



Closing the Compost Loop!



END MARKET OPPORTUNITIES:

CITY LANDSCAPING, GREEN ROOFS, STORM WATER MANAGEMENT, EROSION CONTROL, TURF MANAGEMENT, AGRICULTURE CONSERVATION



Compost Symposium at the Summit for Recycling – Steamboat Springs, Colorado – May 22-23, 2023

TODAY'S GUESTS:

Chuck Duprey

Nature Cycle – President & Founder

BJ Juelfs

Clearwater Sediment & Erosion Control

Matt Ball

US Composting Council – Director of Industry Development

John A. Miller

Colorado Department of AG – Soil Health Program Coordinator



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A close-up photograph of two hands, palms facing each other, cupped together in a gesture of holding or nurturing. The hands are positioned in the foreground, with the fingers slightly spread. The background is a soft-focus outdoor scene with green grass, trees, and a hint of a blue object, possibly a pool or a car, under bright, natural light.

CLOSING THE LOOP

WHY?

- **GHG AVOIDANCE**
- **SAVING NATURAL RESOURCES**
- **CLOSING THE COMPOST LOOP**
 - **CARBON SEQUESTRATION**
 - **WATER RETENTION**
 - **HEALTHY SOILS**

POWER OF COMPOST!

Improves soil structure and porosity – creating a better plant root environment

Improves the moisture holding capacity of light soils – reducing water loss and nutrient leaching, and improving moisture retention

Supplies Organic Matter

Supplies beneficial microorganisms to soils and growing media

Allows plants to more effectively utilize nutrients, while reducing nutrient loss by leaching

Contains humus – assisting in soil aggregation, making nutrients available for plant uptake

COMPOST
THE SUSTAINABLE SOLUTION
SOIL WATER PLANTS 

“Essentially, all life depends upon the soil ... There can be no life without soil and no soil without life; they have evolved together.” Charles E. Kellogg, USDA Yearbook of Agriculture, 1938

AAPFCO (Association of American Plant Food Control Officials) consists of state Department of Agriculture in the US. They regulate all claims made by compost manufacturers on product labels, and require state approval. The following list, from their Rules and Regulations, is for the benefits of compost:

Denver Water operating rules that apply to soil amendment and limits on use: Operating Rule 14.02.4. Soil Amendment for Irrigation of Turf at Newly Licensed Premises: Proof of proper soil preparation is required before installation of plant material. Penalties of \$1,000 may apply if soil amendment is not completed and approved by Denver Water prior to the installation of plant material. Penalties for soil amendment is the equivalent of adding approved compost at a rate of four cubic yards per 1,000 square feet of permeable area, incorporated (rototilled) to a depth of six inches. There are other rules and BMPs like across the country.

Facts & Benefits: Water use reduction and conservation

1. A University of Illinois study about amending farmlands

in sandy soils:

Facts & Benefits: Water use reduction and conservation

- 1. A University of Illinois study¹ on water use reduction and conservation**
- In sandy soils, compost will absorb farmland soil with compost produced the following facts:
 - In high clay content soils, compost will increase water holding capacity by absorbing water.
 - Soil factor. Following a 2nd application of amendments (i.e., compost) all amended plots increased Plant Available Water by 5 to 45% compared to the control.
 - This would have potentially reduced the average amount of irrigation water to move through the soil by 10 to 40%.
 - At current prices, a reduction of one irrigation cycle of irrigation water needed by 10 to 3200 on a 160 acre system, depending on the energy source used, would reduce energy costs for The Recycle Company Waters of New South Wales in Australia compared to \$270 to \$620 per acre. (Compost reduced irrigation water in Australia compared to life cycle cost of water from thereby saving 14,000 to 100,000 gallons/acre/year).
- Effects and Benefits: Bioremediation**
- Bioremediation uses microorganisms to break down and remove pollutants from the environment. There are other rules and BMPs like this across the world.

WHY USE COMPOST?
Because amending soil with Compost will significantly reduce water use!

For every 1% increase in organic matter in your soil, you increase water retention at the rate of 3 parts per cubic foot, OR each increase of 1% OM increase soil water holding capacity by 100 gallons H₂O/Acre⁶ will vary depending (soil type).

- Bioremediation uses compost containing beneficial bacteria to break down contaminants in the soil, thereby saving 14,000 to 100,000 gallons/acre/year.

are incorporated into a contaminated soil and then

- Applying just 2" of compost in lieu of the traditional 6" of topsoil can reduce material costs by up to 2/3! The compost also improves soil structure and fertility, and by removing the contaminated soils and adding them to the compost pile, you are recycling the nutrients and preventing them from being lost.

