City of Boulder Open Space and Mountain Parks Priority Research Project Topics

Last updated 11/02/2022

Preference will be given to original proposals that address topics identified below. However, all proposals will be considered based on their merits.

Each question or topic is followed by the corresponding strategy from the OSMP Master Plan; learn more [here](https://www-static.bouldercolorado.gov/docs/Boulder_OSMP_Master_Plan_2019_Online-1-202002200921.pdf) (https://www-static.bouldercolorado.gov/docs/Boulder\_OSMP\_Master\_Plan\_2019\_Online-1-202002200921.pdf).

# **Top Topics for 2023 (in no particular order)**

* Given the potential for changing environmental conditions, what is the risk profile for urban-wildland interface in Boulder in the next 5 to 25 years? How would you model fuel types and growth to understand the wildland fire risk and the efficacy of potential mitigations to reduce that risk? (EHR.3)
* What are management opportunities for reducing wildfire risk in grasslands and ditches (e.g., mowing, grazing, prescribed fire, wind breaks) and their ecological consequences (such as species invasion or habitat loss/fragmentation)? (EHR.3)
* Soundscape research: how can we monitor and manage soundscapes across OSMP? Sub-topics of interest may include how to use passive acoustic recording devices to establish baseline conditions, variation in acoustic indices for monitoring biodiversity, documenting airplane noise and its impact to wildlife, or evaluating how soundscapes effect visitor experience on OSMP (EHR.8)
* How can we best use drones to enhance research and monitoring specifically relevant to OSMP (e.g., invasive species, soil disturbance, phenology)? What are the benefits, constraints, and impacts of using drones and sensor-collected data for specific monitoring/research objectives compared to traditional ground-based techniques? (EHR.7)
* How does measured bicycle speed vary across different trail design elements (e.g., surface type, incline, width, level of difficulty, line-of-sight) on OSMP trails? (RRSE.6)

# **Additional research topics of interest, by category**

## **Wildlife ecology**

* Habitat use and ecology of Preble’s meadow jumping mouse on OSMP, especially as related to influences of land management (grazing, restoration, trail development, etc.). (EHR.1, EHR.2)
* Hibernation biology of Preble’s meadow jumping mouse (EHR.2)
* Investigate nesting success, productivity, and breeding chronology of grassland birds nesting in irrigated hayfields, including impacts of agricultural management on nesting success. (EHR.1, ATT.7)
* Examine impact of grassland bird closures on reproductive success of grassland birds and/or relationships between grazing and nesting success. (EHR.1)
* Investigate new non-insecticidal control mechanisms for sylvatic plague in prairie dogs. (ATT.3)
* Investigate success and feasibility of novel approaches to prairie dog exclusion. (ATT.3)
* Research related to new or emerging non-lethal tools for prairie dog population management (e.g., contraceptives) (ATT.3)
* What are the comparative effects of different prairie dog relocation methods on native prairie communities? Are there practical and effective alternatives to prairie dog nesting boxes (e.g., directional boring)? (ATT.3)
* What are the effects of New Zealand mud snails on lotic ecology? Are there impacts on algae or fish populations? (EHR.6)
* Ecology and habitat use of Abert’s squirrels in ponderosa pine forest stands (EHR.2, EHR.7)
* Evaluation of best opportunities to improve wildlife movement either through restoration or installation of crossing structures on roads, culverts, etc. Focus on variety of taxa, not just large mammals (EHR.1).

## **Vegetation Management**

* What is the influence of trail building and trail use on invasive species spread? (EHR.6)
* How do we best reclaim degraded lands and track success over time? (EHR.1)
* What is the carbon footprint of mechanical vs. herbicide treatments? (EHR.3, EHR.9)

## **Agricultural Land Restoration**

* Evaluate the abundance and species diversity of invertebrate pollinators and characterize other beneficial insect habitat on OSMP’s agricultural lands? (ATT.2, ATT.7)
* How do insect populations respond to prairie dog removal and property restoration? (ATT.3, ATT.7)
* Which agricultural fields are most at risk for losing irrigation water in a future with severely reduced snowpack? (ATT.4)
* How does the soil microbial community change as soil health increases from poor to good on OSMP agricultural lands? (ATT.2, ATT.5)
* What impact will removing invasive trees and shrubs from irrigation ditch corridors have on wildfire fuels mitigation on OSMP property? (EHR.6, ATT.1, ATT.7)
* How can GPS livestock collars be used most efficiently to monitor livestock movement, particularly to reduce visitor conflict between livestock and trail users on OSMP? (ATT.6, ATT.9)
* Study the hydrogeology of the western portion of the OSMP’s grazed system to determine the source water and causal factors for dry up of surface ponds and springs. (ATT.4. ATT.6)

