"Sustainable Agriculture: Food for Thought"

24th Annual Boulder County Ecosymposium
Saturday, March 12, 2016
9:00 AM – 3:00 PM
Boulder County Parks and Open Space offices, Prairie Rooms

The Symposium is free and open to the public. Registration begins at 8:30 am. Donations will be accepted for the Boulder County Nature Association's Research Grants program. Don't forget to bring your reusable plate, cup, and utensils for the complimentary lunch. The Parks and Open Space offices are located at 5201 St. Vrain Rd in Longmont.

Many thanks to the sponsors who make this symposium possible: Boulder County Nature Association, Boulder County Parks and Open Space, City of Boulder Open Space and Mountain Parks, Boulder County Audubon Society, The Boulder Rights of Nature and the Colorado Native Plant Society.

Presentation abstracts and speaker biographies:

Welcome and Announcements

Michael Delaney, Boulder County Nature Association

A Brief History of Agriculture in Boulder County: How Snow, Gravity and Ingenuity Proved the Naysayers Wrong . . . But for How Long?

David Bell, City of Longmont

Boulder County has a rich agricultural heritage. From its beginnings in the 1860s providing food supplies for the mining camps to the large wheat farms and beet fields of the early twentieth century and the much more recent rise of smaller farm to table operations, Boulder County agriculture is noted for its diverse history. This brief historical overview will demonstrate the challenges and successes of the past as well as provide food for thought regarding future opportunities for Boulder County agricultural operations.

As of March 1, David began working as the Natural Resources Manager for the City of Longmont, where he is responsible for the City's open space program, agricultural leases, forestry program and the park rangers. Prior to that, David spent 19 years with the Boulder County Parks and Open Space Department. During the last five years with the County, David served as the agricultural resources manager, where he was responsible for 25,000 acres of publicly owned land that is leased to local farmers and ranchers. In this position he was also responsible for overseeing the county's extensive water portfolio.

During his time as the agricultural resources manager, David helped initiate and implement several significant agricultural projects including: planting of pollinator habitat, a five-year research project with CU to monitor pollinators, volunteer soil monitoring, laboratory testing for residual pesticides in agricultural soils, testing of corn pollen for pesticides, and agricultural water quality testing. In

addition to those responsibilities, David played a significant role in the immediate response and flood recovery along the St. Vrain Creek. He worked closely with FEMA, Boulder County and Longmont staff to help assure that irrigation and domestic water delivery systems were put in place before the 2014 irrigation season.

David's educational background includes a B.S. in Wildlife Biology from Colorado State University, a Master of Resource Law Studies from the University of Denver and his Peace Officer Standards and Training from Red Rocks Community College.

When he is not at work, David spends time with his wife and two daughters figuring out new and creative ways to lose money raising chickens, goats and pumpkins on their five acres.

Striving to Maintain and Enhance Biodiversity on Boulder Open Space's Agricultural Landscapes

Heather Swanson, Boulder Open Space and Mountain Parks

The City of Boulder Open Space and Mountain Parks Department owns and manages over 46,000 acres of land surrounding Boulder. These lands contain exceptional natural ecosystems, communities and species as well as extraordinary examples of historic and sustainable local agricultural production. These natural and agricultural resources don't only share the same space on OMSP, but are tied to each other's persistence and preservation in many cases. From irrigated hayfields and ditches that support rare and Federally listed species, to grasslands that require appropriate grazing to maintain native plant communities, OSMP strives to integrate agricultural management and natural resource protection to best advantage for both resources.

Many lessons have been learned and practices improved through successes and failures over a variety of habitats and over time. The result is ongoing learning with dynamic and adaptive systems of management that incorporate legacies of historic usage with increasing understanding of the interactions and interdependence of the resources to create a system of highly functional natural systems that maintain biodiversity, safeguard ecosystem services, and provide preservation of the area's agricultural heritage.

Heather Swanson is a senior wildlife ecologist with City of Boulder Open Space and Mountain Parks Department. She received her PhD in ecology from CU Boulder focusing on ponderosa pine bird communities in Boulder County. She has spent her career working with OSMP focusing on the interface of wildlife and natural resource protection with agricultural production and recreational opportunities. She has had an increased emphasis on management and protection related to the Federally threatened Preble's meadow jumping mouse following the flood of 2013 and the associated impacts to riparian areas on OSMP.