The US Composting Council supports and strongly recommends regular composting to insure product quality and safety. The Seal of Testing Assurance Program (STA) is the ONLY nationally recognized compost testing program. Read more about it at: <http://compostingcouncil.org/seal-of-testing-assurance/>

Cited References

Compost New Applications for an Age Old Technology, USEPA330-F-97-047
"Compost Water Authority - Soil Amendment Program"
Using Compost - www.water.org

Cited References

- NCRS** www.nrcs.usda.gov/seal-of-testing-assurance/ **nationally recognized compost testing program.**
- "Denver Water Authority - An Age Old Technology, US EPA303-97-047
Using Compost: Soil Amendment Program
<http://www.denverwater.org/Conservation/Program>
"Sharma G and Campbell A. *Composting*. CRC Press, 2006.
Department of Environment and Conservation (DEC) <http://www.dec.wa.gov.au/dec/nature/soil/soil.htm>
USDA NCRS soil health Key Points, Feb. 2013
- Other Useful References:**
How To Soil Mix Management Practices, Tools & Specifications
Choosing a Soil Amendment
<http://www.ces.vt.edu/pubs/Garden97233.html>
- Please visit www.compostcollection.org for many more references on the use of compost for increasing soil C.
- Compost Effect on Water Retention and Native Plant Establishment on a Construction Embankment
http://agronomyjournal.library.tamu.edu/research/publications/publications.htm#vol_286
Landmark Archives: <http://compostcollection.org/seal-of-testing-assurance/> <http://www.hooz.co.uk/11-18>
- US National Resource Institute**

Compost: THE Sustainable Solution
US Composting Council • 5400 Grosvenor Lane • Bethesda, MD 20814
301.897.2715 • www.compostingcouncil.org • www.compostsolution.org

more
plant
ence
are

MP) are
simple is

“1% OF ORGANIC MATTER IN THE TOP SIX INCHES OF SOIL WOULD HOLD APPROXIMATELY 27,000 GALLONS OF WATER PER ACRE.”



USCC Factsheet:
Compost and Its Benefits

What is Compost?

Compost is the decomposition of organic materials through the action of microorganisms. The resulting material is beneficial to soil health and plant growth.

How is Compost Made?

Compost is produced through a controlled process of decomposition. It requires moisture, oxygen, and time. The process generates heat, which helps to break down organic matter and kill pathogens. The final product is a dark, crumbly material that can be used as a soil amendment.

Benefits of Using Compost

- Improves soil structure, porosity, and density, thus creating a better plant root environment.
- Increases infiltration and permeability of heavy soils, thus reducing erosion and runoff.
- Improves water holding capacity, thus reducing water loss and leaching in sandy soils.
- Recycles organic waste and reduces landfill use.

real benefits of using compost are long-term and related to its organic matter content.

United States Department of Agriculture
Natural Resources Conservation Service

Soil Health Key Points

unlock the SECRETS IN THE SOIL

What's critical about soil health now?

- World population is projected to increase from 7 billion in 2013 to more than 9 billion in 2050. To sustain this level of growth, food production will need to rise by 70 percent.
- Between 1982–2007, 14 million acres of prime farmland in the U.S. were lost to development.
- Improving soil health is key to long-term, sustainable agricultural production.

Soil health matters because:

- Healthy soils are high-performing, productive soils.
- Healthy soils reduce production costs—and improve profits.
- Healthy soils protect natural resources on and off the farm.
- Franklin Roosevelt's statement, "The nation that destroys its soil destroys itself," is as true today as it was 75 years ago.
- Healthy soils can reduce nutrient loading and sediment runoff, increase efficiencies, and sustain wildlife habitat.

