

Cover Cropping for Soil Health Ravalli County Targeted Implementation Plan



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Targeted Implementation Plan Summary

In response to the Montana Soil Health Strategic Action Plan (Action Plan, NRCS 2020), the Natural Resource Conservation Service (NRCS) Hamilton Field Office (FO) and the Bitterroot Conservation District (BCD) began collaborating to develop strategies to promote soil health practices within Ravalli County. In 2021, the FO and BCD launched their local Soil Health Education Effort which is a public outreach and education effort to promote the implementation of soil health principles and practices. The Soil Health Education Effort has been a multi-faceted approach that focuses on education workshops and offers free soil health assessments to Ravalli County producers. This Soil Health Education Effort has been developed to promote the four soil health strategic goals as outlined in the Action Plan: demonstrate agency-wide commitment to integrating soil health principles across all agency functions; implement soil health principles and promote soil health innovations; develop and strengthen partnerships to increase the adoption of soil health principles; and, provide education, communication and outreach to employees, producers and partners to increase knowledge and adoption of soil health principles.

One goal of the Soil Health Education Effort was to educate local producers on soil health principles as well as gather feedback from them as to what soil health practices they were most interested in pursuing on their farm and ranch. Cover cropping was identified as a soil health practice that was most appropriate and attractive for producers in Ravalli County. The FO will address this priority practice by leading a Targeted Implementation Plan (TIP) to promote the expansion of soil health principles by encouraging the adoption of soil building principles via the planting of cover crops. The priority resource concern addressed in this TIP is Organic Matter Depletion. Secondary resource concerns are Soil Organism Habitat and Wind Erosion. The Ravalli County Local Working Group has also prioritized and highlighted soil health in the Ravalli County Long Range Plan.

Adoption of the cover crop practice addresses several soil health principles such as maintaining soil cover, keeping living roots in the soil as long as possible, increasing diversity in the soil and the integrating livestock back into the management system. In addition to soil health benefits, the practice of cover cropping increases climate resiliency by increasing carbon sequestration. The NRCS has identified a suite of 'Climate Smart' practices that aim to mitigate climate change by increasing carbon sequestration and offsetting greenhouse gas emission. The cover crop practice has been identified as one of those 'Climate Smart' practices.

This TIP will build upon the existing partnership with the BCD and the Montana State University (MSU) Extension office by offering a more competitive payment rate through the Environmental Quality Incentives Program (EQIP) for cover crop adoption as well as providing funding for a greater number of acres and participants. The goal of the TIP is to facilitate the adoption of cover crops on approximately 1,000 acres in Ravalli County over a four-year time period (2024-2027) with a total NRCS financial commitment of \$200,000. A secondary goal of this TIP is to increase the awareness and education of soil health within the Ravalli County. Our partnerships views cover crops as one of the first steps in the progression of adopting beneficial soil health principles. We have found that after producers try cover cropping and begin implementing them with regularity, they more readily adopt other soil health practices such as reducing tillage, rotating crops, and eliminating burning residue from their operation. Our hope is that by encouraging more large-scale adoption of cover crops within our agricultural community, we will be able to more effectively sell additional soil health practices in the future. This TIP will provide the first step in what will become a multi-step journey towards wide-spread progressive implementation of soil health principles locally.

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Geographic Focus

This TIP will encompass cropland and pastureland within Ravalli County. Approximately 24% of land in Ravalli County is privately owned with 65% of the private land in agriculture (53% pasture, 22% crop; USDA 2021). While the geographical boundary of this TIP is large, the scope of work is well-defined and targeted, cover crops on cropland or pasture. Cropland and pastureland are widely distributed throughout the county and focusing within a more specified geographical area would not allow innovative producers the opportunity to participate if they are outside of the boundary. The only instance that cover crops will be used on pastures is when the pasture is in poor condition and is being renovated for several years before being reseeded.

