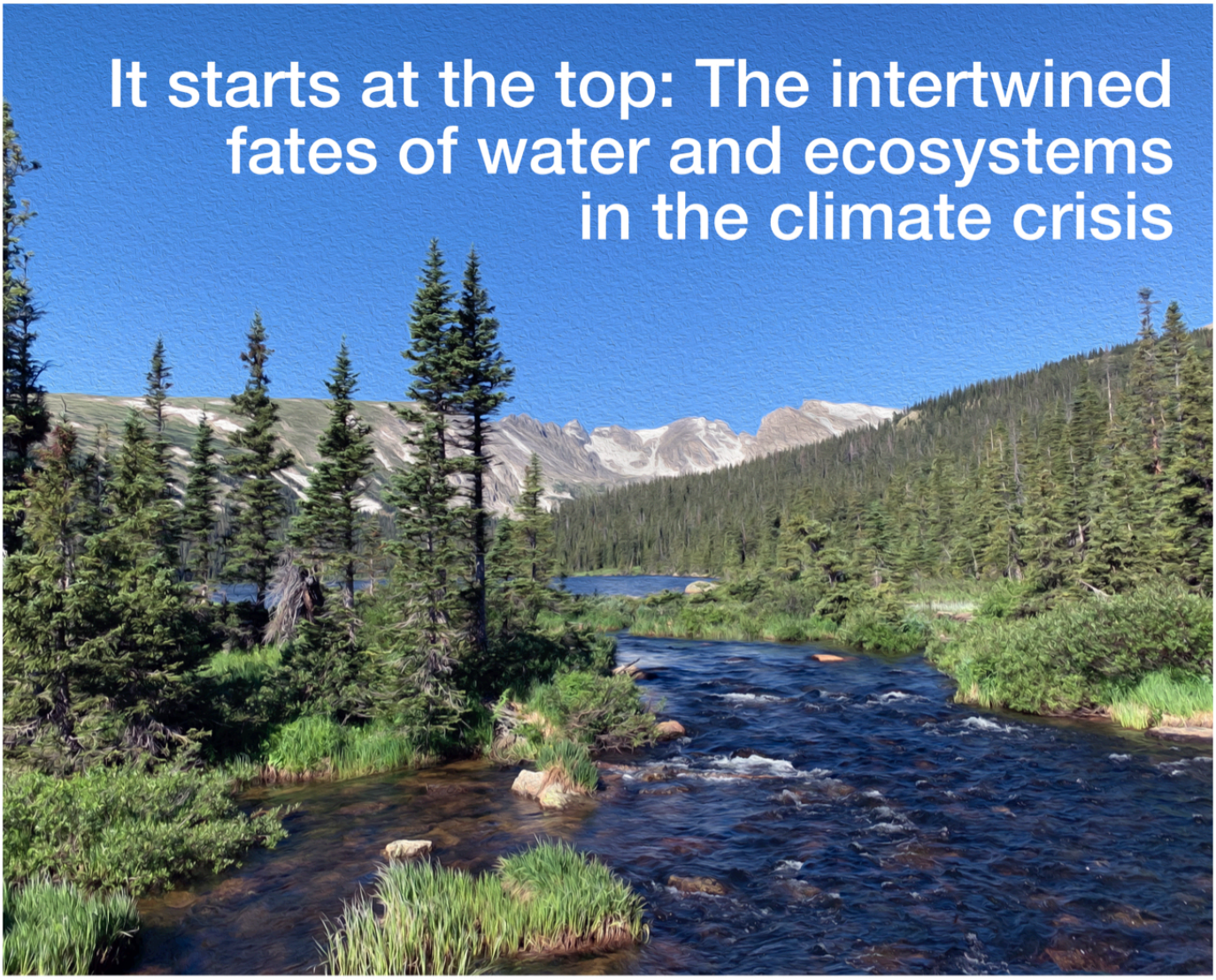

Boulder County Nature Association 2020 Annual Ecosymposium

Saturday, March 14th 9:00 - 3:00 All are welcome

University of Colorado
Sustainability, Energy and Environment Complex (SEEC)
3001 Discovery Drive
Boulder CO 80303

Pre-registration requested at bcna.org

Complimentary lunch provided

More information: bcna.org

Many thanks to the sponsors who make this ecosymposium possible: INSTAAR, CU Albert A. Bartlett Science Communication Center, CU Center for Sustainable Landscapes and Community, Boulder County Parks and Open Space, Boulder Open Space and Mountain Parks, Boulder County Audubon Society, Colorado Native Plant Society

ABSTRACT

Precipitation in Colorado's high country has a big effect on the lives of Front Range residents, whether plant, animal, or human. Snowpack feeds local creeks, lakes, and ditches and moistens the soil for plant communities. Climate change is altering the amount and timing of snow and rain, the runoff of melting snow, as well as the chemistry of the water sent downstream. Greater variability in precipitation will also increase the frequency of drought, flood, and wildfire. Other environmental changes of the Anthropocene Era are also affecting water chemistry and in turn the biological communities in our lakes and streams. Speakers will address questions such as, What changes to our water supply are observed now and predicted for the future? How do scientists measure and model these changes? And what are the consequences for our local ecosystems, both terrestrial and aquatic?