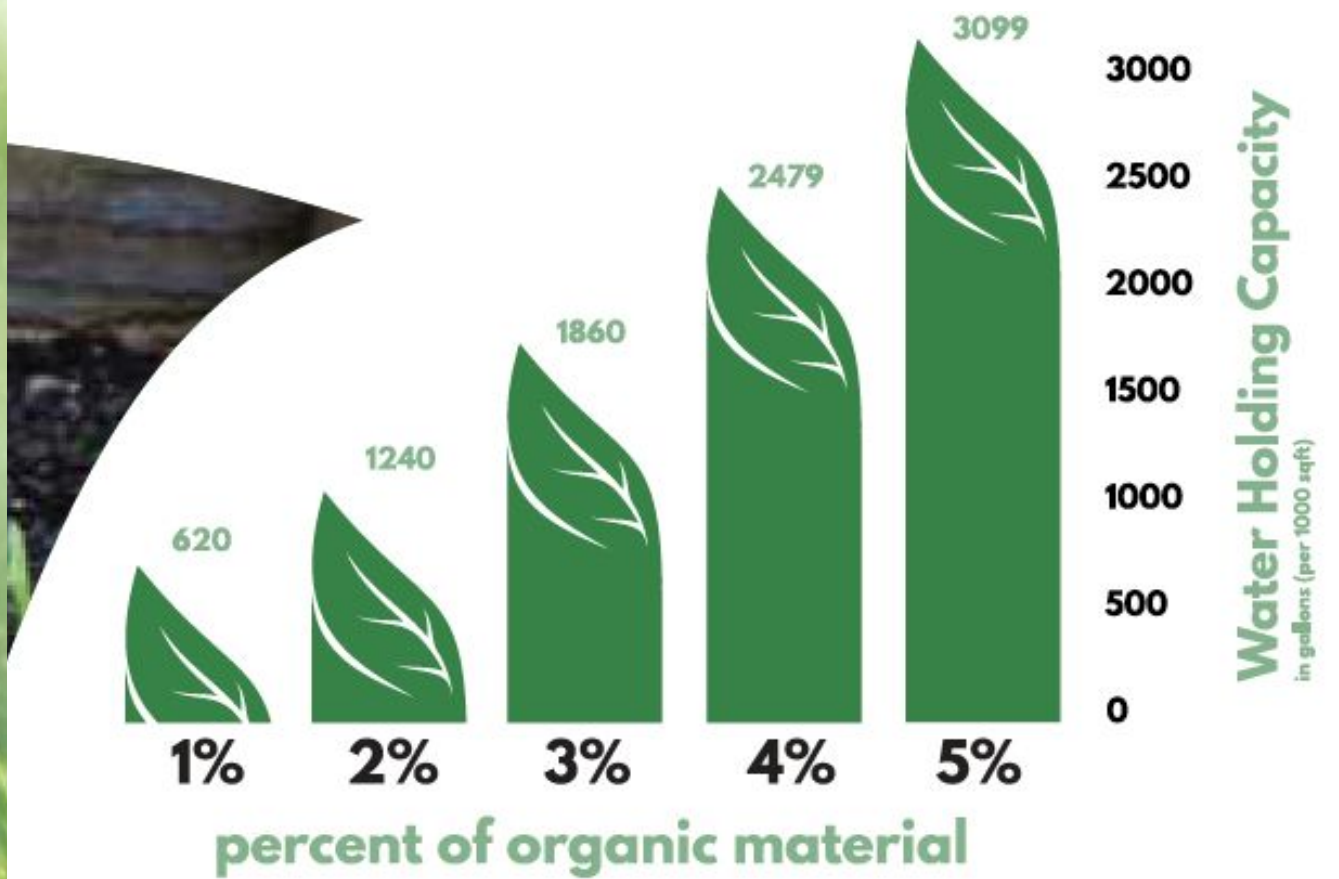
What are the benefits of healthy soil?

- Healthy soil holds more water (by binding it to organic matter), and loses less water to runoff and evaporation.
- Organic matter builds as tillage declines and plants and residue cover the soil. Organic matter holds 18-20 times its weight in water and recycles nutrients for plants to use.
- One percent of organic matter in the top six inches of soil would hold approximately 27,000 gallons of water per acre!
- Most farmers can increase their soil organic matter in **three to 10 years** if they are motivated about adopting conservation practices to achieve this goal.

!

www.nrcs.usda.gov

Helping People Help the Land
USDA is an equal opportunity provider and employer.



Bottom line: how much water you need is directly related to the amount of organic matter present in the soil.

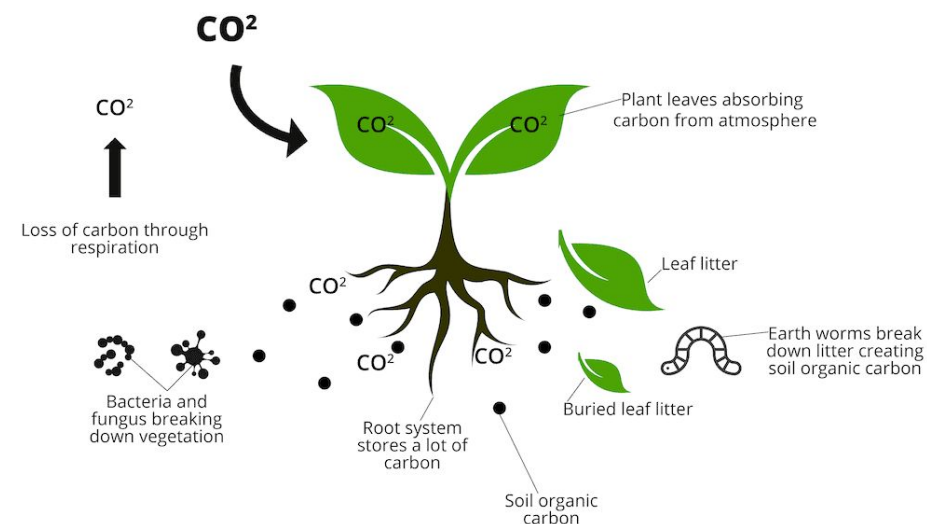
What is carbon sequestration?

The process in which **CO₂** is removed from the atmosphere and stored “in the ground”. Stored in plant roots, plant residues, and other organic solids.

