Routt County Conservation District
Steamboat Springs, Colorado

A Toolkit for Routt County Landowners to Build Soil Health and Create Drought and Wildfire Resiliency

Introduction to this Soil Health Guide

The purpose of this toolkit is to initiate thought on possible ways to adapt to changing conditions that affect the land and the daily practices of farming and ranching in Routt County. Emphasis is placed on understanding the role of healthy soil in creating resiliency to drought and wildfire with other benefits that result when soil health is a consideration. Practices will vary from field to field and region to region based on the conservation goals of the landowner, and benefits will not normally be immediate. In the long term, improving soil health will have multiple layers of benefits including to the bottom line.

Why is Healthy Soil Important?

Conservation practices that improve soil health can help increase organic matter, reduce soil compaction, improve nutrient storage and cycling, and increase water infiltration and water availability to plants. These benefits can lead to a reduction in inputs and higher yields according to NRCS. Best management practices for agriculture include reducing or eliminating tillage; nurturing the living organic components of soils; promoting diversification of soil flora and fauna below ground and of plants above ground; creating pollinator habitat; diversifying rotations including grazing; and reducing wind erosion by establishing wind breaks.

How is drought resiliency related to healthy soils?

Whether the drought is here to stay or not, implementing best management practices that improve soil health is a win-win, decreasing risks from extreme weather fluctuations and improving long term field and watershed health. As important, ag producers' productivity and profitability have been shown to increase as a result.

What Does Healthy Soil Look Like?

There are many soil types in Routt County.

Looking at the USDA web soil survey you can get a general idea of the soil type in your field e.g. loam, sandy soil, clayey soil, etc.

The Routt County Farm Service Agency and NRCS, both located in the Pine Grove Center in Steamboat Springs, are also good sources of information.

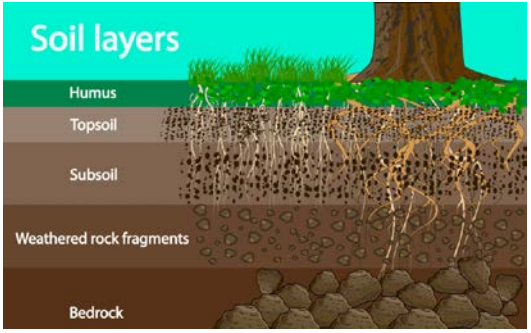
https://websoilsurvey.nrcs.usda.gov/app/

https://www.coloradolandcan.org/local-resources/Routt-County-Farm-Service-Agency/59648

Before we can create and maintain good soil health, it is important to gain a basic understanding of what drives it. A properly functioning soil ecosystem involves interaction between biological, chemical and physical characteristics.

Generally speaking, healthy soil is alive with beneficial micro-organisms. Other signs of healthy soil include plenty of underground animal and plant activity, such as earthworms and fungi. Soil that is porous and rich in organic matter is a good sign. Healthy soil tends to be darker in color and crumbles off of the roots of plants you pull up. A healthy, spread-out root system is also a sign of good soil.

Unhealthy soil doesn't have the moisture and nutrients needed to thrive, which makes it dry, crumbling, and cracked. When you pick up the dirt, it might crumble quickly in your hands or be difficult to break apart. Heavily compacted soil is also unhealthy.



WHAT?	WHY?	HOW?	LOCAL RESOURCES
Comprehensive Soil Testing 	• Better understand condition of field beyond the need for traditional Nitrogen-Phosphorus-Potassium or N-P-K testing • Develop a soil health baseline to measure progress over time • Help make good decisions that save $ and improve productivity • Healthy soils provide beneficial resilience to drought and wildfires	• Create field-specific plans including maps • Sign out the free soil health test kit from RCCD • Send results to appropriate lab • Get help with interpretation (NRCS) • Continue to monitor	Routt County Conservation District board@routtcountycd.com routtcountycd.com 970.879.3225 x 3243 Natural Resource Conservation Service Clinton.Whitten@co.usda.gov 970.879.3225 x 3246 Colorado State Univ. Extension Office routt.extension.colostate.edu 970.879.0825 USDA Farm Service Agency fsa.usda.gov

WHAT?	WHY?	HOW?	LOCAL RESOURCES
Keeping Soil Intact 	• Reduces moisture loss • Reduces wind and soil erosion • Maintains a living root system • Develops a more healthy soil ecosystem • Increases biologic activity • Reduces noxious weed invasion	• Minimize soil tillage and disturbance (example: using a no-till drill when planting) • Maintain plant cover year round (aka soil armor) • Minimize bare soil areas	Routt County Conservation District board@routtcountycd.com routtcountycd.com 970.879.3225 x 3243 Natural Resource Conservation Service Clinton.Whitten@co.usda.gov 970.879.3225 x 3246 Colorado State Univ. Extension Office routt.extension.colostate.edu 970.879.0825 USDA Farm Service Agency fsa.usda.gov

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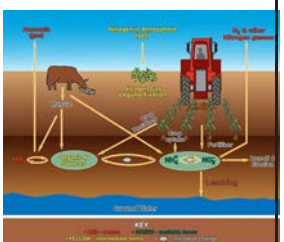
Increasing Organic Content 	• Increases resiliency to drought • Enhances soil's ability to recover biologic activity and support a healthy ecosystem	• Leave 3-4" hay stubble following harvest • Maintain continuous living roots • Consider adding non-cash crops to diversify plant species (e.g. nitrogen fixing legumes) • Consider adding organic supplements (e.g. biochar, compost)	STAR 5 principals of soil health: • Soil Armor • Minimize Soil Disturbance • Plant Diversity • Continual Live Plant/Root • Livestock Integration ag.colorado.gov/soil-health