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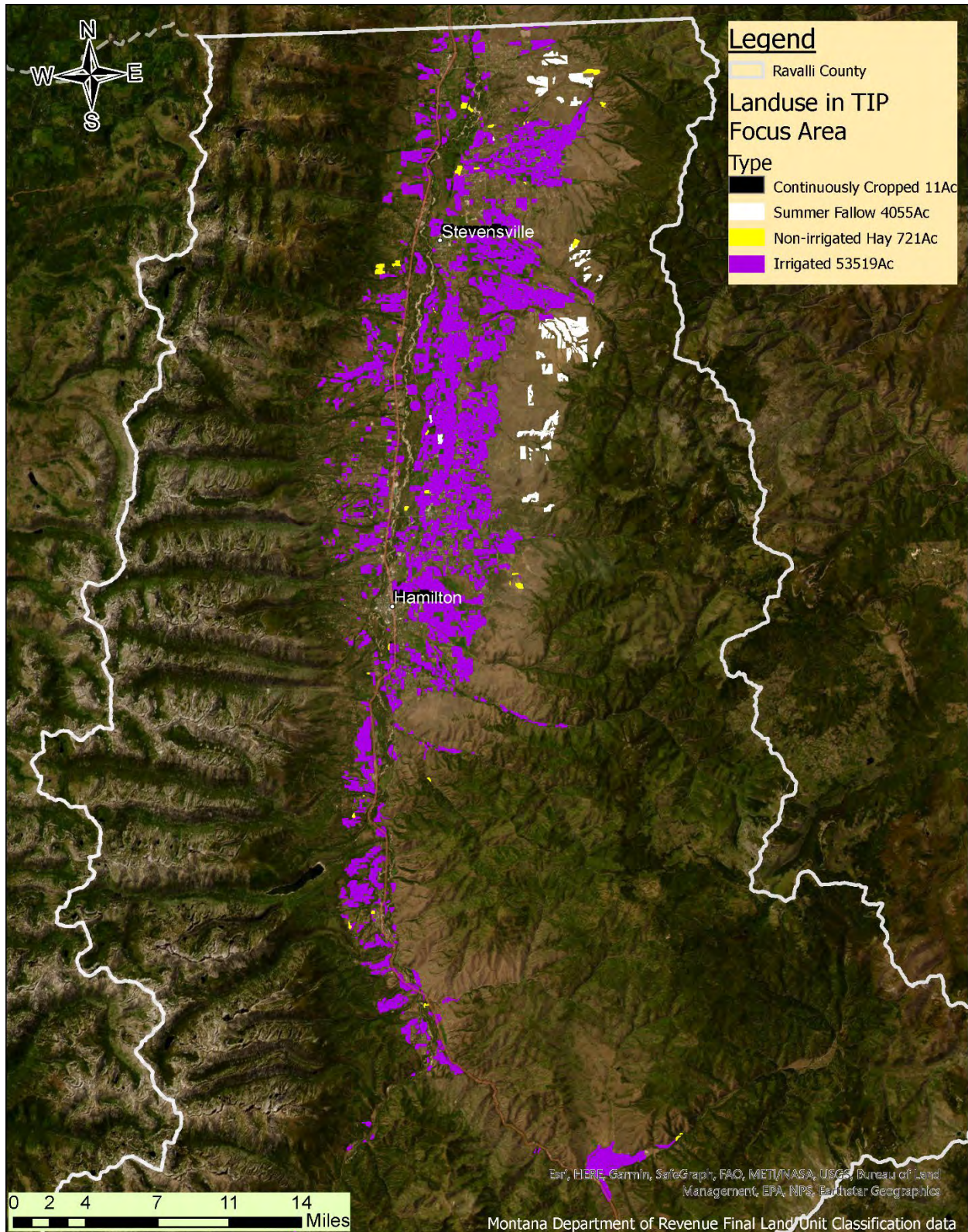


Figure 1: Project Area, Ravalli County. Eligible lands for this TIP include cropland, hayland and pastureland.

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Resource Concerns

The priority resource concern in this TIP is **Organic Matter Depletion**. Secondary resource concerns are *Soil Organism Habitat* and *Wind Erosion*.

One of the benefits of the local Soil Health Education Effort was, not only to have the opportunity to educate local producers about soil health principles, but also for the FO and BCD staff to observe first-hand the soil health condition of cropland and pastureland within Ravalli County. The completion of soil health assessments during the summer of 2021 and 2022 revealed that annual tilling and post-harvest fallow was resulting in low soil organic matter, degradation of soil organism habitat and an increase in wind erosion. During years of small grains or vegetable rotations, fields are tilled, planted in the spring, and after summer harvest, left bare and exposed. The use of annual tillage destroys soil structure and soil organism habitat. In addition, organic matter is rapidly consumed by surface residue decomposers after tillage which further degrades soil microbiology as organic matter is the food source for this biology. After small grains or vegetable harvest, when fields are left bare, they are left exposed to undesirable temperatures and winds during late summer and fall which can occur at the height of intense rain and wind events. This lack of cover and absence of living roots in the soil not only increases the impacts of wind erosion but also further degrades soil organism habitat, soil organic matter and soil health.