“Compost increased soil productivity and the formation of stable carbon that can remain in the soil for decades. [The Marin Carbon Project](#) found that a one-time application of compost increased the soil’s carbon content continually, at a rate comparable to **removing 1.5 metric tons of carbon from the atmosphere each year.**” Columbia University

“Due to the majority of human land management practices and our growing population, we are experiencing soil degradation and desertification at an alarming rate. **Rich living soil has been turned into dysfunctional dirt.** Drylands now cover about 46% of the earth’s surface, 9% of which are facing severe desertification. In the last 40 years, we have lost about 1/3 of our arable land.” Kiss the Ground

Photosynthesis



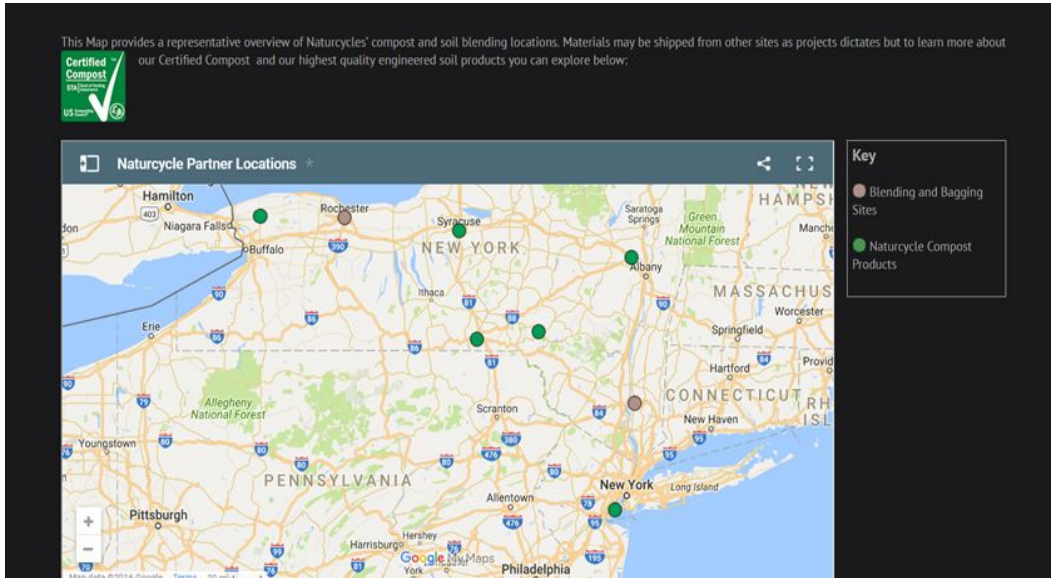


Compost Markets Turf Management & Green Roof Media

CHARLES DUPREY , FOUNDER & PRESIDENT – NATURCYCLE LLC



Compost Symposium at the Summit for Recycling – Steamboat Springs, Colorado – May 22-23, 2023



Naturcycle LLC

- ▶ Focused on *Restoring Earth* through our work with landscape architects and other professionals
- ▶ Brokers compost for municipal and private producers throughout the northeastern United States
- ▶ Provides expert consultation for compost application, sourcing, operations and logistics
- ▶ Charles Duprey -- Over 16 years of marketing and using compost in many different applications. Trustee of the Compost Research Education Foundation. Committee Chair of S&P Pathogens Task Force. Market Development Committee USCC and more

Follow us on Instagram and like us on LinkedIn and Facebook!



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Turf Management

“A study, published in the journal Environmental Management, found that over 40 million acres of land in the continental US has some form of lawn on it. That's three times more than corn, or any other irrigated crop, the researchers wrote. Most of the corn in the US isn't irrigated.” Business Insider 2/19/16



Turf Management

As the largest crop managed in the United States how do we better promote and use compost as a tool?

Top Dressing is a natural fertilizer alternative

No permit or certified employee is required to spread unlike an applicator license

Damaged and struggling turf leads to additional runoff contributing to poor water quality (M. Petrovich , Cornell 2016)

Turf responds well to stable, mature compost especially biosolids products (IE Milorganite)



Turf Management

- Adding organic matter to soil (IE Stands of Turf) reduces water needs. Increases water holding capacity of the soil.
- Municipalities could expand these kinds of programs to use their own composts on their turf be it parks or lawns around a City.
- Locally made product verse imported chemical fertilizers. Safe for play or use immediately



Green Roof Media

A specialized use for premium compost products.

Used as a stormwater management tool, capture water on site (a roof or structure) so it doesn't run off

Provides insulation benefits, beautification

It is often a mix of lightweight aggregate, sand, specialty materials and a premium, well made compost.



Green Roof Media

Expand its use through zoning or laws related to stormwater management.

Uses a small percentage of compost in its blends

Amenity Space and green park like settings becoming a standard in high rise residential.