Boulder County Bees: an Overview of Diversity and Life Histories

Virginia Scott, University of Colorado

Boulder County supports a great number of very diverse bees. To date 562 species of bees have been documented from Boulder County alone. This equates to approximately 60% of the near 950 species known to occur in Colorado and nearly 15% of all North American bee species.
Boulder County's bee diversity can be attributed to both the wide range of habitats over the elevational gradient in our county and to the legacy of bee research that has been happening here over the past century. The bee fauna is genuinely rich, but well studied enough for that to be fully recognized. Because of the long history of bee research in Boulder County, we have excellent background information for current and future research. Boulder County bee species come in a variety of sizes, shapes, and colors. They also vary in their biology, with some species being social, many being solitary nesters, and some species being parasitic on other bees. While many bee species are generalist foragers that collect pollen from a wide variety of plants, some bee species specialize by collecting pollen from only a few related plant species. Although the European honey bee lives in managed hives, most bees nest in the ground or in cavities in dead wood. An introduction to bee diversity and life history traits is presented.

Virginia Scott has been the Collections Manager of the Entomology Section of the University of Colorado Museum of Natural History since 1994. She started studying bees as an undergraduate student in the Department of Entomology at Michigan State University in 1982. In 1989 she received her Master's Degree in Entomology, also from Michigan State University. Her thesis was on the nesting biology of *Hylaeus ellipticus* (Hymenoptera: Colletidae), a native species of yellow-faced bee. After receiving her Master's and before coming to Colorado, she worked as a field technician on an environmental impact study of the U.S. Navy's ELF antenna on native, solitary, wood-nesting bees. She currently serves as the scientific consultant on The Bees' Needs, a citizen science project through the University of Colorado Museum of Natural History that monitors local solitary wood-nesting bees and wasps.

The Habitat Value of Ditches

Erick Carlson, Colorado State University

In arid and semi-arid regions where crops are irrigated, a large proportion of water is moved from natural streams into constructed ditches and canals to locations where it is used. In many arid regions surface water occurs in only a few perennial and some intermittent streams, and most of the water flows in man-made ditches and canals. Many man-made channels support aquatic and riparian ecosystems and but relatively little is known of their contribution to regional biodiversity. The riparian plant and aquatic insect communities of irrigation ditches were compared to natural streams and rivers in Larimer and Weld Counties. Each group had a wide diversity of physical and biological components, with surprising similarities and differences related to canopy type, channel width and location for plants and substrate, distance from diversion, and water temperature for insects. Biodiversity does not tell the whole story as invasive species and insects which tolerate lower water quality indicate changes in riparian and aquatic condition.

Erick Carlson is a 4th year PhD student at CSU researching irrigation canals and their ecological significance along with other irrigation system ecosystem services. He earned his Master's in Ecology at CSU in 2009 and has worked for the Colorado Natural Heritage Program before returning to CSU for his current work. He is currently looking to expand his research to include irrigation ditches on City of Boulder Open Space land.

Water Challenges: The Pressures of Providing a Reliable Water Supply for Differing Agricultural Markets

Sean Cronin, St. Vrain and Left Hand Water Conservation District

Many are familiar with the agricultural industries evolution and adaptation to changing free market conditions. Some believe these market places can be further influenced through local policy. A reliable water supply is crucial to a sustainable irrigated agriculture industry. At times local policies conflict with water management practices challenging the ability for local producers to meet policy expectations. Sean will explore this conflict further, and discuss additional pressures (climate change, storage, urbanization) to providing a reliable water supply.

Sean is the Executive Director for the St. Vrain and Left Hand Water Conservancy District. He has 20 plus years experience in water resource planning and policy. Sean earned his Bachelor's Degree in Environmental Science from the University of North Carolina at Charlotte, and spent two years as a Natural Resources Agent with the North Carolina Cooperative Extension Service before moving to Colorado. Prior to joining the District, Sean spent 13 years with the City of Greeley, including the last six as their Water Resources Manager.

Sean serves on the Interbasin Compact Committee (IBCC), is the past chair of the South Platte Basin Roundtable, and previously served on the Board of Directors for the Colorado Section of the American Water Resources Association. Sean is a recipient of the Colorado Foundation for Water Education – Emerging Leader Award, and under Sean's direction his District received a Collaboration Award from the Special District Association.
Sean lives in his adopted home of Colorado with his wife and two children. When Sean isn't spending time with family and other activities, you can find him on a river trying to master the art of making a trout rise.