WHAT?	WHY?	HOW?	LOCAL RESOURCES
Integrating Livestock and Grazing Management 	• Recycles and redistributes nutrients from feces and urine • Enhances weed suppression • Increases production	• Create a Grazing Management Plan including maps • Calculate carrying capacity • Rotational grazing or Rest Grazing (allows a longer revegetation period) • Virtual fencing • Monitor forage levels frequently • Keep records • Minimize disturbance to riparian areas (along waterways), e.g. fencing animals away from sensitive areas • Minimize or rotate concentrated feeding areas and/or winter livestock zones • Prepare drought contingency plan	*Local Rancher Tip:* A simple method to monitor pasture/ rangeland vegetation is the “Boot Method”. Walk in a straight line and every 3rd step count the plants or note open ground on the toe of the boot. Repeat for 100 measurements. Then calculate ground cover and monitor over time to track changes. **Grazing Landowner Planning Workbook** **CSU Ext Grazing Guide**

WHAT?	WHY?	HOW?	LOCAL RESOURCES
Striving for More Efficient Nutrient Management 	• Maximizes crop production • Minimizes need for synthetic fertilizers • Increases proper nutrient cycling to make them available to plants • Saves $$ • Potential to improve water quality and reduce excessive algae growth in water bodies	• Perform soil testing beyond standard N-P-K • Develop a nutrient management plan including all input sources • Implement Four R's of fertilizer application: Right Type, Right Place, Right Amount, Right Time • Test water quality leaving field • Test plant tissue • Practice soil erosion management • Keep complete records and revisit nutrient plan	Routt County Conservation District board@routtcountycd.com routtcountycd.com 970.879.3225 x 3243 Natural Resource Conservation Service Clinton.Whitten@co.usda.gov 970.879.3225 x 3246 Colorado State Univ. Extension Office routt.extension.colostate.edu 970.879.0825 CSU Ag Water Quality Program agsci.colostate.edu/waterquality

WHAT?	WHY?	HOW?	LOCAL RESOURCES
Irrigation Considerations 	• Too much or too little water is not ideal for crop production or soil health • Field runoff can carry nutrients and sediment detrimental to water quality • Loss of nutrients through leaching has the potential to waste money spent on fertilization	• Maintain a living root and ground cover all year round • Establish grass filter strips and/or native vegetated buffer zones around water ways to filter pollutants and reduce erosion potential • Monitor soil moisture and apply irrigation accordingly • Avoid over saturation	Latest CSU Fact Sheets Can Be Found Here: agsci.colostate.edu/waterquality/resources

WHAT?	WHY?	HOW?	LOCAL RESOURCES
Forest Management Considerations 	• Reduces wildfire potential • Improves forest ecosystem	• Keep forest fuels in check • Diversify species that are native to the ecosystem • Protect young trees which often have already begun to adapt to prolonged drought • Plant native riparian vegetation along waterways • Reduce grazing in riparian areas • Understory vegetation is important for many reasons, including forage for insects, birds, and mammals, as well as for supporting important ecological processes such as soil stability to reduce erosion	Colorado State Forest Service - Steamboat Springs csfs.colostate.edu john.twitchell@colostate.edu 970.879.0475 U.S. Forest Service - Routt/Medicine Bow www.fs.usda.gov 970.870.2299 Routt County Wildfire Mitigation Council routtwildfire.org

WHAT?	WHY?	HOW?	LOCAL RESOURCES
Water Quality 	• Protects our valuable resource • Exposure of contaminants to livestock is reduced • Reduces sediment and nutrients in water bodies which protects streams, lakes, and fisheries	• Establish buffer zones around waterways (rule of thumb 50 feet) • Plant and/or protect native vegetation in buffer zones • Implement erosion reduction practices • Incorporate 4 R's when applying fertilizers (see nutrient section) • Use herbicides and pesticides sparingly and according to instructions on labels	Upper Yampa River Watershed Group lhalliday@environmentalsolutionllc.com 970.879.6323 Trout Unlimited tu.org Water Quality Resources agsci.colostate.edu/waterquality/resources

WHAT?	WHY?	HOW?	LOCAL RESOURCES
Noxious Weed Control 	• Non-native and noxious weed control is the responsibility of every landowner	• Develop a weed management plan • Proper identification of weed species is imperative • Always follow label instructions when applying herbicides • Timing is critical to success • Get local assistance from experts.	Routt County Weed Control tcarlson@co.routt.co.us 970.870.5246 Routt County Conservation District Weed Sprayer Rental Program (includes application rate chart and more) routtcountycd.com/equipment-rental/

Additional Resources

There is a plethora of related resources that are too numerous to list here in their entirety.

Here are some websites to help begin the journey to improving your soil health.

Routt County Conservation District

routtcountycd.com

NRCS

nrcs.usda.gov/conservation-basics/natural-resource-concerns/climate/climate-smart-mitigation-activities

nrcs.usda.gov/conservation-basics/natural-resource-concerns

Colorado Department of Ag STAR Program

ag.colorado.gov/soil-health

Understanding Ag 6 Soil Health Principals

https://youtu.be/r5WuVhAOtuE

Colorado State University Ag Water Program

coagnutrients.colostate.edu/ag-best-management-practices/

WISE Water Irrigation Scheduler for Efficient Application

wise.colostate.edu

CO Cattlemen's Land Trust / Yampa Valley LT

ccalt.org

CO Ag Water Alliance

coagwater.org

1475 Pine Grove Road, Suite 201A
Steamboat Springs, CO 80487
routtcountycd.com

For information about this Guide
please contact the author
Lyn Halliday
board@routtcountycd.com
lhalliday@environmentalsolutionllc.com

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