8:30-9:00 COFFEE, NAME TAGS AND REGISTRATION

9:00-9:15 Intro and overview of day – Sandra Laursen & Claudia VanWie

9:15-10:00 Lineke Woelders: "Changing climate, snowpack, and streamflow in the Front Range"

Both the ecosystems and human residents of the Front Range have long been accustomed to large swings from year to year in precipitation, snowpack, and streamflow, including multi-year wet periods and droughts. But amidst this continuing variability, there are increasingly telltale signs that anthropogenic warming is altering the relationships between precipitation, snowpack, and streamflow, nudging the climate and hydrology of the Front Range towards more drought-like conditions. Global Climate Models (GCMs) and other tools allow us to predict that these changes will continue over the next several decades. The compounding effects of unprecedented climate conditions and events may lead to unexpected outcomes for the hydrology and ecosystems of the Front Range. We will review what we know about recent and future changes, and how we know it.

Lineke Woelders *joined the Western Water Assessment, Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado Boulder team in September 2019. Lineke has a MS in Hydrology and Water Quality from Wageningen University (the Netherlands) and a PhD in paleoclimatology and paleoecology from the KU Leuven (Belgium). Lineke worked as a researcher/ consultant at Deltares (the Netherlands) for two years, where she worked on projects involving the effect of future climate change on the hydrology and ecology of large river basins in Europe. Lineke is a co-author on the Colorado River Basin Climate and Hydrology State of the Science Report and is engaged in projects involving creating usable science and engaging with water managers.*

10:00-10:20 COFFEE BREAK

CHANGES IN THE ALPINE

10:20-11:00 John Crawford: "From acid rain to acid drainage: Surprises in the water quality of alpine streams"

The deposition of strong acids (commonly known as acid rain), including nitric and sulfuric acid, has decreased substantially over the past 30 years in the high-alpine of Colorado. The pH of precipitation has followed these declines and has increased to near pre-industrial values. These trends show the impacts of environmental air regulations and are the beginning of an environmental success story. Yet, despite declining sulfur deposition, surprising increases in sulfur concentrations in mountain streams are being observed in Colorado and in alpine systems globally. The increases in sulfur are likely driven by changes in mountain climate and the process is similar to the widespread problem of acid mine drainage which leads to acidification of streams. However, we do not observe acidification, and the acidity of surface waters is actually improving. Overall, this high alpine watershed is trending towards pre-industrial conditions with respect to water quality, but many of the chemical, biological, and ecological effects remain to be described.

John Crawford*, Institute of Arctic and Alpine Research (INSTAAR), University of Colorado Boulder, studies water quality and ecological processes in freshwater systems across the US. He has studied methane and carbon dioxide emissions, nutrient pollution, and spatial structure of aquatic ecosystems of natural and human-impacted systems. He is currently exploring how chemistry is changing in high-elevation systems as a result of changing air quality.*

11:00-11:40 Sarah A. Spaulding: "Ecological change in high elevation lakes of the Rocky Mountains"

Although high-elevation lakes are typically remote, they are being increasingly altered by human impacts. Ironically, high-elevation lakes are exposed to higher rates of deposition of nitrogen, and increasingly, dust, as compared to lower elevation lakes. High-elevation lakes are typically low in nutrients (oligotrophic) and generally occupy poorly buffered watersheds characterized by sparsely or unvegetated talus, poorly developed soils, and exposed bedrock. The sediments of lakes can be examined to understand the history of ecological change, as lake sediments record the direct evidence of atmospheric deposition of reactive nitrogen and dust, along with markers of temperature. As surface water chemistry is altered, there is a distinctive suite of shifts in algae, including diatom species composition and the increased growth of green algae. It appears that the changes in these photosynthetic organisms, at the base of the food web, are without historic precedent.

