TECHNICAL NOTE

USDA NATURAL RESOURCES CONSERVATION SERVICE

Plant Materials Technical Note No. 30

January 2025

WA NRCS Cover Crop Calculator

Crimson clover in bloom. Photo source: Washington State Univesity Extension Fact Sheet

Introduction

The WA NRCS Cover Crop Calculator is a tool to help conservation planners plan cover crop mixes for producers using practice 340. The tool is an excel spreadsheet for calculating cover crop mixes on acres for larger fields or square feet for smaller fields. It also includes tabs for the certification process as well as valuable information on seeding rates, termination methods, plant characteristics, and additional references for species of cover crops grown in Washington State. This technical note provides guidance and step-by-step instructions for how to use the WA NRCS Cover Crop Calculator.

Instructions on how to use the WA NRCS Cover Crop Calculator

Calculator (Ac) Tab *Use this tab when planning sites with 1 acre or greater.*

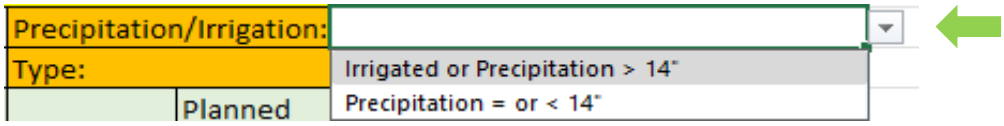
1. Enter producer and contract information in the first section of the sheet.

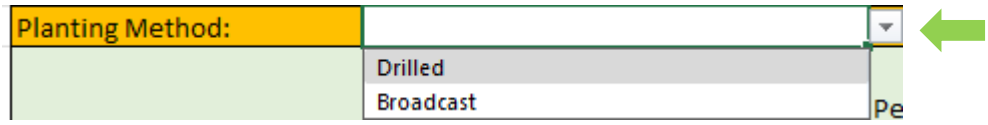
NRCS WA Cover Crop Calculator			
Client:		Contract:	
Farm:		Tract	
Field:		CIN:	
County:		Acres:	
Land Use:		Planner:	

2. Enter planned acres, precipitation/irrigation, planting method, and type of equipment used.

Planned Cover Crop Mixture			
Planned Area (Acres):		Precipitation/Irrigation:	
Planting Method:		Type:	

Note that Precipitation/Irrigation and Planting Methods each have a dropdown menu





3. Use the dropdown menu under Species to select a list of potential cover crop species to seed. If applicable, enter the variety to be used. This will auto populate Crop Type, Full Seed Rate lbs./ac PLS, seed size, and seeding depth for that species.
4. Enter the percentage of the mixture you want for each species. This will auto populate the Planned Rate in lbs./ac PLS, the Total lbs. PLS to be seeded for that species, and the seeds per square foot PLS.

5. At the bottom in the "Total" row, you will see auto calculations of Total Percent of Mixture, Total Planned Rate lbs./acre PLS for the mix per acre, Total lbs. PLS for the total planting area, and Total Seeds/Sq Ft PLS.

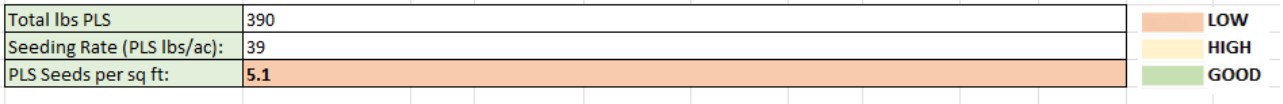
Example:

Planned Cover Crop Mixture									
Planned Area (Acres):	10.00			Precipitation/Irrigation:		Irrigated or Precipitation > 14"			
Planting Method:	Drilled			Type:		Great Plains Drill			
Species	Variety	Crop Type	Full Seed Rate lbs/ac PLS	Percent of Mixture	Planned Rate lbs/ac PLS	Total lbs PLS	Seeds/Sq Ft PLS	Seed Size	Seeding Depth (inches)
Winter Pea		CSL	70	45%	31.5	315	2.5	Large	1.0-3.0
Oat		CSG	70	25%	17.5	175	6.0	Medium	0.5-1.5
Turnip		CSB	10	30%	3	30	13.3	Small	0.25-0.5
Total				100%	52	520	**21.8**		

