



# The Periodic Table of Cover Crops

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## Introduction

The Periodic Table of Cover Crops is a visual tool for producers interested in utilizing cover crops on their farms or ranches. The overall layout of the cover crop selection tool is meant to mimic the organized structure of the periodic table of elements. Where the plant is located on the chart, the color of the box, and the numbers and icons in the corners of the box all provide information relevant to that plant. This table is meant to be an easy-to-use, handy reference to help land stewards find the most suitable cover crop plants to help achieve their soil health goals.

It is important to note that information on specific crops is generalized and approximate and may not reflect performance in on-farm conditions.

## How to Use the Periodic Table of Cover Crops

There are eight data points for each plant within its square on the periodic table: plant name, function, root type, plant structure, crude protein, life cycle, biomass per pound of seed, and carbon-to-nitrogen (C:N) ratio.

This table also includes three criteria that determine the plant's location on the chart: seasonality (warm vs. cool season), plant type (grass, legume, or broadleaf) and water demand (low vs. high water needs).

## Function

The term listed in the upper left-hand corner of each square represents the most notable function for this plant. It is not the only function the plant has; the plant can still be used for other purposes.



Photo: Nina Prater, NCAT

You will find these functions in the table:

- **Erosion control:** plants that help slow water movement with their fibrous roots or prostrate growth.
- **Weed suppression:** plants with prostrate growth that crowds out weeds.
- **Nitrogen scavenger:** plants that collect nitrogen from the soil and store it.
- **Beneficials:** plants known to attract beneficial insects to the landscape.
- **H<sub>2</sub>O infiltration:** plants with tap roots that loosen hard soils and provide water pathways.
- **Phosphorus (P) and potassium (K) scavenger:** plants that collect these nutrients from the soil and store them.
- **Allelopathic:** plants that produce biological compounds that influence other plants and seeds.

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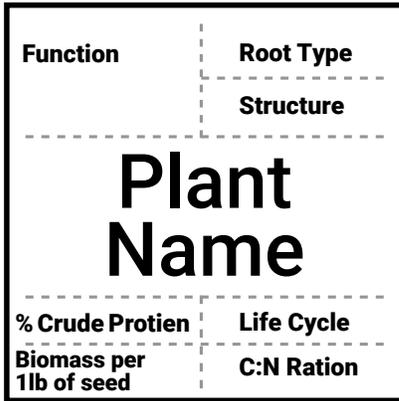


## ROOT TYPE

 = fibrous roots     = tap root

## PLANT STRUCTURE

 = upright plant     = prostrate



## Life Cycle

**A = Annual**  
**B = Biannual**  
**p = Perennial**

## \*Saline Tolerant Cool Season Grasses

RS Hybrid Wheatgrass,  
Tall Wheatgrass,  
Intermediate Wheatgrass,  
Slender Wheatgrass,  
Russian Wildrye and  
Alkaligrass

Sources: Clark; Midwest Cover Crops Council; USDA-NRCS PLANTS Database; USDA-NRCS Plant Materials Documents

## References

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This updated cover crops chart was originally created by NCAT Agriculture Specialist Cody Brown while completing his Master of Science in Integrated Agricultural Sciences at Texas State University under advisor Dr. Ken Mix, founding member of the Small Producers Initiative. This image has now been properly illustrated and made into shareable formats with funding from SSARE, NFWF “Farmers for Soil Health,” and NCAT’s ATTRA program.

COOL

# Periodic Table

Erosion Control  <b>Fescue</b> 8% 50    A 20:1			
Erosion Control  <b>Barley</b> 10% 40    A 20:1			
Weed Control  <b>Oat</b> 10% 25    A 33:1	Beneficials  <b>Camdina</b> 46% 200    A/B 40:1	Allelopathic Nitrogen Scavenger  <b>Mustard</b> 10% 400    A 20:1	Weed Control  <b>Balsana Clover</b> 15% 250    A/D 15:1
Nitrogen Scavenger  <b>Spelt</b> 11% 50    A 80:1	Beneficials  <b>Phacelia</b> 19% 485    A 15:1	Nitrogen Scavenger  <b>Canola</b> 20% 250    A/B 15:1	Weed Control  <b>Berseem Clover</b> 28% 750    A 20:1
Nitrogen Scavenger  <b>Wheat</b> 10% 50    A 80:1	Beneficials  <b>Flax</b> 30% 160    A 25:1	Nitrogen Scavenger  <b>Radish</b> 26% 400    A 20:1	Weed Control  <b>Crimson Clover</b> 18% 233    A 16:1
Nitrogen Scavenger  <b>Rye</b> 5% 50    A 40:1	Erosion Control Allelopathic  <b>Kale</b> 30% 600    A 20:1	Nitrogen Scavenger  <b>Turnip</b> 15% 400    A 20:1	Weed Control  <b>Red Clover</b> 15% 250    B/P 20:1
Nitrogen Scavenger  <b>Triticale</b> 10% 50    A 20:1	Erosion Control  <b>Spinach</b> 20% 400    A 8:1	Nitrogen Scavenger  <b>Beet</b> 15% 400    B 15:1	Weed Control  <b>White Clover</b> 25% 666    P 20:1
<b>Saline Tolerant Cool Season Grasses*</b>	Erosion Control  <b>Chard</b> 32% 600    A/P 20:1	H <sub>2</sub> O Infiltration  <b>Carrot</b> 10% 400    A/B 15:1	Weed Control  <b>Kura Clover</b> 25% 300    P 20:1
<b>Native Prairie</b>  <b>Wild Rye</b> 7%    P 40:1	<b>Native Prairie</b>  <b>Western Wheat-grass</b>  15%    P 80:1	<b>Native Prairie</b>  <b>Needle-grass</b> 10%    P	<b>Native Prairie</b>  <b>Brome-grass</b> 15%    P