Why are schools or municipal buildings not required to have?







Thank you

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NRCS Conservation Practice Standard: Soil Carbon Amendment Code 336

OPPORTUNITIES THROUGH FEDERAL PROGRAMS FOR COMPOST
MANUFACTURERS AND THEIR GROWERS

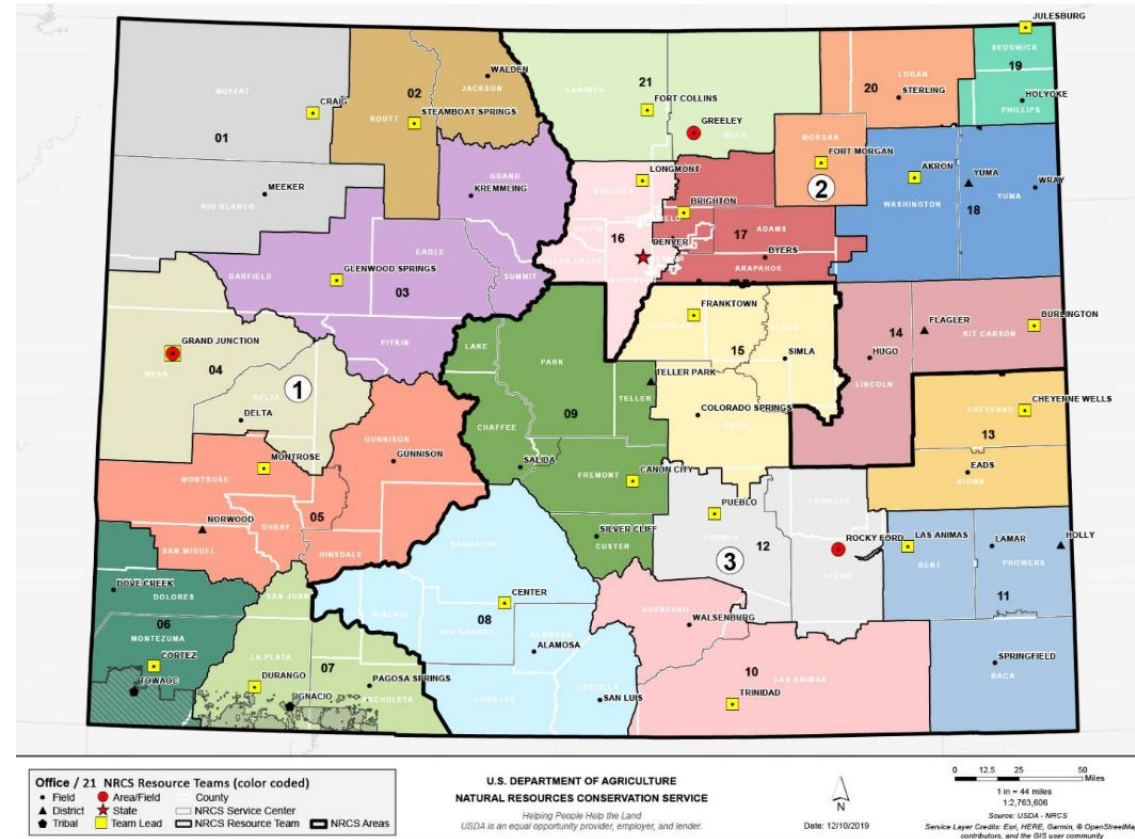


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USDA - Natural Resources Conservation Service

- NRCS is USDA's private land conservation agency
- Formed in the 1930's as a response to the dust bowl and the farming practices that led to massive topsoil erosion
- Today, through **voluntary conservation programs**, NRCS helps producers, soil and water conservation districts, and other partners protect and conserve natural resources on private lands throughout the United States.
- Regional NRCS Staff, field agents, independent Technical Service Providers, and ***NEW*** Qualified Individuals

Colorado NRCS Offices



Find Your Local Service Center

USDA Service Centers are locations where you can connect with Farm Service Agency, Natural Resources Conservation Service, or Rural Development employees for your business needs. Enter your state and county below to find your local service center and agency offices. If this locator does not work in your browser, please visit offices.usda.gov.

Colorado



- Please select -



SEARCH

Conservation Practice Standard

- A structural or vegetative measure, or management activity used to protect or reduce the degradation of soil, water, air, plant, animal, or energy resources
- Delivers technology based on allowable criteria to adapt the technology to the site
- 164 Current Practices in NHCP (National Handbook of Conservation Practices)
- Each state that adopts a conservation practice standard will have their own version of the standard

Soil Carbon Amendment Practice Standard

- Interim Practice (808)
 - Created in 2018
 - Evaluation & Refinement
 - Adopted in 29 states (including CO)
- Transition to National Practice (336)
 - Released in November 2022

Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

SOIL CARBON AMENDMENT

CODE 336

(ac)

DEFINITION

Application of carbon-based amendments derived from plant materials or treated animal byproducts.