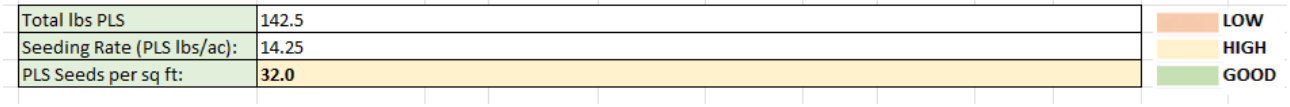
Total lbs PLS	520
Seeding Rate (PLS lbs/ac):	52
PLS Seeds per sq ft:	**21.8**

6. At the bottom of the sheet, the PLS Seeds per sq ft cell will turn either green, yellow, or red depending on whether the mix you created follows NRCS standards.

   Red means this mix will lead to fewer seeds per square foot than recommended. The planner needs to rework the mixture to get a higher amount of seeds per square foot.



   Yellow means this mix will lead to higher seeds per square foot than recommended. This can be a positive or a negative. Positive because a higher seeds per square foot means a higher likelihood of establishment of the cover crop species. Negative because it will be a more expensive mix and there are diminishing returns once you overseed by a certain amount.



Green means Good. If the PLS Seeds per sq ft cell turns green, your mix contains seeds per square foot within the recommended range.

Total lbs PLS	520	LOW
Seeding Rate (PLS lbs/ac):	52	HIGH
PLS Seeds per sq ft:	**21.8**	GOOD

**To change the PLS Seeds per sq ft, you can change the percentages of species planned OR select different species. ****See Seeds Per Sq Ft Tab for more details.

7. This section is also very informative for producers. It includes the total pounds of Pure Live Seed (PLS) they will need for this mix, as well as the seeding rate they should plant in their planned area.
8. The final section of this tab is where the planner can write any additional information about the mix or the cover crop plan.

Calculator (Sq Ft) Tab *Use this tab when planning sites with less than 1 acre*

This tab is set up the same as the Calculator (Ac) tab, but it is meant for smaller fields. Use the same steps (1-8) as above, just note that the units are offered in square feet.

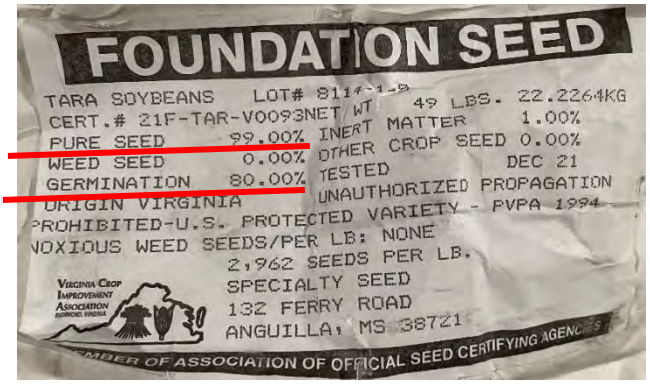
Example:

Planned Cover Crop Mixture											
Planned Area (square feet):	1000				Precipitation/Irrigation:			Precipitation = or < 14"			
Planting Method:	Broadcast				Type:			Manual			
Species	Variety	Crop Type	Full Seed Rate lbs/ac PLS	Percent of Mixture	Planned Rate lbs/ac PLS	Planned Rate oz/sq ft PLS	Total lbs PLS	Total oz PLS	Seeds/sq ft PLS	Seed Size	Seeding Depth (inches)
Triticale		CSG	130	50%	65	0.0239	1.4922	23.8751	20.1	Medium	1.5-2.0
Clover, White		CSL	14	50%	7	0.0026	0.1607	2.5712	124.7	Small	0.25-0.5
Total			144	100%	72	0.0264	1.6529	26.4463	**144.8**		
Total lbs PLS:	1.652892562										
PLS Seeding Rate (lbs/ac):	72										
PLS Seeding Rate (oz/sq ft):	0.026446281										
PLS Seeds per sq ft:	**144.8**										

Cert. Sheet (Ac) Tab *Use this tab when certifying sites with 1 acre or greater.*

When it is time to certify a field for Cover Crop (340), you can come to this tab and enter information the producer has provided. This includes the bulk rate that the producer planted, as well as seed information that can be found on a seed tag from a certified lab. This information includes the % germination and the % purity of that lot of seed for that species.

