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Cover Crop Management

Objectives

1. List benefits of cover crops
2. Identify the different plant functional groups
   - Name 2-3 representative species in each group that are common to most of the US.
   - List key benefits of the representative species
3. How to manage cover crops

Cover Crop Purposes

Identify Resource Concerns & Objectives

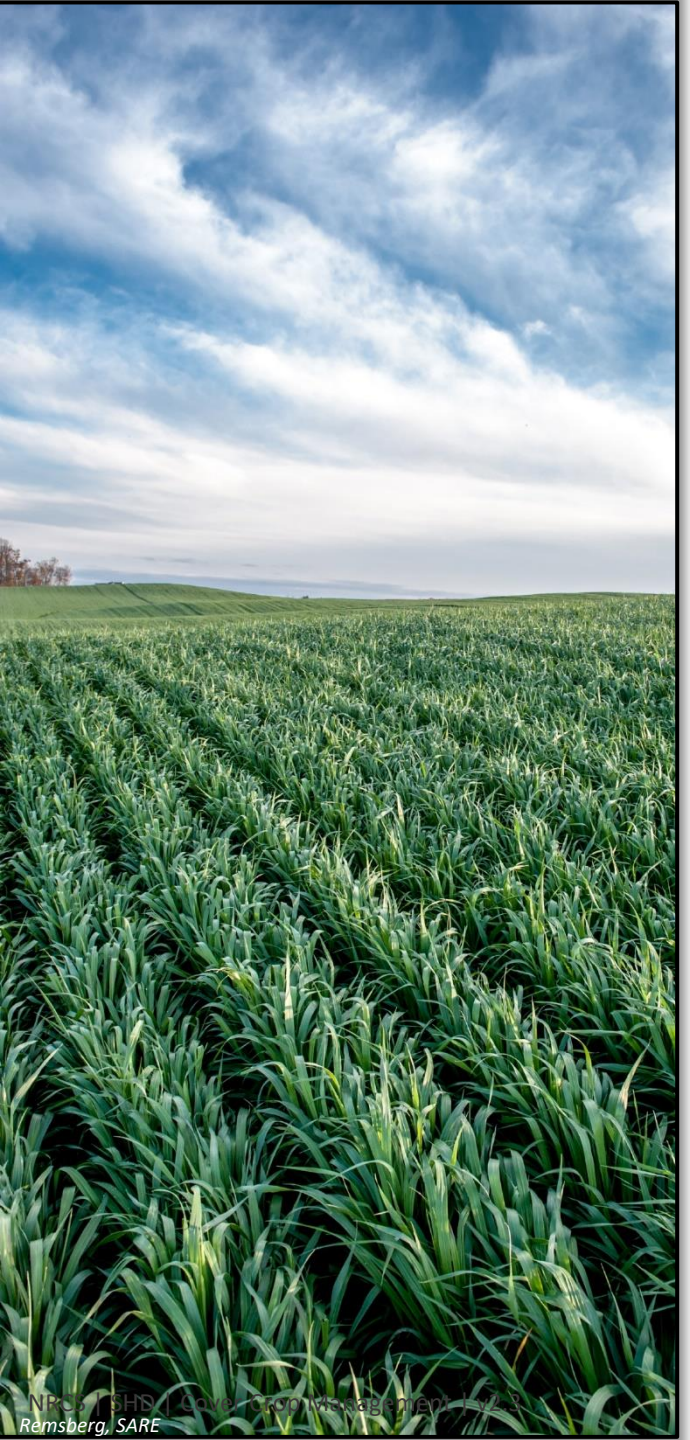
- Crop diversity (habitat)
- Soil surface armor (erosion)
- Build stable soil aggregates
- Improve water cycle/ availability
- IPM/beneficial insects
- Build or improve soil organic matter
- Nutrient cycling/ efficiency
- Air Quality
- Adjust carbon/nitrogen ratios
- Wildlife winter food & shelter
- Livestock integration
- N fixation

Cover Crop CPS (340)

PURPOSE

This practice is applied to support one or more of the following purposes:

- Reduce erosion from wind and water.
- Maintain or increase soil health and organic matter content.
- Reduce water quality degradation by utilizing excessive soil nutrients.
- Suppress excessive weed pressures and break pest cycles.
- Improve soil moisture use efficiency.
- Minimize soil compaction.