Incorporating cover crops into crop rotations addresses both the primary and secondary resource concerns. The use of cover crops entails planting grasses, legumes and/or forbs for seasonal vegetative cover. Cover crops are not cash crops, but instead are planted to build soil health and carbon stocks by reducing erosion, incrementally increasing organic matter, building soil structure and reducing soil compaction.

Goals and Objectives

The primary goal of this TIP is to expand the use of cover crops within Ravalli County to cumulatively treat approximately 1,000 acres within the four-year TIP timeframe. Increasing the use of cover crops will reduce bare ground, reduce erosion, increase soil organic matter, improve soil health and soil organism habitat, produce increased feed for livestock and build healthier soils. It is expected that the integration of cover crops into local agricultural operations will be only a first step towards adoption of more soil health principles over time. The goals and objectives of this project will be completed jointly via NRCS, BCD and MSU Extension.

Ravalli County agriculture is largely forage-based systems; rotations lean heavily towards perennial forages including alfalfa and/or grass hay or pasture. While the significant majority of cropland follows a forage-based rotation, other commonly grown crops on irrigated lands include wheat, barley, oats, peas, and corn as well as numerous smaller community (urban/community) ag producers that grow diverse market vegetables. Employing cover crops on perennial forage rotations is much different than on row crop rotations where cover crops are more commonly used. Planting cover crops in perennial systems can only be done during renovation years when the perennial crop is terminated. Commonly, perennial forages are grown for five to eight years after which they are terminated with herbicide and/or tillage.



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After termination, the fields are typically planted to an annual cereal grain crop for a couple of years; after two years of small grains, they are replanted to perennial vegetation. Most often hay barley or wheat is used during the two years following the perennial crop. The small grain crop is planted in the spring and harvested in mid-July. After harvest, the fields are left bare until the following spring when either another small grain is planted, or the field is seeded back to a perennial crop. It is during these renovation years that cover crops could be implemented to significantly increase the amount of time within the growing season that the soil is covered and maintains a living root in the soil; increase plant and root diversity by planting a diverse cover crop as opposed to fallow; and decrease wind erosion potential by maintaining cover after small grain harvest. Cover cropping would also benefit our community (urban) agricultural producers that often implement extensive tillage during vegetable rotations.

An additional benefit to cover cropping is the opportunity to integrate livestock grazing on croplands. The integration of livestock into management systems is one of the soil health principles. Conservative livestock grazing can improve soil health by processing biomass quickly and accelerating nutrient cycling. The grazing of cover crops would improve soil health as well as provide opportunities to rest pastures within an existing grazing system. The cover crop can be grazed in the fall or winter allowing ranchers the opportunity to rest other pastures and/or reduce hay feeding requirements. Planting a cover crop after small grain harvest works not only during renovation years on perennial rotations but also works well for many of the small grain producers within the TIP area.



Adoption of one of the key components to soil health, cover crops, remains relatively low within the Ravalli County. It is recognized that cover crops play only one part of an overall larger picture regarding soil health, however, encouraging producers to explore the use of cover crops as an introductory first step forward towards a more comprehensive soil health strategy is beneficial. Our work with several local producers who have begun using cover crops has shown this to be true. Our expectation is that this TIP will expand the number of producers in Ravalli County who adopt cover cropping and will lead those producers to progressively implement greater improvements over time.

As previously noted, soil health is highlighted in the Ravalli County Long Range Plan, Section IV, Pg 33. (NRCS 2020) and has been identified as a priority by the Ravalli County Local Working Group.

Alternatives

1. Alternative 1: *Not selected*. This alternative would entail the implementation of cover crops on 1,000 acres over the course of the four-year TIP project. NRCS would assist by providing both technical and financial assistance to producers through EQIP to assist with planting cover crops on private lands. Since Cover Crops (340) would be the only contracted practice for this alternative, there would not be the opportunity to provide technical assistance in nutrient management. While this alternative would provide benefits in promoting soil health practices, it would be narrow and not encompass the complete scope of the goals and objectives of this TIP.