9. Enter producer and contract information in the first section of the sheet.
10. Enter planned acres, precipitation/irrigation (drop down), planting method (drop down), and type of equipment used.
11. Enter species seeded (drop down) and variety used (type in).
12. Enter the bulk lbs. seeded for each species planted (provided by producer).
13. Enter the percent germination and the percent purity for each species planted (from a seed tag). Example below shows Purity is 99% and Germination is 80%

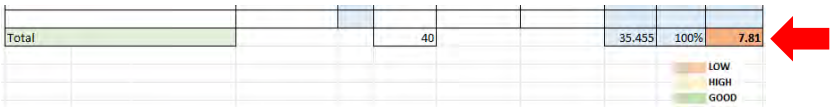


14. Based on the bulk pounds seeded and the information entered from the seed tag, the tool will calculate the PLS pounds seeded, the percents of the mixture that were seeded, and the PLS seeds per square foot that were seeded for each species.

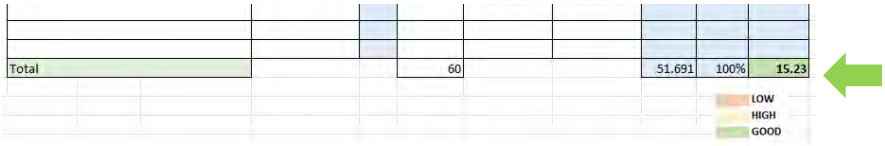
Implemented Cover Crop Mixture								
Acres Seeded:	10.00		Precipitation/Irrigation:	Irrigated or Precipitation > 14"				
Planting Method:	Drilled		Type:	Great Plains Drill				
Species	Variety	Crop Type	Bulk lbs Seeded	% Germination	% Purity	PLS lbs Seeded	% of Mixture	PLS Seeds/Sq Ft
Oilseed Radish		CSB	10	91%	98%	8.918	25%	0.51
Alfalfa		WSL	10	82%	99%	8.118	23%	3.71
Sorghum-Sudan grass		WSG	10	94%	98%	9.212	26%	0.42
Mustard		CSB	10	99%	93%	9.207	26%	3.17
Total			40			35.455	100%	7.81

LOW
HIGH
GOOD

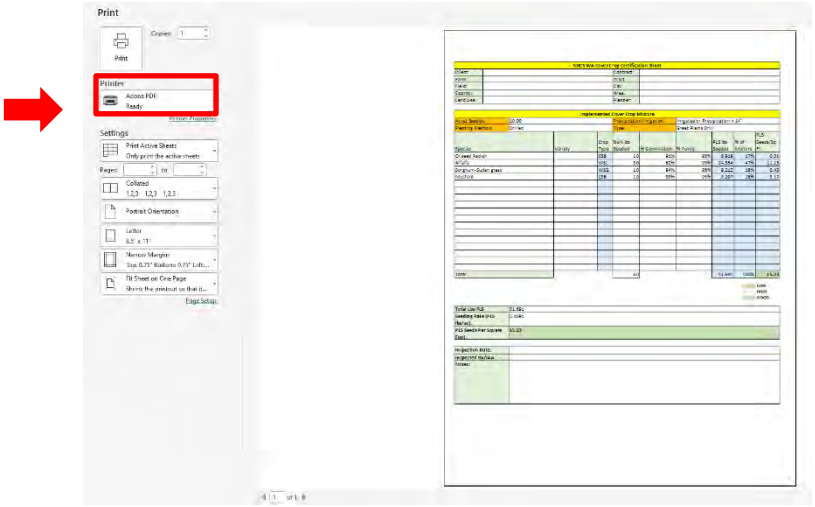
15. At the bottom in the Total row, the PLS seeds per square foot will appear Red, Yellow, or Green. Red means the client seeded lower than the recommended seeds per square foot for the Precipitation/Irrigation entered and the Planting Method. **Red** means they did not seed according to WA NRCS CPS 340 standards and specifications. **Action will need to be taken**. Either the client will need to overseed to meet a minimum seeds per square foot or the planner will have to elevate the question to Area or State Office staff/specialists with the appropriate JAA.