Cover Crop Considerations

for Successful Planning

- Site preparation
- Early weed control
- Timing and species (adequate growing season)
- Crop rotation/diversity
- Seed quality (bin run, PLS, certified)
- Seeding method seed-soil contact (broadcast vs. drilling)
- Seed size/seeding depth
- Legume inoculation
- Moisture management (cover benefits, water use)
- Producer's goals

Cover Crop Considerations

for Successful Planning

- Residue management (cash crop) before & after cover crop emergence
- Nutrient cycling (C:N ratio, residual NO_3)
- Weed, insect & disease management
- Termination method/timing
  - Know how you are going to terminate before you plant
- Economics
  - Yield impacts (+/-), cost of establishment, soil improvement, can we afford not to use them?

What is your Seeding Timeframe ?

- Spring - Fallow ground, prevented planting or prior to a summer crop
- Early Summer - After early vegetable harvest, winter grain or small grain forage harvest, after first crop hay
- Late Summer - After grain harvest, Interseeding into corn or soybean, cotton etc.
- Fall - After fall crop harvest

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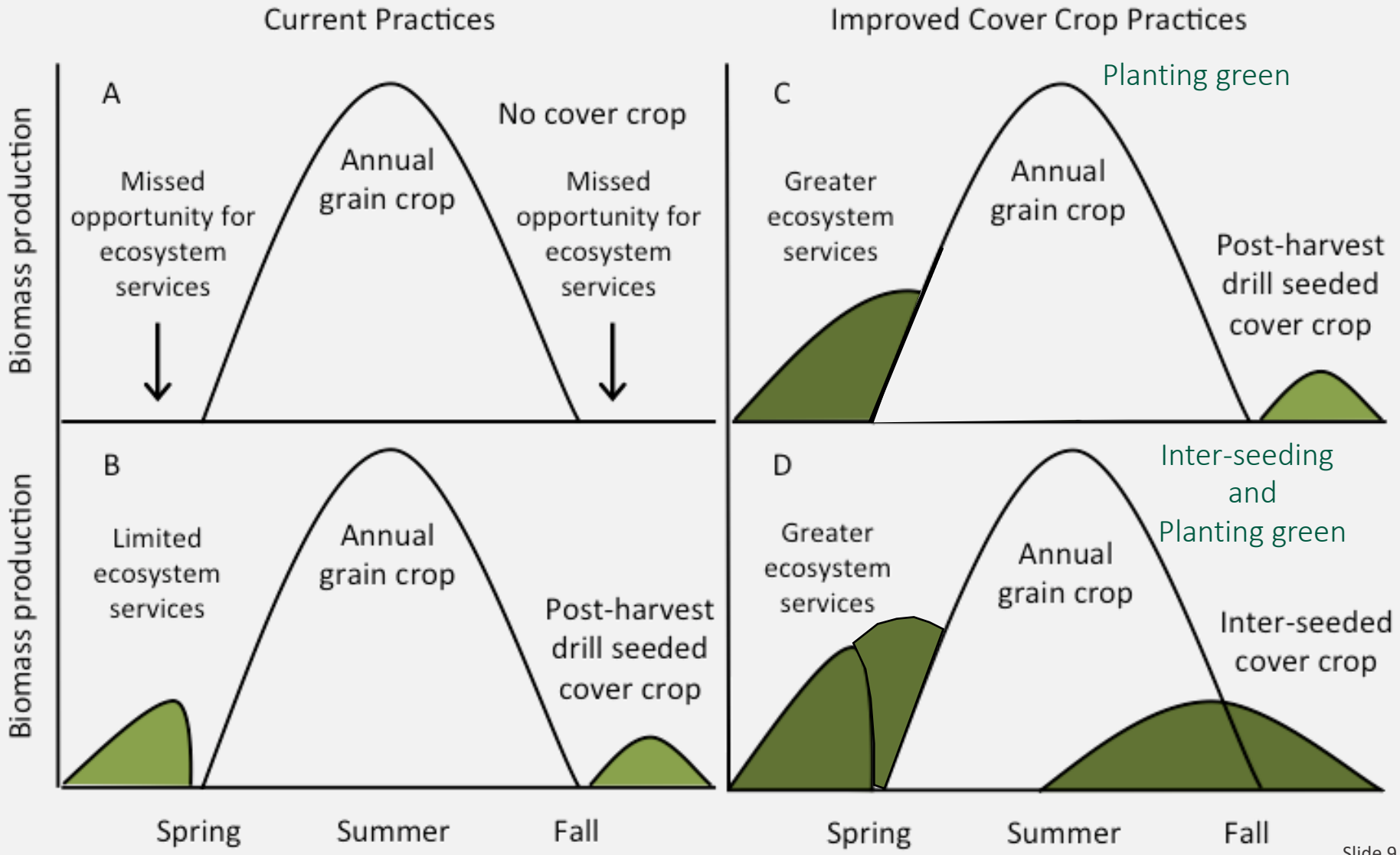
Seeding Considerations

