Practical Winter Cover Crop Mixtures for the Shenandoah Valley

Crop production continues to be an expensive proposition due to high fertilizer, chemical, seed, and other input costs. Planting a mixture of winter cover crop species has proven to be an economical way to lower input costs and improve crop yields. Winter cover crop mixtures can help take up and hold surplus nutrients, fix nitrogen from the atmosphere, relieve soil compaction issues, stimulate a wide array of soil microorganisms, provide weed control, and also deliver many other short and long term benefits. At the same time, winter cover crop mixtures can also provide high quality livestock forage for grazing, silage, or hay.

Below are 16 proven winter cover crop mixtures for the Shenandoah Valley and the recommended seeding rates and dates. The seeding rates below may be reduced, as needed, to cut costs if the purpose of the cover crop is strictly for winter cover. Average local seed costs for 2024 are included for reference.

Seeding Date	Cover Crop Mixture	Seeding Rates per Acre	Seed Cost per Acre	Uses / Notes on Mixture
Early August 20-September 15	Spring Oats Forage Radishes	1.5 Bushels (48 lbs.) 3-5 lbs.	$31-$35	Mid Fall Grazing or Winter Cover Frost/Freezing will kill in Late Fall
	Triticale Annual Ryegrass Turnips	1.25 Bushels (70 lbs.) 20 lbs. 3 lbs.	$55	Late Fall/Spring Grazing or Winter Cover Freezing will kill Turnips during Winter
	Barley Crimson Clover Forage Radishes	1.5 Bushels (72 lbs.) 12-15 lbs. 3-5 lbs.	$56-$67	Spring Grazing, Silage, or Winter Cover Provides Good Nitrogen Fixation Freezing will kill Radishes in Late Fall
	Forage Rye Forage Radishes	1.5 Bushels (84 lbs.) 3-5 lbs.	$33-$37	Spring Grazing, Silage, or Winter Cover Freezing will kill Radishes in Late Fall
Moderate September 15-October 5	Barley Crimson Clover	1.5 Bushels (72 lbs.) 12-15 lbs.	$51-$58	Spring Grazing, Silage, or Winter Cover Provides Good Nitrogen Fixation
	Forage Rye Crimson Clover Austrian Winter Peas	1.5 Bushels (84 lbs.) 12-15 lbs. 8-12 lbs.	$64-$75	Spring Grazing, Silage, or Winter Cover Provides Good Nitrogen Fixation Works well for Rolling
	Triticale Annual Ryegrass	1.25 Bushels (70 lbs.) 30 lbs.	$59	Late Fall/Spring Grazing, Hay, Silage, or Winter Cover
	Forage Wheat Austrian Winter Peas	1.5 Bushels (90 lbs.) 18-24 lbs.	$58-$65	Spring Grazing, Silage, or Winter Cover Provides Good Nitrogen Fixation
	Triticale Austrian Winter Peas Forage Rape	1.5 Bushels (84 lbs.) 15-18 lbs. 3-4 lbs.	$57-$61	Spring Grazing or Winter Cover Provides Good Nitrogen Fixation Works Good for Rolling
	Forage Wheat Forage Rape	1.5 Bushels (90 lbs.) 3-4 lbs.	$43-$45	Late Fall/Spring Grazing or Winter Cover

Seeding Dates	Cover Crop Mixture	Seeding Rates per Acre	Seed Cost per Acre	Uses / Notes on Mixture
Late October 5-October 25	Barley Hairy Vetch	1.5 Bushels (72 lbs.) 15-18 lbs.	**$63-$71**	Silage or Winter Cover Provides Great Nitrogen Fixation
	Triticale Austrian Winter Peas	1.5 Bushels (84 lbs.) 18-24 lbs.	**$56-$63**	Spring Grazing, Silage, or Winter Cover Provides Good Nitrogen Fixation
	Triticale Hairy Vetch	1.5 Bushels (84 lbs.) 15-18 lbs.	**$76-$84**	Silage or Winter Cover Provides Great Nitrogen Fixation
	Triticale Hairy Vetch Austrian Winter Peas	1.5 Bushels (84 lbs.) 12-15 lbs. 8 lbs.	**$77-$85**	Silage or Winter Cover Provides Great Nitrogen Fixation Works well for Rolling
Real Late After October 25	Forage Rye Austrian Winter Peas	1.5 Bushels (84 lbs.) 18-24 lbs.	**$47-$54**	Spring Grazing, Silage, or Winter Cover Provides Good Nitrogen Fixation
	Forage Rye Hairy Vetch	1.5 Bushels (84 lbs.) 15-18 lbs.	**$67-$75**	Silage or Winter Cover Provides Great Nitrogen Fixation