PURPOSE

Use this practice to accomplish one or more of the following purposes:

- Improve or maintain soil organic matter.
- Sequester carbon and enhance soil carbon (C) stocks.
- Improve soil aggregate stability.
- Improve habitat for soil organisms.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to areas of Crop, Pasture, Range, Forest, Associated Agriculture Lands, Developed Land, and Farmstead where organic carbon amendment applications will improve soil conditions.

Parameter	Range	Unit
Feedstock	Report ¹	Type by %
pH	Report	pH units
Electrical Conductivity (EC)	Report	dS/m
Moisture	Report	%
Organic Matter/Carbon	Report	% DW ²
Total Nitrogen	Report	% DW
Particle Size	Report	% per size class
Phosphorus	Report	mg/kg ⁴ DW
Potassium	Report	mg/kg DW
Calcium	Report	mg/kg DW
Magnesium	Report	mg/kg DW
Arsenic ³	<41	mg/kg DW
Cadmium	<39	mg/kg DW
Copper	<1500	mg/kg DW
Lead	<300	mg/kg DW
Mercury	<17	mg/kg DW
Nickel	<420	mg/kg DW
Selenium	<100	mg/kg DW
Zinc	<2800	mg/kg DW

¹Report results, also see criteria under amendment type.

²DW = Dry weight.

³Pollutant concentration limit values from US EPA Title 40 Part 503 STANDARDS FOR THE USE OR DISPOSAL OF SEWAGE SLUDGE. Follow State and local laws and regulations.

⁴milligrams per kilogram (mg/kg) = parts per million (ppm) = grams per ton (g t⁻¹)

Compost

Use compost that is produced by the controlled aerobic, biological decomposition of biodegradable feedstocks. Use compost with the US Composting Council's Seal of Testing Assurance Program (STA) or that meets the following criteria in Table 2 below as determined by the Test Methods for the Examination of Composting and Compost (TMECC) or by LGU recognized methods.

Parameter	Range	Unit
C:N	Report ¹	unitless
Organic matter	Report	% DW
Fecal coliform	<1000	MPN ² per g dry compost
Salmonella spp.	<3	MPN per 4 g dry compost

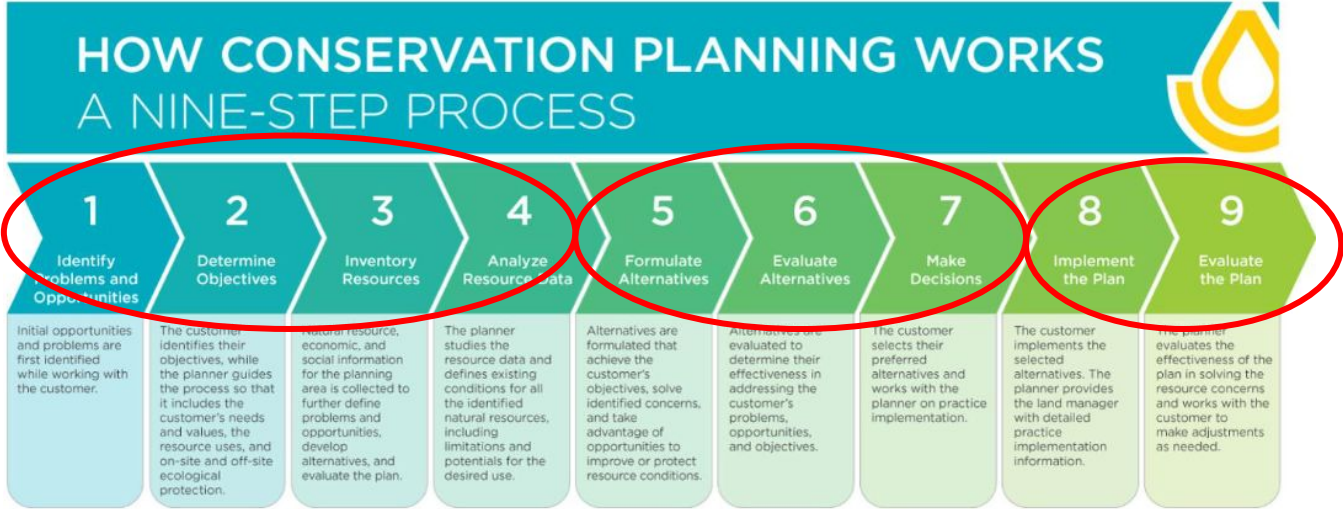
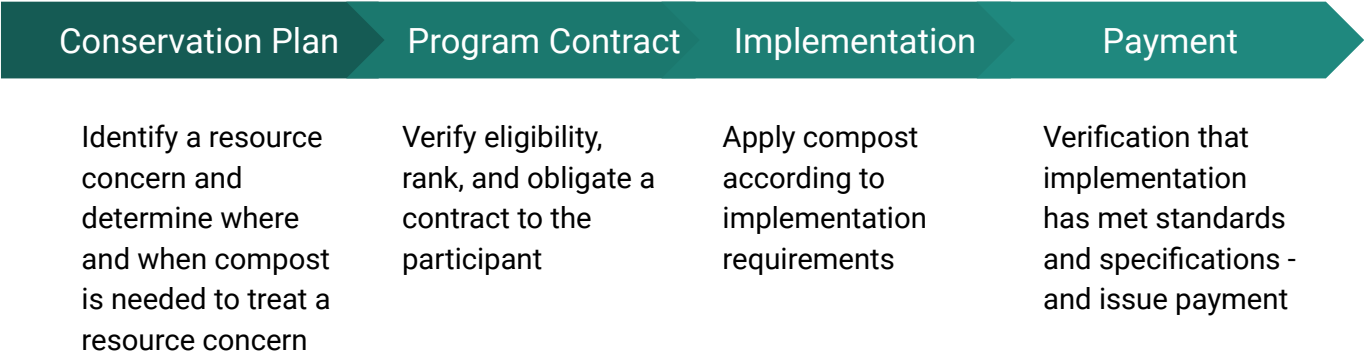
¹Report = Required results only, no threshold or range needs to be met.