- Earlier seeding results in better seed germination, tillering, growth, survival and more biomass.
- Delaying termination in spring can compensate for delayed planting in the fall (some producers have learned to plant green)
- Be aware of planting dates based on species in the mix (warm / cool season; winter grains /cool season legumes and brassicas)
- Drilling is much more efficient than surface broadcast. Increase seeding rate by 10-30% when broadcasting (some states have specific, higher rates for broadcast vs. drilling).
- Higher seeding rates are not necessarily good – can be detrimental (i.e., increases competition for limited resources)

Cover Crops Niches for Summer Annual Crops



Matt Ryan, Cornell University

What Characteristics Should Be Considered?

- Growth cycle
- Growth habit
- Root architecture
- Growth rate
- Chemical composition
- Stress tolerance
- Time to flowering
- Pest resistance or susceptibility

Pytlik, NRCS

Cover Crop Chart

USDA –ARS Cover Crop Chart

United States Department of Agriculture
Agricultural Research Service

AREA 4 SCD Cooperative Research Farm

GROWTH CYCLE	PLANT ARCHITECTURE	RELATIVE WATER USE
A = Annual	♈ = Upright	💧 = Low
B = Biennial	✱ = Upright-Spreading	💧💧 = Medium
P = Perennial	〰 = Prostrate	💧💧💧 = High

COOL						WARM			
--GRASS--	BROADLEAF								--GRASS--
A 💧 ANNUAL FESCUE ♈									A 💧 BROWNTOP MILLET ♈
A 💧 BARLEY ♈					LEGUME			A 💧 AMARANTH ♈	A 💧 FOXTAIL MILLET ♈
A 💧💧 OAT ♈	A/B 💧 CAMELINA ♈	A/P 💧 MUSTARD ✱	A 💧 BALANSA CLOVER 〰✱	A 💧 CHICKPEA ✱	A/P 💧 MEDIC ♈	A 💧 COWPEA ✱	A 💧 CLUSTER BEAN ✱	A 💧💧 BUCKWHEAT ♈	A 💧 PEARL MILLET ♈
A 💧 SPELT ♈	A 💧 PHACELIA ♈	A/B 💧💧 CANOLA ✱	A 💧💧 BERSEEM CLOVER ♈	A 💧 PEA ♈	A 💧 LUPIN ♈	A/P 💧 LABLAB 〰✱	A/P 💧 JACK BEAN ✱	A 💧💧 QUINOA ♈	A 💧💧 PROSO MILLET ♈
A 💧💧 WHEAT ♈	A 💧💧 FLAX ♈	A 💧💧💧 RADISH ✱	A 💧💧 CRIMSON CLOVER ✱	A 💧 LENTIL ✱	A 💧💧 FABA BEAN ♈	A/P 💧 FENUGREEK ♈	A 💧 VELVET BEAN ✱	P 💧💧 CHICORY ✱	A 💧💧 GRAIN SORGHUM ♈
A 💧💧💧 CEREAL RYE ♈	A 💧💧 KALE ✱	B 💧💧💧 TURNIP ✱	B/P 💧💧 RED CLOVER ♈	A/P 💧💧 LESPEDEZA 〰✱♈	A/B 💧💧 SWEET CLOVER ♈	A/P 💧 PIGEONPEA ✱	A 💧💧 MUNG BEAN ✱	A 💧💧💧 CUCURBITA 〰	A 💧💧 SUDAN GRASS ♈
A 💧💧💧 TRITICALE ♈	A 💧💧 SPINACH ✱	B 💧💧💧 BEET ✱	P 💧💧 WHITE CLOVER 〰✱	P 💧💧 BIRDSFOOT TREFOIL 〰	P 💧💧💧 ALFALFA ♈	A 💧💧 PARTRIDGE PEA ♈	A 💧💧 SOYBEAN ✱	A 💧💧💧 SAFFLOWER ♈	A 💧💧 TEFF ♈
P SALINE TOLERANT ♈	A/B 💧💧💧 CHARD ✱	A/B 💧💧💧 CARROT ✱	P 💧💧 KURA CLOVER 〰	A/B 💧💧 VETCH 〰	P 💧💧💧 SAINFOIN ♈	A 💧💧 SUNNHEMP ♈	A/P 💧💧💧 PEANUT 〰✱	A 💧💧💧 SUNFLOWER ♈	A 💧💧💧 CORN ♈

Oat
(*Avena sativa* L.)