## **Wetland Ecology**

* A holistic study of hydrologic and/or hyporheic processes and impacts in South Boulder Creek, Boulder Creek, or Coal Creek as a baseline for climate change and to help identify future restoration opportunities (EHR.3).
* How do soil physical, chemical, and biological properties differ by wetland type on OSMP (ATT.2, EHR.3)?
* Develop hydrologic models for both montane and front range wetlands on OSMP to quantify the effects of climate change to help inform future restoration and management actions (EHR.3).
* Evaluate the role of irrigation in maintaining wetland communities across the OSMP system. (EHR.1, ATT.4)

## **Recreation/Visitor Experience**

* How does person density relate to perceptions of crowding along the trail (people-per-view) or at destination points (people-at-one-time)? (RRSE.1)
* Can machine learning be used to measure parking lot occupancy? What are the requirements and limitations to obtain an accurate count? (RRSE.4)
* Does education or messaging impact behavioral outcomes? What are the OSMP visitor behavioral drivers? (CCEI.2, RRSE.9)
* Using existing agency visitation data, explore statistical methods for classification of locations (trailheads, access points, etc.) into factor groups. (RRSE.9)
* How does OSMP (and our visitors) relate/contribute to the local economy? (FS.3)
* Where are trail “blind spots” on multi-use trails where line-of-sight may be interrupted for cyclists (based on topography and/or PPGIS)? (RRSE.6)
* Conservation Framing: How do our visitors and staff define “conservation” (nature for itself, nature despite people, nature for people, nature and people, etc.), and why does this matter? (RRSE.8, RRSE.9)

## **Recreational Ecology**

* How do OSMP’s dog regulations impact habitat? For example, what is the correlation of weed density/diversity and where dogs are allowed off-leash compared to on-leash or no-dog trails? (RRSE.1, RRSE.5)
* Does wildlife utilization increase in the vicinity of closed/restored undesignated trails? (RRSE.1, EHR.7, RRSE.9)
* Is fencing along trail corridors correlated with grassland bird abundance, diversity, or nesting success/fecundity? (RRSE.1, EHR.7, RRSE.9)
* Conduct new research on the correlation of visitation and ecological health (plants, wildlife, soils, water quality, insects). This could include the correlation of visitation with the spatial or temporal habitat use by native wildlife; the correlation of night-time human use on wildlife; the correlation of dogs with changes in wildlife community composition. (RRSE.1, EHR.7, RRSE.9)

## **Soil Ecology**

* How does forest management impact soil moisture and fertility? (ATT.2, EHR.2)
* What are the best and most practical methods to enhance soil quality in tilled fields, especially wheat-fallow? (ATT.2)
* How does improved soil health on OSMP lands enhance flood mitigation? (EHR.2, ATT.4)

## **Plant Ecology/Restoration Ecology**

* How can we use LIDAR data to understand fire behavior or forest composition? (EHR.1, EHR.3)
* Are there genetic changes in native grass cultivars after decades, and if there are, how might those changes effect plant traits that relate to long-term restoration success? (EHR.1, EHR.7)
* How can we use our newly digitized herbarium to study some aspect of plant geography, ecology or morphology? (EHR.7)
* What is the productivity of our long-term grassland monitoring sites? How can we measure or model this without direct disturbance to the plots? (EHR.1, EHR.7))
* How can we best measure or estimate relative water availability in our grassland habitats and at what types of sites would we expect the most limitations on water availability? (EHR.1, EHR.7)
* Develop and implement a baseline macrofungal inventory to identify species and their relative abundance in one or more vegetation types or in a comparative study across different land use or restoration histories (EHR.1, EHR.7).
* Develop and test monitoring methods (remote and/or ground-based) and mitigation techniques that OSMP could implement to assess and manage soil erosion vulnerability and associated impacts on native plant communities under scenarios of potential climate change, catastrophic weather events, human use, and land management practices, particularly in ecologically significant habitats such as our shale barrens, White Rocks, and foothills riparian areas (EHR.1).

## **Cultural and Scenic Resources**

* Does publicizing cultural resource presence through signage and interpretation to visitors adversely affect their integrity? Is information availability correlated to integrity in other public lands contexts? Is constraining information availability an effective strategy to protect cultural resources? (CCEI.9)
* Who were the people referenced by inscriptions at White Rocks? What are their connections to the Boulder area? (CCEI.9)

## **Trails and Facilities**

* Does recycled asphalt, when used for trail improvements, leach chemicals into the surrounding soil? (RRSE.2, RRSE.3)