***Sarah A. Spaulding**, US Geological Survey and INSTAAR, University of Colorado Boulder, is interested in diatoms, which are a type of algae. Diatoms are used as tools for understanding the history of lakes and oceans, as well as for assessing biotic condition of freshwaters. Her work is informed by diatom biogeography; where do species live and why do they live there? She strives to understand diatom biology and the ecological roles of diatoms on the planet. She is passionate about sharing all things diatomaceous with scientists, students and the public. She currently serves as the Chair of the Editorial Review Board for collaborative, electronic, peer-reviewed flora, Diatoms of North America (diatoms.org).*

11:40-12:20 Noah Molotch: "Slower snowmelt in a warmer world: Exploring the hydrological and ecological implications of earlier snowmelt on Niwot Ridge, Colorado"

Declining mountain snowpack and earlier snowmelt within sub-alpine forests have profound implications for water resources and ecosystem services. For approximately two decades studies have been performed on Niwot Ridge, Colorado, to understand how snowpacks are responding to climate warming and how these snowpack changes affect forests. In this regard, a major focus has been on determining how climate variability influences the timing and rate of snowmelt and associated impacts on forest uptake of CO_2. Using a combination of snowpack measurements and models, and observations of carbon exchange, we illustrate that: 1) regional warming and earlier snowmelt is associated with lower snowmelt rates; 2) lower snowmelt rates are associated with less streamflow; and 3) earlier snowmelt is associated with reduced forest productivity. The broader implications of this work extend to societal vulnerabilities to climate change, water availability, ecosystem health, and vulnerability to disturbance such as fire and insect-related forest mortality.

***Noah Molotch** is an Associate Professor in Geography, Fellow of INSTAAR, and Director of the Center for Water, Earth Science, and Technology (CWEST). Noah is also a part-time research scientist at the NASA Jet Propulsion Laboratory, Pasadena, CA where he works to establish methods for measuring snow from earth-observing satellites. Noah has his BA in Environmental Studies at CU, an MS in Environmental Science and Management from UC Santa Barbara, and a PhD in Hydrology and Water Resources from the University of Arizona. He has worked on Niwot Ridge for the past 15 years and will be speaking about his experiences studying climate change, snow, and forest productivity.*

12:20-1:15 LUNCH (YES, THERE IS SUCH A THING AS FREE LUNCH!)

Donations are always welcome

1:20-2:00 JEREMY SUELTENFUSS: "COLORADO'S WETLANDS IN THE FACE OF WATER SCARCITY"

There is plenty of evidence that water development has stressed, and in many cases depleted, our natural wetland and aquatic resources along the Front Range and east to our border. What is also evident, though, is the incidental creation of wetlands across our landscape as a function of water redistribution. Research in the last five years has indicated the significant amount of wetland acreage created as a result of seepage from"hydrologic reversal" across the landscape, sending significant amounts of water to
historically arid land far from its original water course. Although this has negative impacts on the river the water was diverted from, the incidental creation of new wetlands from this water distribution should be acknowledged as we work together to plan for a future with increasing water scarcity. As our urban areas continue to grow and require more water, incidentally created wetlands stand to join the list of our lost aquatic resources if water transfers to the city are not prioritized effectively.

Jeremy Sueltenfuss *is on the faculty at the Warner College of Natural Sciences, Colorado State University and focuses on watershed, wetland and floodplain conservation and restoration. He has worked on restoration projects with the National Park Service, wetland mitigation policy with the Army Corps of Engineers, and is generally interested in the ecology of our landscape from a hydrologic perspective. His research scales from the movement of water within an individual plant to the biogeography of mountain wetlands throughout North and South America.*

2:00-2:50 PANEL DISCUSSION: "RESPONDING TO THE CLIMATE CRISIS: STRATEGIES AT THE INTERSECTION OF WATER AND ECOSYSTEMS"

Panelists will explore legal, scientific and community responses that are addressing the problems raised during the symposium.

- Jeremy Sueltenfuss, CSU - wetlands restoration
- A representative from Colorado Water Trust - water rights for the environment
- Heather Yocum, North Central Climate Adaptation Science Center - adaptation science & community work

Heather M. Yocum is a research scientist at CIRES, CU Boulder. She is the lead for stakeholder engagement and communication at the North Central Climate Adaptation Science Center. An environmental anthropologist and political ecologist, Heather studies how culture and social systems impact the way that humans understand and interact with the environment. Her current research is on the social dynamics that influence the supply of and demand for weather and climate information, including production, dissemination, understanding, and use in the Western US. Her research interests include the changing patterns of land use and natural resource management in the face of climate change; the production, dissemination, and use of climate and weather information; environmental markets and payments for ecosystem services; and the emerging carbon and climate knowledge economies.

Colorado Water Trust (CWT) is a nonprofit conservation organization whose mission is to restore flows to Colorado's rivers in need. CWT engages in and supports voluntary, market-based efforts to restore and protect streamflows using permanent acquisitions of water, leases of water, and physical solutions. CWT also offers education and technical assistance to Colorado land trusts that encounter water issues in connection with their land conservation activities. From 2001 through 2019, the Water Trust has helped to restore approximately 11.5 billion gallons (35,472 acre-feet) of water to 444 miles of streams and rivers in Colorado. Executive Director Andy Schultheiss or Staff Attorney Kate Ryan will join the discussion.

2:50-3:00 THANKS, EVALUATION & CLOSING