- Cool Season, grass
- Annual
- Upright plant architecture
- Medium water use
- Fair salinity tolerance
- Seeding depth: 1 – 2 inches
- Crude protein: hay 9-15%, grain 13-18%
- C:N ratio: 33
- Forms arbuscular mycorrhizal associations
- Self pollinator (wind)
- Rated 'very good' at scavenging nitrogen from the soil

Cool Season Grasses

- Annual Ryegrass
- Cereal Rye
- Barley
- Oats
- Wheat
- Triticale

Spring Oats

Cereal Rye

Photos: Michael Kucera & Jodie Reisner

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Warm Season Grasses

- Pearl Millet
- Japanese Millet
- Sorghum-Sudan grass
- Forage Sorghum
- Teff

Brown rib sorghum - sudan grass

Pearl Millet

Photos: Michael Kucera & Jodie Reisner

Cool Season Broadleaf

- Radish
- Turnip and Rape
- Kale and Collards
- Mustard
- Phacelia

Know How & When Cover Crops Produce Seed

- CC's that go to seed could become a weed problem:
- Radishes are photoperiod sensitive Longer days = seed set
  - Avoid spring/early summer
- Mustards mature quickly, blooming in 45-60 days after planting
- Turnips, kale, collards, cabbage & rapeseed require vernalization to set seed

Warm Season Broadleaves

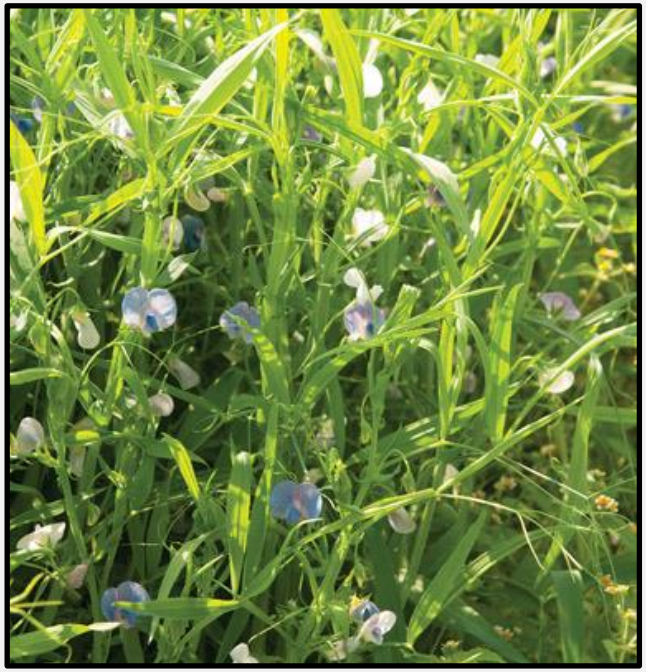
- Buckwheat
- Safflower
- Sunflower

Cool Season Legumes

- Vetch
  - Hairy, Purple, Common, Woolypod
- Crimson Clover
- Perennial Clovers
  - Red, White, Alsike
- Winter Pea
  - Austrian, Canadian