²MPN = Most Probable Number.

Use laboratories successfully meeting the current requirements and performance standards of the STA or use an alternative State-approved certification program that considers laboratory performance and proficiency to ensure accuracy of laboratory analyses.



- Getting Started:** A landowner can contact their local NRCS Field Office, express a **resource concern** and ask about the conservation planning process. **Some resource concerns addressed by 336:**
 - Compaction
 - Organic matter depletion
 - soil organism habitat loss or degradation,
 - Inefficient irrigation water use
 - Plant productivity and health
- Phase 1: Inventory and Evaluation:** An on farm visit to dial in a farmer's goals and objectives. Outcomes include identification of **resource concerns** and unrealized opportunities
 - Planner Observations
 - Conservation Evaluation and Monitoring (CEMA)
 - Soil Health Testing
- Phase 2: Decision Support:** Identify conservation practices to meet a client's objectives. 336 will typically be included with a suite of soil health practices
 - Nutrient management (590)
 - Critical Area Planting (342)
 - Early Succession Habitat Development (647)
 - Mulching (484)
- Phase 3: Implementation and Evaluation:** A conservation plan will be developed and implemented. Local NRCS staff will verify implementation.
 - Conservation Evaluation and Monitoring (CEMA)
 - At this point a participant can apply for an receive payment
 - **CO EQIP:** 2-5 year contract
 - **CO Timeline** of 2-3mo depending on complexity



Example Practice Schedule

Tract Number	PLU (Field) #	Practice Code	Practice Name	Planned Amt	Practice Units	Planned Date
1000	3, 5, 7	590	Nutrient Management	12	Ac.	May 2023
1000	3, 5, 7	808	Soil Carbon Amendment	12	Ac.	September 2023
1000	3, 5, 7	340	Cover Crop	12	Ac.	October 2023
1000	3, 5, 7	329	Residue Mgt., No-Till	12	Ac.	April 2024

Example Plan map



NRCS Conservation Programs and Eligibility

Once a land owner has gone through the conservation planning process, they're then eligible for reimbursement through NRCS flagship Conservation Programs:

EQIP: Environmental Quality Incentives Program

- Applications accepted year round
- Final contract signed
- Regional Payment Rates set annually
- Typically 75% reimbursement on payment schedules that includes built in cost for labor, equipment, ect.
- Conservation Innovation Grants

CSP: Conservation Stewardship Program

- Continued stewardship post EQIP Contract

RCPP: Regional Conservation Partnership Program

- Public/Private partnership

Practice: 808 - Soil Carbon Amendment

Scenario #53 - Compost - Off Site

Scenario Description:

Apply compost to improve soil biology and other soil health-related resource concerns. Compost has been tested and is imported from an outside source. Compost is applied at the recommended rate to treat the identified resource concerns.

Before Situation:

An appropriate assessment tool is used to determine that soil health resource concerns exist.

After Situation:

Compost was applied at the recommended rate. Soil health resource concerns were treated. A follow up follow up assessment is planned to determine the effect of the compost application.