## North America

WARM

BROADLEAF

# Role of Cover Crops

LEGUMES

LOW H<sub>2</sub>O DEMAND



<p>Beneficials ↓ <b>Chickpea</b></p> <p>6% A 80 20:1</p>	<p>Beneficials ↓ <b>Medic</b></p> <p>20% A/P 187 20:1</p>	<p>Beneficials ↓ <b>Cowpea</b></p> <p>20% A 85 20:1</p>	<p>Erosion Control ↓ <b>Cluster Bean</b></p> <p>10% A 250 65:1</p>	<p>Beneficials ↓ <b>Buckwheat</b></p> <p>10% A 41 20:1</p>	<p>Erosion Control ↓ <b>Pearl Millet</b></p> <p>15% A 30 50:1</p>
<p>Erosion Control ↓ <b>Pea</b></p> <p>6% A 80 20:1</p>	<p>Beneficials ↓ <b>Lupin</b></p> <p>15% A 50 20:1</p>	<p>Beneficials ↓ <b>Lablab</b></p> <p>20% A/P 250 17:1</p>	<p>Weed Control ↓ <b>Jack Bean</b></p> <p>30% A/P 250 21:1</p>	<p>H<sub>2</sub>O Infiltration ↓ <b>Quinoa</b></p> <p>14% A 300 20:1</p>	<p>Erosion Control ↓ <b>Proso Millet</b></p> <p>10% A 30 20:1</p>
<p>Beneficials ↓ <b>Lentil</b></p> <p>15% A 80 20:1</p>	<p>Beneficials ↓ <b>Faba Bean</b></p> <p>17% A 250 100:1</p>	<p>Weed Control ↓ <b>Fenugreek</b></p> <p>20% A/P 48 20:1</p>	<p>Weed Control ↓ <b>Velvet Bean</b></p> <p>20% A/B 250 29:1</p>	<p>Nitrogen Scavenger ↓ <b>Chickory</b></p> <p>25% P 400 8:1</p>	<p>Erosion Control ↓ <b>Grain Sorghum</b></p> <p>10% A 300 20:1</p>
<p>Beneficials ↓ <b>Lespedeza</b></p> <p>15% A/P 80 20:1</p>	<p>Beneficials ↓ <b>Sweet Clover</b></p> <p>15% A/B 300 15:1</p>	<p>Erosion Control ↓ <b>Pigeonpea</b></p> <p>25% A/P 85 20:1</p>	<p>Erosion Control ↓ <b>Mung Bean</b></p> <p>20% A 40 15:1</p>	<p>Beneficials ↓ <b>Curcubita</b></p> <p>15% 50 8:1</p>	<p>Erosion Control ↓ <b>Sudan Grass</b></p> <p>15% A 228 50:1</p>
<p>Beneficials ↓ <b>Birdsfoot Trefoil</b></p> <p>20% P 80 20:1</p>	<p>Beneficials ↓ <b>Alfalfa</b></p> <p>20% P 200 12:1</p>	<p>Beneficials ↓ <b>Partridge Pea</b></p> <p>20% A 83 20:1</p>	<p>Erosion Control ↓ <b>Soybean</b></p> <p>20% A 80 20:1</p>	<p>Erosion Control ↓ <b>Safflower</b></p> <p>15% A 200 30:1</p>	<p>Erosion Control ↓ <b>Teff</b></p> <p>15% A 50 40:1</p>
<p>Beneficials ↓ <b>Vetch</b></p> <p>15% A/B 153 15:1</p>	<p>Beneficials ↓ <b>Sainfoin</b></p> <p>15% P 147 20:1</p>	<p>H<sub>2</sub>O Infiltration ↓ <b>Sunnhemp</b></p> <p>20% A 100 15:1</p>	<p>P &amp; K Scavenger ↓ <b>Peanut</b></p> <p>15% A/P 80 20:1</p>	<p>Beneficials ↓ <b>Sunflower</b></p> <p>20% A 200 30:1</p>	<p>Erosion Control ↓ <b>Corn</b></p> <p>10% A 200 25:1</p>