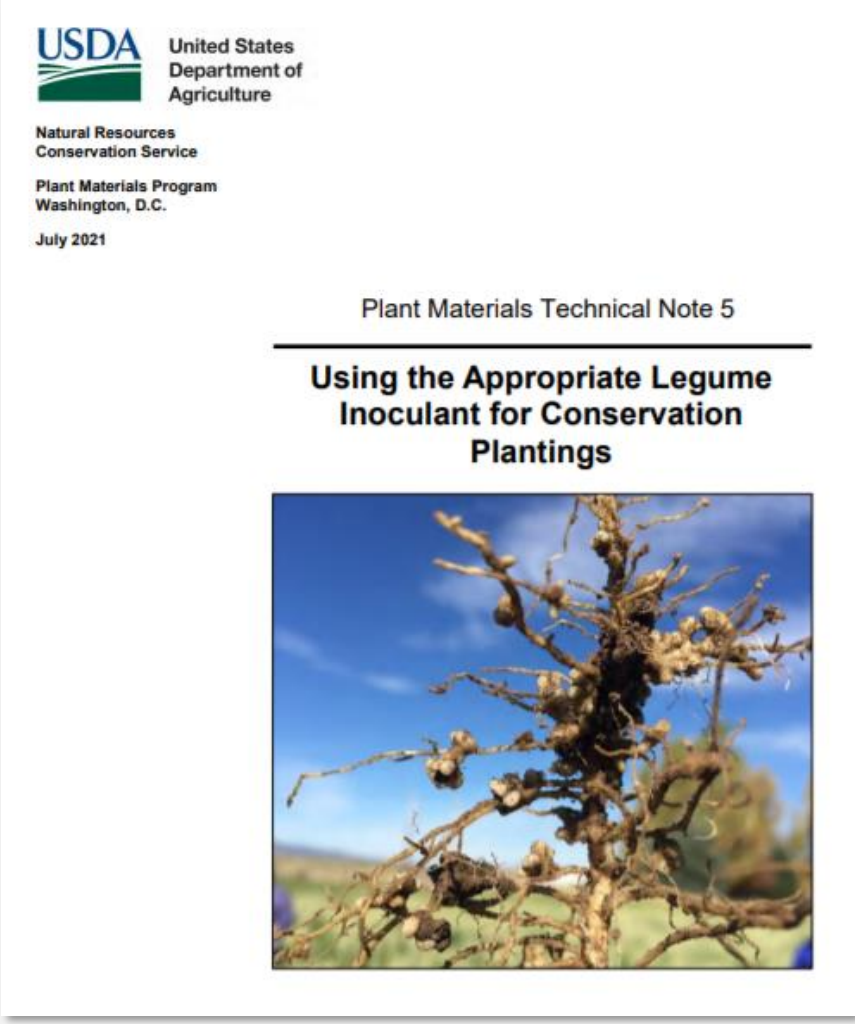
Warm Season Legumes

- Cowpea
- Soybean
- Sunn hemp
- Chickpea
- Mungbean
- Chickling vetch
- Guar



Need for Legume Inoculation

- Inoculants help guarantee the successful formation of nitrogen-fixing nodules in legumes
- Inoculants are species specific
- Inoculants are alive and have a maximum storage life
- Keep inoculant refrigerated out of direct sunlight and Use prior to expiration date.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Natural Resources Conservation Service

Plant Materials Program
Washington, D.C.

July 2021

Plant Materials Technical Note 5

Using the Appropriate Legume Inoculant for Conservation Plantings

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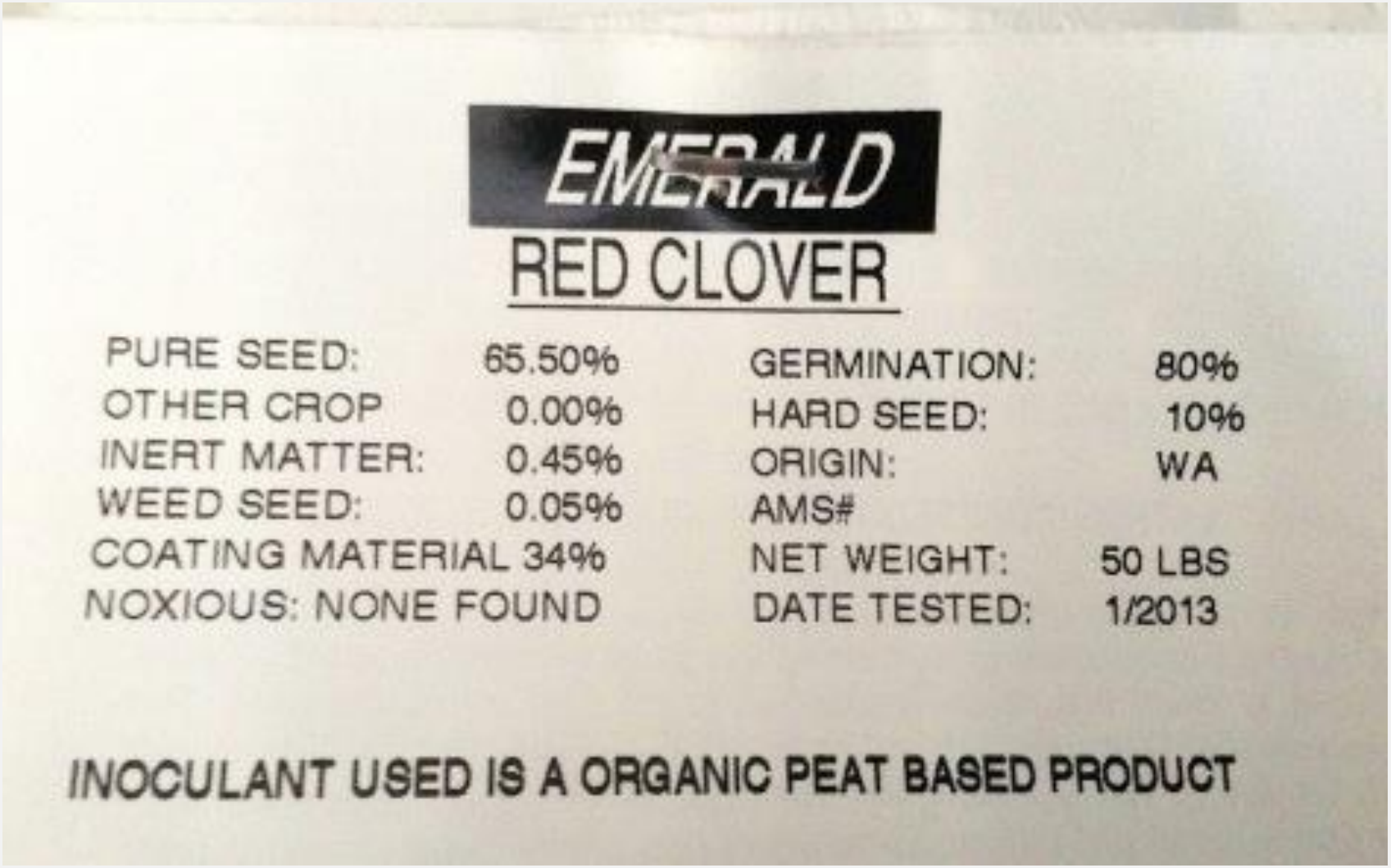
Bin Run Seed