Feature Measure: Cubic Yards of Amendment per Acr

Scenario Unit: Cubic Yards

Scenario Typical Size: 6.00

Scenario Total Cost: ~~\$13,567.78~~ \$506.98

Scenario Cost/Unit: ~~\$2,261.30~~ \$84.50

Cost Details:

Component Name	ID	Description	Unit	Cost	QTY	Total
Equipment Installation						
Tillage, Light	945	Includes light disking (tandem) or field cultivator. Includes equipment, power unit and labor costs.	Acres	\$13.21	20	\$264.20
Manure, compost, application	955	Loading, hauling and spreading manure/compost by ground equipment. Includes equipment, power unit and labor costs.	Hours	\$120.27	0.5	\$60.14
Materials						
Compost	265	A mixture of decaying organic matter, as from leaves and manure, used to improve soil structure and provide nutrients.	Ton	\$42.88	3	\$128.64
Biochar	2743	Solid material obtained from thermochemical conversion of biomass in an oxygen-limited environment (pyrolysis). Biochar is typically produced from woody biomass, but other carbon sources may be used. Materials only.	Cubic Yards	\$163.26	80	\$13,060.80
Mobilization						
Aggregate, Shipping, Cubic Yard-mile	2360	Mobilization of aggregate material beyond 20 miles of local delivery from quarry to construction site. Cubic Yard-mile (Cubic Yard * miles of haul).	Cubic Yard Mile	\$0.36	150	\$54.00

Compost - Off Site ~~CuYd~~ ~~\$1,696.06~~

\$63.00

**Current FY 23 - *Work
Around* To be Updated in
FY 24**

Thanks! [USCC NRCS 336 Resource Hub](#)

Matt Ball

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Colorado STAR And STAR+ Programs

**JOHN MILLER – SOIL HEALTH PROGRAM COORDINATOR
COLORADO DEPT. OF AGRICULTURE**



Compost Symposium at the Summit for Recycling – Steamboat Springs, Colorado – May 22-23, 2023

What is STAR?

- Movement for a CDA soil health program began as a grassroots movement in 2019. **CCHS**
- Commissioner of Agriculture Kate Greenberg made healthy soils a leading strategy for achieving the CDA mission to promote responsible natural resource stewardship.
- The original STAR program was implemented in Illinois. Colorado partners worked together to adapt that framework to meet our needs.
- Basic concept of STAR is a free and voluntary tool:
 - Producers fill out assessment forms (11 crop systems)
 - Points are assigned for soil health practices
 - Producers then receive a rating and of 1 to 5 stars to show how far they are on their soil health journey. Producers receive a sign with their STAR rating.
 - This provides them a starting point to further improve practices if needed and helps to advance the soil health discussion
 - First 100 Producers receive a free soil health test

★ 1 Star (Average)

A field with practices similar to what 80% of fields of that type are doing in that region.

★★ 2 Stars (Above Average)

A field beginning to implement soil health principles.

★★★ 3 Stars (Great)

A field implementing multiple soil health principles.

★★★★ 4 Stars (Excellent)

A field implementing several soil health principles.

★★★★★ 5 Stars (Ideal)

A field implementing all five soil health principles.

STAR+ State Soil Health Program

- 3-year CDA program funded by various grants and donations. 319, CIG, CPP, CSC. (HB21-1181)
- Administered locally through conservation districts and eligible entities.
- CD's and EE's receive capacity building payments of 20k upfront and 2k per producer for each year for 4 years AND \$25k each for equipment purchases.
- Producers fill out STAR evaluations and receive STAR scores.
- Producers receive \$75/acre to implement a NEW soil health practice on their enrolled field.
- Payments of min \$1000 and max of \$5,000 with a 100% match required by producers.
- Covered practices are flexible
- Producers receive technical assistance
- Soil health testing in years 1 and 3 and soil moisture monitoring systems installed on all new fields.
- Edge of field monitoring on specific sites

2022 – First Year of STAR+

- Approximately \$5.6 million in funds from state stimulus, Gates Family Foundation, CDPHE, CWCB, NFWF, and the NRCS.
- 125 participants began their first year of participation
- 16 conservation districts and 3 eligible entities
- \$626,000 in initial capacity support for program administration to cd's and ee's
- \$442,693 in producer incentive payments paid
- \$698,418 equipment grants to participants, cd's and ee's
- 24,500 +/- acres enrolled in STAR and STAR+
- New BMP's implemented – Residue and tillage management (reduced or no-till), cover cropping, mulching, conservation crop rotation, prescribed grazing, nutrient management, rangeland planting, forage harvest management, wind-barriers, shelterbelts and soil carbon amendment.
- **Approximately 1/3 of the participants implemented new practices related to compost or compost tea. A similar amount of the equipment grant funding went to compost related equipment such as spreaders and tea extractors**

2023 and the Future of STAR

- \$25 million funds from Climate Smart Commodities for program expansion
- 25 new conservation districts and eligible entities just chosen by SHAC
- 320+/- new participants will begin enrollment this summer
- Studies:
 - More research fields
 - Soil moisture monitoring systems for all participants
 - Economic analysis tool for practice adoption
 - Sociology study for bmp adoption barriers
 - Peer to peer learning pilots
 - **Pay for performance and market opportunities**
- Expansion of STAR evaluation system to 5 additional states

Thank you!

John Miller
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Questions?



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