Important Things to Consider when Planting Cover Crop Mixtures:

-For optimal nitrogen fixation by legumes, seed must either be inoculated with the proper inoculant prior to planting or pre-inoculated seed must be used.

-When using a drill to plant, larger seeded species such as Austrian winter peas, vetch, and tillage radishes can be mixed in with small grains in the same seed box. Smaller seeded species such as turnips, forage rape, and crimson clover should be put in a small seed box.

-When nitrogen fixation is a primary objective, legume species should be allowed to get to 20-30% bloom before the mixture is terminated or harvested. No-till planting of the crop following the cover crop mixture is encouraged for maximum nitrogen retention.

-If hairy vetch is included in a mixture with small grain and silage is an objective, harvest should occur when the small grain gets to the flag leaf stage to prevent the vetch from getting too mature and pulling the mixture down.

-For fields where small grains are grown for grain as a part of a crop rotation, vetches and ryegrass should be excluded from mixtures to prevent contamination of future small grain stands. Vetches typically have hard seed that can germinate one to three years after seeding. Ryegrass can be overly aggressive and may go to seed early. This seed may germinate in subsequent years.

-**The cover crop mixtures, their respective seeding rates, and dates listed on this handout do not necessarily align with the requirements of state and/or federal cover crop assistance programs.**

The 16 mixtures included in this bulletin are examples of the many possible winter cover crop mixtures suitable in the Shenandoah Valley. For questions on specific winter cover crop mixtures suitable for your operation, you may contact any of the NRCS staff at the Harrisonburg Field Office at 540-534-3105.

Funding available for NEW acres of conservation practices!

Farmers are eligible to receive payments for committing to BMPs for 5 years on new acres.

Participants in this program may also be eligible for SWCD funding

The following soil-building practices are eligible on owned, rented or leased acres where these practices will be implemented for the **first time:**

- Cover crops
- No-Till
- Manure Injection
- Rotational Grazing
- Cropland Grazing

Contact us to discuss details and eligibility:

Dale Gardener
(540)246-2839
dalegardne@gmail.com

Kevin Tate
(540)383-3417
ktate@shenandoahalliance.org

Shannon Gaffey
(434)566-1358
sgaffey@allianceforthebay.org

ALLIANCE FOR THE SHENANDOAH VALLEY

ALLIANCE for the Chesapeake Bay

CONSERVATION INNOVATION FUND

SMITH CREEK WATERSHED Partnership

Connect with us!

@Smith Creek Watershed Partnership
Website: smithcreekwatershed.com
Small Watershed Coordinator:
Caitlin Worsham
(828) 395-3320
cworsham@shenandoahalliance.org

Funding Opportunities!

BUFFER INCENTIVE PROGRAM

For each acre of new streamside tree planting through program will provide $4,000 up to a maximum of $20,000 per farm.

BUFFER MAINTENANCE PROGRAM

Maintenance for new streamside plantings. No cost to landowners! Invasive species control, tree tube replacement, tree replanting included.

Contact Caitlin for eligibility and program details.

DEMONSTRATION FARMS

5 field days on local farms planned this fall 2024!

Topics include managing grazing rotations, pasture stockpiling, mixed species cover crops.