Certified or VNS? What is PLS?



Knowledge check – poll question

Knowledge Check

What are the four functional groups of cover crops?

Answer:

Warm Season Grasses

Cool Season Grasses

Warm Season Broadleaf

Cool Season Broadleaf

Cultivars Vary

black oats (*Avena strigosa*)

SoilSaver

black-seeded winter oats (*Avena sativa*)

Cosaque

balansa clover (*Trifolium michelianum*)

Fixation	Frontier

crimson clover (*Trifolium incarnatum*)

AU Robin	Contea
AU Sunrise	Dixie
AU Sunup	KY Pride

field peas (*Pisum sativum*)

Arvica	Lynx
Dunn	Maxum
Frostmaster	Survivor-15
Windham	Whistler

red clover (*Trifolium pratense*)

Cinnamon Plus	Kenland
Cyclone II	Mammoth
Dynamite	Starfire
Freedon	Wildcat

daikon radish (*Raphanus sativus*)

Big Dog	Graza
Concorde	Groundhog
Control	Lunch
Defender	Nitro
Driller	Sodbuster
Eco-till	Tilllage

cereal rye (*Secale cereale*)

Aroostook	Maton II
Bates	Merced
Brasetto	Oklon
Elbon	Rymin
FL 401	Wheeler
Guardian	Wintergrazer
Hazlet	Abruzzi

Maton

hairy vetch (*Vicia villosa*)

CCS-Groff	Purple Prosperity
Lana	TNT
Purple Bounty	Vilana

How will you seed it?

Drill

- Most time consuming
- $16-$18/ac
- Provides row plant spacing
- Consistent results
- Good soil to seed contact

How will you seed it?

Air Seeder on a Harrow or Vertical tillage

- Wide swath at 10 mph
- Fast
- Cheap? $17.30/ac plus $12.50/ac broadcasting
- Provides a random plant spacing
- Soil disturbance

How will you seed it?

Fly it on

- Most flexible timing
- Fast
- $12-$18/ac
- Provides a random plant spacing
- No seed to soil contact/moisture dependent
- Higher seeding rates may become impractical

How will you seed it?

Fly it on…When?...Who?

- Target the optimum window
- Balance sunlight and moisture
- Growing Degree Days
- Some species are more adapted
- Lack of soil to seed contact/Moisture dependent

How will you seed it?

Highboy for establishing into standing corn

How will you seed it?

Air Seeder on Combine Head

Ray McCormick, Vincennes, IN

- Concurrent operation
- Cheap / Fast
- Provides a random plant spacing
- Seed placed beneath the residue

How will you seed it?

Precision planting in narrow rows (15” rows)

- Use existing bean planter
- Less seed per acre
- $12-$18/ac
- Provides precision row/ plant spacing
- Consistent results
- Good soil to seed contact

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Inter seeding possibility

Interseeding into V6 Corn

Crimson clover about 8 weeks after interseeding

ARG legume mix

Annual ryegrass Oct 30th Central NY

Planting Green

Advantages:

- increased biomass for weed control
- better planter performance in standing cover vs a thick mat
- more biomass reduces evaporation and erosion

Disadvantages:

- increased pest pressure
- more risk of wrapping on planter drives and wheels; hairpinning
- pollen shed plugging breathers or air flow devices
- over utilization of moisture.