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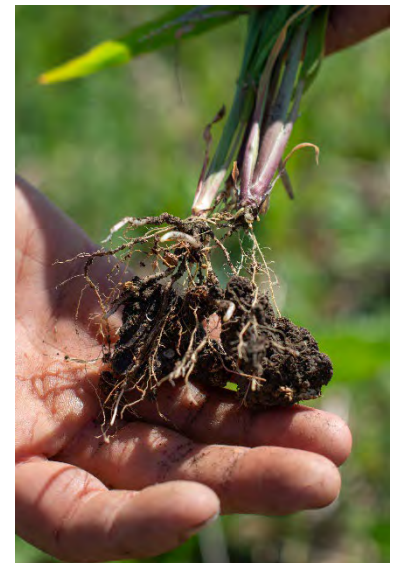


2. **Alternative 2: *Selected Alternative*.** This alternative would include the implementation cover crops and nutrient management on 1,000 acres over the course of the four-year TIP project. NRCS would assist by providing both technical and financial assistance to producers through EQIP to assist with the planning and implementation of Cover Crops (340) on private lands. Cover cropping would maximize soil cover, increase plant and root diversity and maintain living roots in the soil thus decreasing wind erosion, increasing soil organic matter, increase carbon sequestration, and improving habitat for soil organisms. In addition, cover cropping would increase surface residue and reduce wind erosion on these fields. The Cover Crop practice has also been identified as a 'Climate Smart' practice by the NRCS. This alternative would also include implementing nutrient management (590) on 1,000 acres which would ensure that participants are working under an efficient and effective nutrient budget. Implementation of nutrient management would give participants an educational tool for successful crop rotation and soil nutrient management. The Soil Health Testing practice (216) would also be available to applicants as a tool for them to learn more about their soil health and microbiology and track their success. It is expected that this alternative would provide the highest likelihood for expanded use of cover crops and soil health principles within the county over the next four years.
3. **Alternative 3: *No action*.** NRCS will not provide financial or technical assistance to producers to implement soil health strategies. It is likely that if this alternative is selected that the level of implementation and adoption of soil health principles within the work unit would remain relatively unchanged from current conditions.

Alternatives will be analyzed in compliance with the National Environmental Policy Act (NEPA). All practices chosen for implementation will meet NEPA requirements. Special consideration will be given for practices affecting T/E species, such as Canada Lynx and Bull Trout, to meet all federal regulations and NRCS policy requirements. Any cultural resources present will be identified and avoided during the planning and implementation of practices involving any federal action.

Implementation

Public outreach and education will be critical for successful implementation of this TIP. The NRCS FO in partnership with the BCD and MSU Extension will continue to promote soil health principles and practices through workshops, tours and offering soil health assessments. NRCS field staff will work with interested participants in developing and implementing diverse cover crop mixes that augment their operation while addressing resource concerns and improving soil health. Hand-in-hand with soil health is good soil nutrient management that ensures nutrients are managed within an efficient and effective budget. NRCS field staff will work with local producers in interpreting soil nutrient analyses and developing a nutrient budget that promotes diverse crop rotations and meets yield goals. The nutrient management practice will also help guide cover crop species selection. Participants will also be encouraged to complete soil health testing through the Haney Test and the Phospholipid Fatty Acid Test (PLFA). These tests will serve as an educational tool towards understanding soil microbiology, the importance of organic carbon and organic nitrogen and guiding species selection for cover crop seed mix.



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The expected outcomes from the TIP are:

1. Expand the use of cover crops by seeding cover crops on 1,000 total acres during the four-year TIP as shown in Table 1. The cover crop practice will extend the time within the growing season that the soil is covered with diverse, living roots. This practice will reduce exposure to wind erosion, increase organic matter and overall improve soil health and biology.
2. Facilitate nutrient management and soil health testing on 1,000 acres over the four-year TIP timeframe. Nutrient management will provide participants with a tool for understanding their current soil nutrients and ensuring proper nutrient application. Through participation in the soil health practice, participants will be encouraged to complete a Haney and PLFA tests to measure soil health indicators such as organic carbon, total organic nitrogen, microbial respiration, soil biology, and guide development of cover crop seed mix.
3. Increase landowner awareness of cover crops and other soil health principles. Results will be measured by hosting annual tours and/or workshops and conducting soil health assessments during the four-year TIP.

Table 1: Total Anticipated Acres/Year Enrolled in the TIP

Practice	2024	2025	2026	2027	Total
Cover Crop (340)					
<i>Large scale farm, multiple species</i>	180 ac	210 ac	210 ac	250 ac	
<i>Small acreage farm, Community Ag</i>	20 ac	40 ac	40 ac	50 ac	
Total acres in Cover Crop	200 ac	250 ac	250 ac	300 ac	1,000 ac
Nutrient Management (590)					
<i>Large scale farm</i>	180 ac	210 ac	210 ac	250 ac	
<i>Small acreage farm, Community Ag</i>	20 ac	40 ac	40 ac	50 ac	
Total acres in Nutrient Management	200 ac	250 ac	250 ac	300 ac	1,000 ac
Soil Health Testing (216)					
<i>Basic soil health suite (Samples)</i>	15	26	26	32	99

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It is expected that interest in this TIP will increase over time as more producers become aware of the program and understand the benefits that cover crops can provide. The budget projection in Table 2 is based on the 2023 fiscal year EQIP cost schedule.