Follow us at smithcreekwatershed.com or Facebook for dates and times

Denitrifying Spring Bioreactors:
Opportunity for Landowners to Treat Legacy Nitrogen from Springs

Zach Easton and Kurt Stephenson
Virginia Tech
July 2024

Groundwater in many areas of Virginia has elevated levels of nitrogen, mainly in the form of nitrate (NO_3). The nitrate accumulates in groundwater after decades of applying commercial fertilizers and manures in a region. Groundwater eventually emerges from the ground as springs. While nitrate levels in the majority of Virginia springs (<10mg/l) are not thought to be high enough to harm human or animals, elevated levels of nitrate can adversely impact downstream water quality by contributing to excess algae growth. Higher algae growth can adversely impact fish and other aquatic organisms by reducing the amount of oxygen in the water.

Virginia Tech seeking landowner assistance. The state of Virginia is working with Virginia Tech to pilot the use of bioreactors to reduce nitrate levels in springs. Virginia Tech is seeking landowners who would be willing to consider siting a bioreactor on their property. Virginia Tech would incur all installation costs and would be responsible for all construction. A spring must have sufficient flow and nitrogen levels for treatment. Springs should have an average flow of 10 gallons per minute, and ideally run all year (see pictures below).

Benefits for the landowner. The landowner would receive financial payments for hosting a bioreactor. Since the bioreactor is a designed water quality practice, it is unsuitable for livestock grazing or crops. The only thing the landowner must do is agree to keep the bioreactor in grass. The landowner would also receive a water quality test of their spring water at no charge. Finally, the landowner would be helping improve water quality for all Virginia citizens.

Spring near Berryville,
~20 gallons per min.

Spring near Harrisonburg,
~600 gallons per min.

Interested landowners should contact:

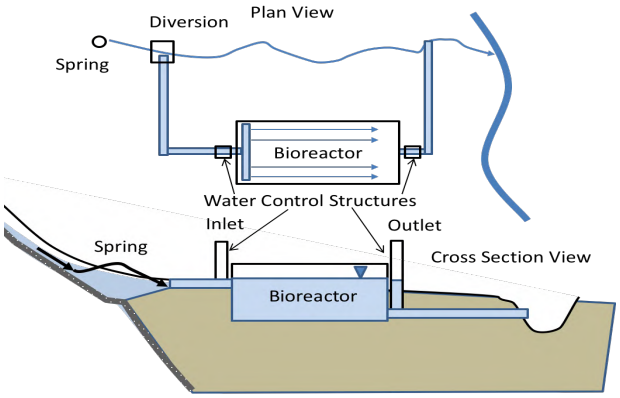
Zach Easton, Professor
Dept of Biological Systems Engineering
Virginia Tech
zeaston@vt.edu

Kurt Stephenson, Professor
Dept of Ag & Applied Economics
Virginia Tech
kurts@vt.edu

What is a bioreactor and how does it remove nitrogen?

Bioreactors are lined pits filled with woodchips. Spring water is diverted into the bioreactor. Naturally occurring microbes then use the woodchips as an energy source to convert some of the nitrate (NO_3) in the water into harmless dinitrogen gas (N_2) that is released into the atmosphere. Dinitrogen gas makes up 78% of the air we breathe. The water is then released back into the stream. The bioreactor is topped with a foot of soil and planted in grass.

Bioreactors are typically rectangular with the length 3 to 4 times longer than the width and can range between 2 and 6 feet deep. Bioreactors can range in size and are designed based site-specific conditions. The operational life of a bioreactor is between 10 and 15 years.



This diagram shows an above view and cross section view of a spring denitrifying bioreactor. Water control structures at the inlet and outlet of the bioreactor regulate the amount of water flowing into the bioreactor and the height of the water in the bioreactor.

Bioreactor under construction (right): A large bioreactor was constructed east of Harrisonburg to remove nitrogen from a spring to Smith Creek. The white liner keeps the water from leaking out of the bioreactor. The bioreactor is approximately 3 feet deep. Woodchips are being placed in the lined pit. (Photo courtesy of Phil Davis).

Completed bioreactor a month after construction (right): A portion of the spring water in the spring is diverted into the bioreactor through a diversion pipe at the spring (white pipe, right hand-side of picture). This bioreactor captures about 20% of spring flow and the rest of the flow remains in the stream channel. Treated water is discharged back into the stream channel a few hundred yards downstream of the spring.