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Cover Crop Termination Methods

- Herbicide burn down
- Tillage
- Frost termination
- Crimper / Roller (mature enough to kink the stem)
- Grazing– Not in Term Guidelines
- Shredding / mowing
- Combination of methods

COVER CROP -Termination When and How?

- Have a good GAME PLAN…
  - What are your goals?
- Be adaptive to the season
  - Wet springs happen!

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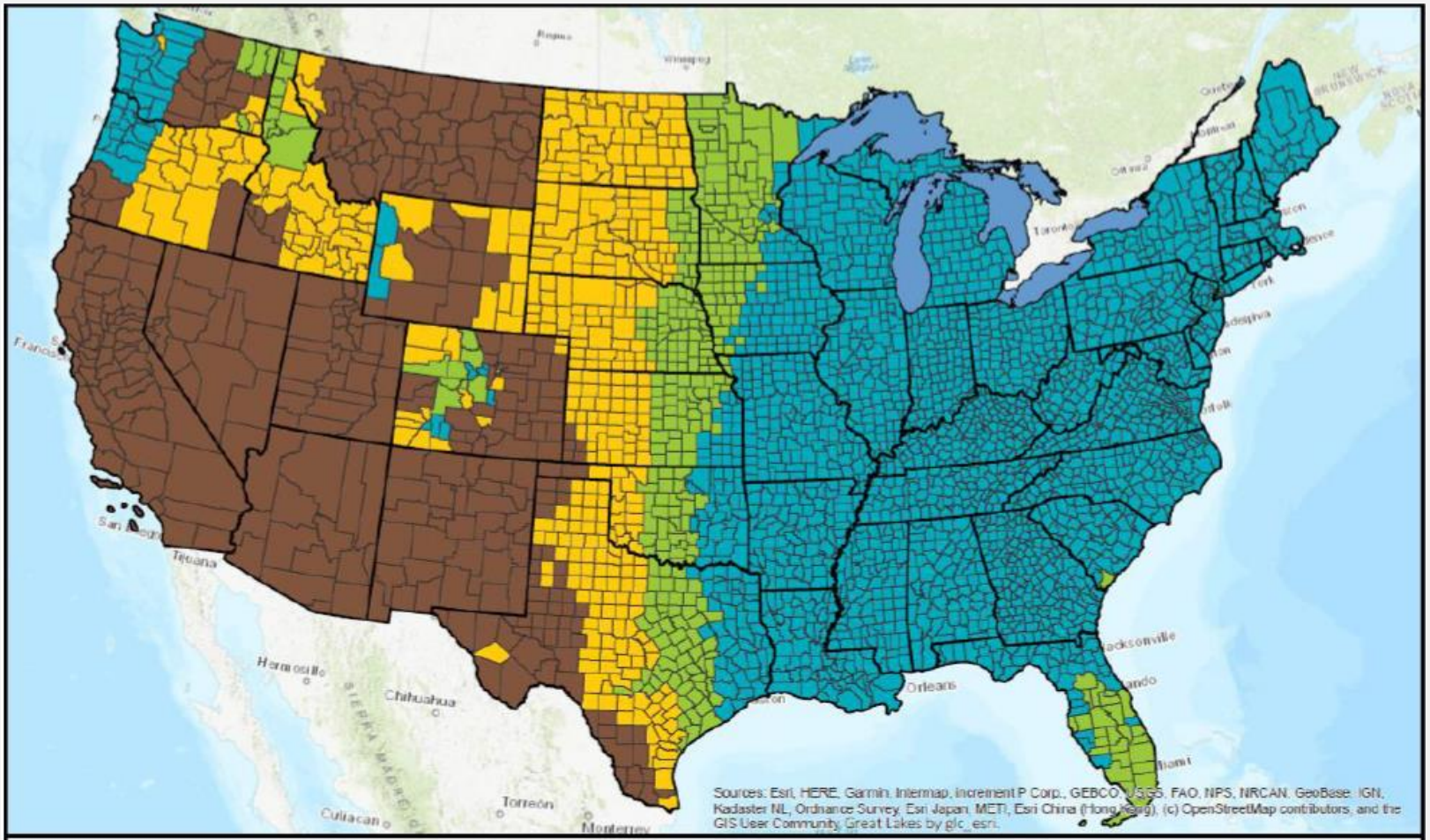
Cover Crop Herbicide Restrictions

- Forage and grain (food chain)
  - Herbicide must be labeled for all crops
  - Rotation/plant back restrictions
  - Forage restrictions (grazing, haying)
- Cover only (soil building or erosion)
  - At your own risk (some labels lack info)
  - Review labels/experience
  - Climate & soils (biological activity)

Herbicide Persistence

- Carryover potential
  - Challenging to predict potential carryover of herbicides to cover crops with exhaustive variables.
  - Careful planning can help increase confidence.
  - When in doubt, perform a bioassay.