Table 2. NRCS Budget Projections

CONTRIBUTIONS	2024	2025	2026	2027	TOTAL
Cover Crop (340)	\$26,100	\$38,400	\$38,400	\$47,000	\$149,900
Nutrient Management (590)	\$7,300	\$13,200	\$13,200	\$16,400	\$50,100
Soil Health Testing (216)	\$1,790	\$3,100	\$3,100	\$3,810	\$11,800
NRCS EQIP FA	\$35,190	\$54,700	\$54,700	\$67,210	\$211,800

Ranking Questions:

Applications for this TIP would be assessed and ranked annually and the highest ranked applications would be selected for funding depending on fund availability. Below are the proposed ranking questions:

1. Will the planned cover crop contain at least five different species from at least 2 functional groups?
2. Will the planned cover crop be in place for greater than 90 days during the growing season (growing season is May thru September)?
3. Does the EQIP application include both the cover crop practice (340) and the nutrient management practice (590)?
4. Will the cover crop be grazed?

Partnerships

Public outreach will be a critical element to the success of this TIP. Public outreach events such as tours and workshops will, first, enable producers to understand the importance of soil health principles and how cover crops can play a role in improving soil health. Secondly, public outreach events get producers excited in taking the risk to adopt new practices and provides an opportunity for them to understand how cover crops would fit into their current operation. Promoting the adoption of new practices often requires multiple partners to achieve consistent, widespread outreach.

The following partners will provide assistance with public outreach and education for this TIP:

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- Bitterroot Conservation District (BCD): BCD and the FO have had a longstanding partnership coordinating on conservation efforts. BCD has been a partner in our local Soil Health Education Effort and has assisted in hosting workshops, conducting soil health assessments, and promoting soil health principles in Ravalli County. The BCD is committed to continuing to assist with education and outreach effort to promote soil health and this TIP. Specifically, BCD staff will continue to assist in providing soil health assessments and will host an annual on-site cover crop tour that will highlight successful cover crop projects.
- Ravalli County MSU Extension: MSU Extension has been an active partner with the FO in public outreach and education activities regarding soil health. MSU Extension has coordinated with the FO in conducting winter workshops that focus on soil health principles and practices. MSU Extension is committed to hosting at least one workshop that will focus on the use of cover crops and promote this TIP. They are also committed to disseminating promotion materials regarding soil health assessments and this TIP to the agricultural producers.



Outcomes

The overarching goal of this TIP is to promote the use of soil health practices, specifically cover crops, for improving soil health, soil organic matter, soil organism habitat and reduce wind erosion. The outcomes for this TIP will be measured through acres of cover crops implemented, annual soil health assessments, annual infiltration tests and residue measurements.

Acres of Cover Crops implemented: Since one of the primary goals of this TIP is to educate and promote soil health principles to local producers, acres of cover crops implemented will be a metric that will evaluate the effective of this outreach goal. By working with participants in the design and implementation of cover crops, it will provide NRCS FO staff an opportunity to promote soil health principles and highlight the benefits of soil health practices.

Soil Health Assessments and Infiltration Tests: Participants will receive training from NRCS staff on conducting soil health assessments. NRCS will work with the participant in year 1 of the contract to complete a pre-project soil health assessment and infiltration test that will be used as baseline for a qualitative assessment of soil health. Participants will be provided a soil health assessment card and kit and will be required to complete annual assessments and infiltration tests. NRCS will review the soil health assessment and infiltration rates to identify trends. The projected outcome of this TIP is that soil health will be improved, and soil health assessment scores will trend towards a desired score of 5. In addition, outcomes will be assessed by observing trends in infiltration rates with an increase in infiltration by the end of the project.

Residue Measurements: An increase in surface residue will reduce wind erosion over the short term and increase soil organic matter over the long term. Under the current crop rotations, residue after grain harvest averages 40 percent (790 lbs.). Participants implementing cover crops will complete residue measurements at

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the end of the growing season in cover crop fields. The projected outcome is an increase in surface residue from 40 percent to over 60 percent. This increase in residue will not only reduce wind erosion but improve habitat for soil microorganisms and soil health.

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References Cited

NRCS. 2020. Montana Soil Health Strategic Action Plan. USDA NRCS, Montana NRCS State Office.

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