HIGH H<sub>2</sub>O DEMAND



## American Native Prairie Grasses

<p>Native Prairie ↓ <b>Little Bluestem</b></p> <p>15% P</p>	<p>Native Prairie ↓ <b>Big Bluestem</b></p> <p>15% P</p>	<p>Native Prairie ↓ <b>Eastern Grama-grass</b></p> <p>15% P</p>	<p>Native Prairie ↓ <b>Indian-grass</b></p> <p>15% P</p>	<p>Native Prairie ↓ <b>Switch-grass</b></p> <p>15% P</p>	<p>Native Prairie ↓ <b>Buffalo-grass</b></p> <p>15% P</p>
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## Root Type

The type of root a plant has gives you an idea of what effect that plant will have below the soil surface. A taproot is a large root that grows straight down. Fibrous roots grow and spread outward and are smaller in diameter than taproots.

*Scenario:* A farmer has a heavy, compacted soil and is looking to break up the dense clay. They may look for a plant with a taproot, because it will work like a biological drill to help loosen the clay and create macropores in the soil profile.

## Plant Structure

The above-ground structure of the plant and its growth habit should match the producer's goals, enabling them to use cover crops while creating the conditions required for a successful cash crop.

*Scenario:* A land manager uses grazing to terminate cover crops. A taller mix of plants may produce good forage but might make it hard to observe or count the herd or flock. On the flip side, taller plants may provide shelter and protection from aerial predators for smaller livestock.

*Scenario:* A vegetable grower who wants to plant their cash crop directly into the cover crop may look for plants with a prostrate growth habit rather than upright, so the cash crop can get the sunlight it needs.

## Crude Protein Percentage

A plant's crude protein percentage is important to producers using the cover crop for livestock feed. The number on this table is an average; different varieties within a plant species might have higher or lower protein content than this average.

Different types of livestock each have their own dietary needs and protein requirements, so it is important to know this value when making a feed mix. Too much or too little protein both have impacts on animal performance.

*Scenario:* A land manager has a pasture that is dominated by warm-season grass, and they want to boost the protein percentage of the summer forage. They would look for a plant with a high percentage of crude protein that also does well in the warm season.

## Life Cycle

The life cycle of a plant (annual, perennial, or biennial) will determine how long you can expect it to grow and whether it will come back the following year or years.

*Scenario:* A land manager needs a quick cover crop between cash crop plantings, so they select a mix of annual plants for that field, ensuring the cover crop will not persist and become a weed.

## Biomass per Pound of Seed

This value will help land managers decide how much seed they need to plant to get the desired biomass. This plant characteristic is often represented as biomass per acre; the value on this table is derived from that number to be more useful for small-scale producers. A high biomass per pound of seed generally equates to a larger plant with a lot of leaves, like corn.

*Scenario:* A rancher in South Texas wants a cost-effective cover crop that will produce a lot of quality feed for cattle and sheep in the heat of summer, so they may choose a Sudan grass mix, which has a high biomass per pound of seed, as well as heat tolerance.

## Carbon: Nitrogen (C:N) Ratio

The carbon: nitrogen ratio is an indicator of the durability of the plant, i.e., how long it takes to break down in the field. The higher the carbon content, the longer it takes the plant to break down. This ratio indicates how long you can expect the cover crop residue to remain in the field.

*Scenario:* A farmer is planning to plant a fall cover crop and wants it to last through the winter to protect the soil until the spring crop is established. They would look for a plant with a medium C:N ratio to ensure the residue lasts through the winter. A plant with a high C:N ratio would also persist, but could lock up nitrogen, making it unavailable for the spring crop.

## Other Considerations

**Native prairie grasses:** These plants evolved to thrive in deep, healthy prairie soils. Therefore, they will struggle to thrive in degraded soil. If you want to establish a perennial cover of native grasses, which are shown at the bottom of the periodic table, start by focusing on soil health to create the right environment for these species to thrive.

**Salinity:** Not all plants tolerate soils with high salinity levels, so it's important to know your soil's salinity (i.e., salt content) when choosing cover crops. Some options for grasses that tolerate saline soils appear at the side of the periodic table.

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