Termination Guidelines



Zone 1 - Terminated Cover Crop 35 Days or Earlier Before Planting, except for RMA Summerfallow Practice.

Zone 2 - Terminated Cover Crop 15 Days or Earlier Before Planting, except for RMA Summerfallow Practice.

Zone 3 - Terminated Cover Crop at or Before Planting, except for RMA Summerfallow Practice.

Zone 4 - Terminated Cover Crop Before Crop Emergence.

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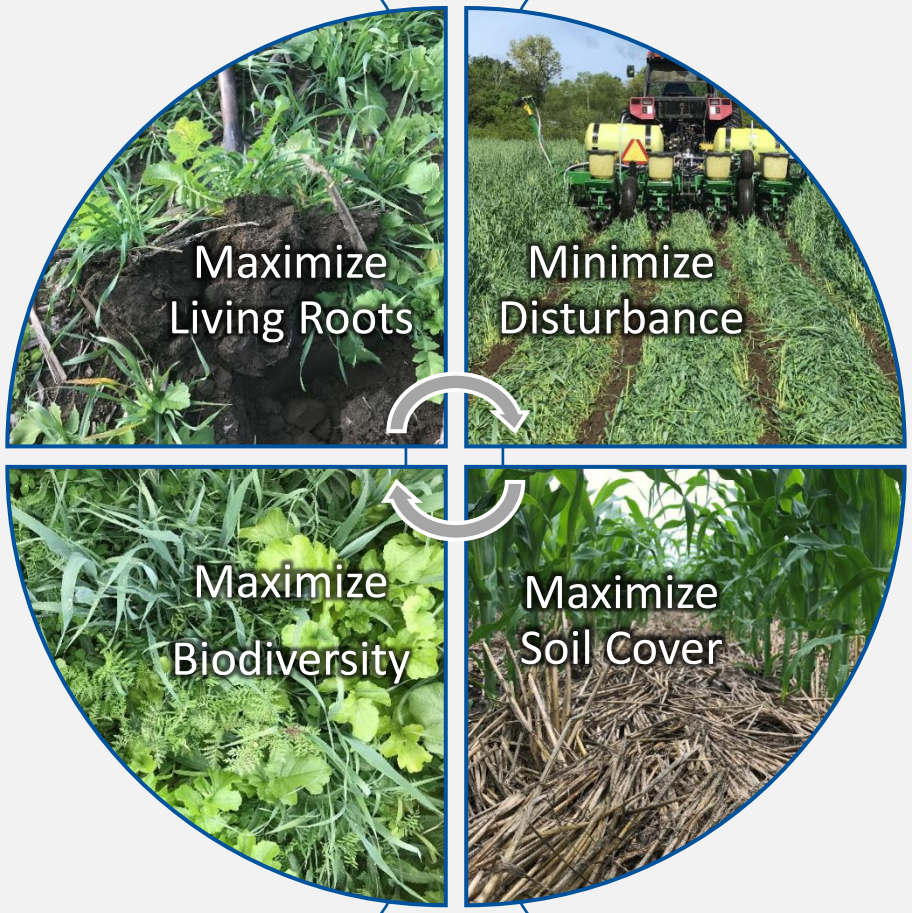
Cover Crop Planning Tools

- Cover Crop 340 Practice Standard
- Cover Crop Councils
- Resources and Publications—Soil Health Division
- Sustainable Agriculture Research & Education (SARE)
  - Online Book and Topic Room on Cover Crops
- Cover Crops for Sustainable Crop Rotation and Soil Health and the SARE cover crops topic room
- No-Till Farmer: The Pluses And Minuses Of Today's Most Popular Cover Crops
- Various industry cover crop calculators

Soil Health Principles to Support High Functioning Soils

Feed

Fuel Soil Biology
Improve Resilience
Improve SOM



Protect

Soil Aggregates
Organism Habitat
SOM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Meeh, NRCS