Yellow means the client seeded higher than recommended seeds per square foot. This is fine for implementation and can be certified. **Green** means the client seeded within the seeds per square foot range recommended for the Precipitation/Irrigation selected and the Planting Method selected. **Yellow and Green can be certified**.



16. The bottom section of this tab includes total Lbs. PLS, Seeding Rate in PLS lbs./ac, and PLS Seeds per Square Foot which is pulled from the information you entered above.
17. Manually enter the Inspection Date and name of the person who did the inspection along with their JAA. Notes from the certification can be written in the last section and can include: how cover crop met purpose of the practice, was planting successful, any changes made between planning and certification, termination date/method/height at termination, and any other notes.
18. This certification sheet can be converted to a PDF and spliced into the As Built section of the IR, or can be screenshotted and spliced in, and used along with the rest of the IR/As Built for certification documentation.



Cert. Sheet (Sq Ft) Tab *Use this tab when <u>certifying</u> sites with less than 1 acre*

This tab is set up the same as the Cert. Sheet (Ac) tab, but it is meant for smaller fields. Use the same steps (9-17) as above, just note that the units are offered in square feet.

Example:

Implemented Cover Crop Mixture									
Square Feet Seeded:	1000			Precipitation/Irrigation:	Irrigated or Precipitation > 14"				
Planting Method:	Broadcast			Type:	Manual				
Species	Variety	Crop Type	Bulk oz. Seeded	% Germination	% Purity	PLS oz Seeded	% of Mixture	PLS Seeds/Sq Ft	
Oilseed Radish		CSB	16	91%	98%	14.2688	33%	22.30	
Alfalfa		WSL	8	82%	99%	6.4944	15%	80.77	
Sorghum-Sudan grass		WSG	16	94%	98%	14.7392	34%	18.42	
Mustard		CSB	8	99%	93%	7.3656	17%	69.05	
Total			48			42.868	100%	**190.55**	

LOW
HIGH
GOOD

Seeds Per Sq Ft Tab

There are four different target seeding rates to aim for depending on which Irrigation/Precipitation Regime the site/Client is in and which seeding method the Client will be using.

A. Precipitation =/<14" and Drilled seeding method requires 10-15 seeds per square foot PLS.

B. Precipitation =/<14" and Broadcast seeding method requires 20-30 seeds per square foot PLS.

C. Irrigated or Precipitation >14" and Drilled seeding method requires 15-30 seeds per square foot PLS.

D. Irrigated or Precipitation >14" and Broadcast seeding method requires 30-60 seeds per square foot PLS.

Recommended Seeds Per Square Foot		
	Irrigated or Precipitation > 14"	Precipitation = or < 14"
Drilled	15-30	10-15
Broadcast	30-60	20-30

All seeding rates are based off drilled seeding rates. The broadcast seeding rate is 2x the drilled rate.

Seeds per square foot is calculated by taking the seeds per pound by species, multiplying that by the seeding rate, and dividing by 43,560.

If a planner wishes to create a seeding recommendation outside the recommended seeds per square foot, please consult with Area or State staff/specialists to provide written concurrence that a seeding rate with a seeds per square foot outside the recommended range will meet the purpose of the practice and meet WA CPS 340 standards and specifications.

Seeding Info Tab

This tab provides a plethora of information for many cover crop species.
It organizes cover crop species into six functional groups:

A. Cool Season Grass (CSG)
B. Warm Season Grass (WSG)
C. Cool Season Broadleaf (CSB)
D. Warm Season Broadleaf (WSB)
E. Cool Season Legume (CSL)
F. Warm Season Legume (WSL)

The columns of data include:

- Species common name
- Recommended planting depth in inches
- Information about seeding rate (drilled)
- If an inoculant species is recommended
- Suggested winter hardiness
- Approximate seeds per pound
- Relative seed size
- Minimum temperature for soil germination
- Preferred pH
- Termination methods
- Additional notes

Plant Info Tab

This tab is useful for helping a producer design a cover crop mix. It provides abundant plant information about common cover crop species in Washington State. First it includes a species' common name, scientific name, and whether it has an annual, perennial, or biennial lifecycle.