Agricultural Greenhouse Gas Production and the Web of Population in the U.S. Great Plains

Myron Gutmann, University of Colorado, Boulder

The Great Plains region of the United States is an agricultural production center for the global market and an important source of greenhouse gas emissions. This research uses historical agricultural census data and ecosystem models to estimate the magnitude of annual fluxes from all agricultural sources—cropping, livestock raising, irrigation, fertilizer production, and tractor use—from 1870 to 2000, and then asks new questions about the role of population. The results show that carbon released during the plowout of native grasslands was the largest source of greenhouse gas emissions before 1930, while livestock production, direct energy use, and soil nitrous oxide emissions are currently the largest sources. Climatic factors mediate these emissions, with cool and wet weather promoting carbon sequestration and hot and dry weather increasing greenhouse gas release. Because

most production in the Great Plains is sent to other markets, local population is not well correlated with agricultural GHG emissions. A new analysis of the population-driven conversion of land from agriculture to lawns partly confirms that conclusion, but also suggests that urban and suburban development has led to other large increases in GHG emissions from vehicles and other sources.

Myron P. Gutmann is Professor of History and Director of the Institute of Behavioral Science at the University of Colorado, Boulder. From 2009 to 2013 he served as Assistant Director of the U.S. National Science Foundation, leading NSF's Social, Behavioral, and Economic Sciences Directorate. Gutmann has broad interests in interdisciplinary research, especially health, population, economy, energy, and the environment. He is widely known for his research on the demographic history of Early Modern and Modern Europe and for his large-scale research program on the relationship between population and environment in the Great Plains of the United States. Before his service at NSF, Gutmann was Professor of History and Information and Research Professor in the Institute for Social Research at the University of Michigan, where he served from 2001 to 2009 as Director of the Inter-university Consortium for Political and Social Research (ICPSR), the world's largest repository of publicly available data in the social and behavioral sciences. As director of ICPSR, he was a leader in the archiving and dissemination of electronic research materials related to society, population, and health, with a special interest in the protection of respondent confidentiality. At NSF Gutmann led efforts in scientific integration, ensuring that the human aspects of scientific issues are always among the questions and investments in NSF-supported science. He also spearheaded NSF's initiative to improve public access to publications and data. Gutmann has written or edited five books and more than eighty articles and chapters, and has served on numerous advisory committees and editorial boards. Among numerous awards and recognitions, he was named a Digital Preservation Pioneer by the Library of Congress in 2007, and elected a Fellow of the American Association for the Advancement of Science in 2011.

Conservation on Private Lands: Mountain Plover as a Model for Land Stewardship

Angela M. Dwyer, Bird Conservancy of the Rockies

The Bird Conservancy of the Rockies has been working to conserve birds and their habitats for nearly 30 years through an integrative model of Science, Stewardship and Education. Land stewardship plays a vital role in conservation programs as more than 70% of the U.S. is privately owned. One successful private land program involves the Mountain Plover, a Nebraska state-threatened species. They construct their nests on crop fields and thus are at risk of potential accidental loss due to farming operations. For 15 years we have built a model of land stewardship by using Mountain Plover as a connection to the farming community of Kimball, Nebraska. Our Landowner Outreach Biologist is a third generation farmer and rancher and has recruited 80 other farmers to conserve nearly 900 Mountain Plover nests by locating and marking them with brightly colored stakes such that farmers to drive around nests with no loss to farming productivity. This model has led to numerous research and outreach opportunities for landowners, many of whom also continue to participate in other conservation efforts.

Angela Dwyer is a Grassland Wildlife Coordinator for Bird Conservancy of the Rockies (formerly Rocky Mountain Bird Observatory). She has a Master's in Wildlife Management from Stephen F. Austin State University and spent most of her career working with waterbirds and shorebirds mostly as a Conservation Biologist with Audubon North Carolina. Just after moving to Colorado in 2010 she worked for Audubon Rockies and Colorado State University, and now has been with the Bird

Conservancy for just over 3 years. She currently coordinates Mountain Plover and other grassland bird conservation projects on private and public lands.

Closing Remarks

Michael Delaney, Boulder County Nature Association