy proximity, and distance from areas without trees combine to provide the highest-priority buildings for green roofs. This study presents priority locations for green roof implementation, as well as an opportunity for corresponding studies of the best planting system for Salt Lake County's climate.

SRI LIKHITHA GUDLA, ISIAKA ADEBAYO AZEEZ, JENNIFER R REEVE, JEANETTE M NORTON, ASTRID R JACOBSON **#19**
Utah State University

Effects of various composts and nitrogen additions on soil carbon, nitrogen, and microbial activity in a dryland organic wheat system

Dryland organic wheat production in the western United States is limited by low precipitation and low soil nutrient availability. Organic amendments may influence soil carbon, nitrogen, and biological activity, but responses can differ among amendment types.

This study evaluated the effects of several organic amendments and supplemental nitrogen on soil total organic carbon (TOC), total nitrogen (TN), and dehydrogenase activity in a dryland organic winter wheat system near Snowville, Utah. A field experiment established in 2021 included softwood compost (SW), hardwood compost (HW), Miller's paunch manure compost (MC), wheat straw (WS), and an unamended control (NC). Compost treatments were applied at 50 Mg ha-1, wheat straw at 5 Mg ha-1, and feather meal (FM) at 360 kg ha-1 to half of each plot. Soil samples collected from 2022 to 2025 were analyzed for TOC, TN, and dehydrogenase activity. Amendment treatment affected TOC ($P < 0.0001$), TN ($P = 0.0389$), and dehydrogenase activity ($P = 0.0002$). Softwood compost had the highest mean TOC (21.94 g kg-1) and TN (1.40 g kg-1), while the unamended control had 13.60 and 1.00 g kg-1, respectively. Paunch manure compost had the highest mean dehydrogenase activity. Sampling year affected all three variables ($P < 0.0001$), and a treatment × year interaction was observed for dehydrogenase activity ($P < 0.0001$). Feather-meal did not significantly affect TOC, TN, or dehydrogenase activity. These results indicate that amendment type and year influenced soil C, N, and microbial activity under dryland organic wheat production.



NOTES

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