The rest of the columns provide a general rating for how good a cover crop species is at meeting a certain goal or withstanding certain environmental factors. Ratings are on a scale from 1 to 5. **1 is the worst, 5 is the best**. You can use this spreadsheet to sort (the drop-down button in the title cell) for higher ranking 3, 4, or 5, when looking for certain ecological functions to provide to a site.

One way to use this tab is when you are building a cover crop mix for a specific goal or purpose, i.e.: to treat one or more resource concerns. For example, if your client wants to focus on building organic matter, you can sort the data to rank cover crop species by their strength in that category. Use the drop-down button in the title cell and select 3, 4, and 5. The spreadsheet will now show all cover crop species that are good (3), very good (4), or excellent (5) at building organic matter.

PLANT INFORMATION			
Species Common Name	Scientific Name	Annual Perennial Biennial	OM Builde
Annual Ryegrass	*Lolium multiflorum*	Annual	4
Barley	*Hordeum vulgare*	Annual	4
Black Oat	*Avena strigosa*	Annual	3
Cereal Rye	*Secale cereale*	Annual	5
Oat	*Avena sativa*	Annual	4
Triticale	*X Triticosecale*	Annual	5
Wheat	*Triticum aestivum*	Annual	4
Forage Sorghum	*Sorghum bicolor*	Annual	5
Sorghum	*Sorghum bicolor*		5
Grazing Corn	*Zea mays*	Annual	3
Millet, Brown Top	*Urochloa ramosa*	Annual	3
Millet, Pearl	*Pennisetum glaucum*	Annual	3
Millet, Proso	*Panicum miiaceum*	Annual	5
Sorghum-Sudan grass	*Sorghum bicolor x Sorghum bicolor*	Annual	5
Sudangrass	*Sorghum x drummondii*	Annual	5
Collards/Kale	*Brassica spp.*	Annual	3
Chicory	*Cichorium intybus*	Biennial	3
Okra	*Abelmoschus esculentus*	Annual	4
Clover, Crimson	*Trifolium incarnatum*	Annual	3
Faba Bean	*Vicia faba*	Annual	5
Clover, Red	*Trifolium pratense*	Perennial	3
Clover, Sweet	*Melilotus officinalis*	Biennial	3
Vetch, Woolly Pod	*Vicia villosa*	Annual	3
Clover, Alsike	*Trifolium hybridum*	Perennial	3
Partridge Pea	*Chamaecrista fasciculata*	Annual	3
Alfalfa	*Medicago sativa*	Perennial	4

You can sort additional columns (ecological functions) if you want a mix that has strengths in more categories.

The last 5 columns in this tab include more information about plant characteristics. These comprise of morphologies such as Root Architecture, Shape & Orientation, and Root Depth. Additionally, there are columns for Soil Moisture Use, Winter Survival, and Nitrogen Accumulation. **Site specific conditions may differ, use this data as a starting point.

Termination Tab

The information in this tab is pulled from the Risk Management Agency (RMA) guide for termination. Washington State has all four zones, so look for your specific county for guidance on termination regulations.

General References Tab

The final tab in this tool provides additional references for each cover crop species. Information can be useful for planning cover crop mixes for NRCS contracts and can be provided to provided to clients for references as well.

Acknowledgements

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Plant Materials Technical Note No. 30 prepared by:

Jennifer MacMillan, Agronomist, Moscow, ID, Rebecca Anderson, Small Farms and Urban Ag. Specialist, Olympia, WA, and Steven A. Lee, PMC Manager, Pullman, WA.

Special thanks to Bobby Burken for his work designing the tool.

This Technical Note is a step-by-step guide for the Washington State Cover Crop Tool. It can be used by conservation planners alongside the excel spreadsheet while planning or certifying the Cover Crop Practice (340). It includes calculators for both large (acres) and small fields (sq. ft.) as well as tabs with information about seeding, plant morphology, termination guidance, and additional resources.

Suggested citation:

U.S. Department of Agriculture, Natural Resources Conservation Service. 2025. Cover Crop Calculator. West NTSC Plant Materials Technical Note. Pullman, WA