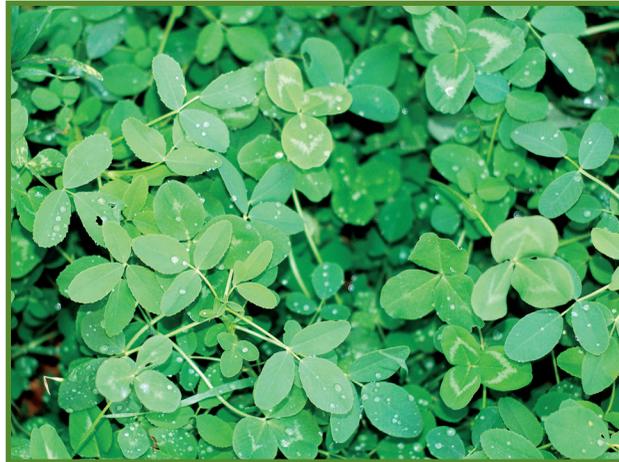


6. The broadcast seeder is correctly calibrated. Red clover should be spun on at 3-4 lbs/A if frost-seeded every year, and 6-8 lbs/A if every other year or a first-time seeding. White or ladino clovers go in at 1-2 lbs/A, and are longer lasting, so they won't need an annual reseeding.

7. Post-seeding management is sound. Treat the new seeding as you would any new and fragile stand. Your newly seeded clover won't yield substantially until early summer. If you frost-seeded a hayfield, take a timely first cutting to open up the stand for the clover to take off. Keep harvest height above 3 inches. In the small grain scenario, a few weeks after grain harvest, the clover hay can be cut as "stubble hay," incorporating some of the small grain straw to add effective fiber to the rich clover. Alternatively, the clover can be left as a cover crop over the summer for nitrogen credits and sprayed or plowed under for a late summer planting, or left over winter for a spring planting the following year.



Clover seeds that were frost-seeded into a wheat stand. Ground is frozen and soil exposed.



3-Way Clover getting a head start in the spring



Frost seeding works in later-planted wheat (right) but not thick, early-planted barley in which no soil is exposed (left).



FROST SEEDING

Rejuvenating Pastures

Establishing A Cover Crop



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Frost-seeding is one form of over-seeding, in which you can use legumes to economically and quickly thicken a pasture or a perennial hayfield in late winter. Though no-till drilling has more guarantee of success, frost seeding is an easy operation while you have time in the off season, and if managed correctly and timed properly, has good likelihood of success. Clover eventually contributes to grass yield in a pasture by fixing nitrogen, and many legumes can help offset the summer slump that grasses experience (as well as boost the nutritional value of the forage). Red clover has the potential to increase forage yields by 30%, and protein levels by 3-5%. It is more agronomically adaptable, and more palatable as a feed than alfalfa.

There are two scenarios in which frost-seeding is appropriate:

- a) A pasture or hayfield is thinning and more legumes are desired. There is plenty of exposed soil and the existing stand was ideally grazed or mowed down very short pre-winter.
- b) A field with a fall-planted small grain (grown for grain, not forage), in which a legume cover crop and/or hay crop is desired immediately following the grain crop.



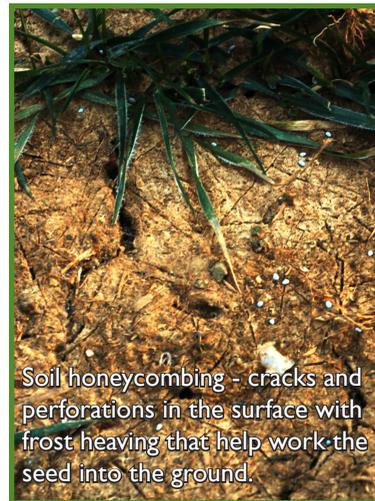
Herd Seeder broadcasts seed from the back of the tractor.

In either case, you are establishing a crop in an existing crop so you need to make sure:

1. There is little competition from the existing

stand and plenty of exposed soil (free from both residues and existing stand). In a pasture or hayfield scenario, if some bare ground is exposed but you are unsure if it's enough, you can open up the stand a little bit with a chain drag, light vertical tillage, an aerator, or a light disking.

2. Weather conditions are right: ground is frozen solid in the morning to drive or walk over while broadcasting, and thaws in the afternoon. The expansion and contraction of this freeze-thaw cycle, as well as subsequent spring rains, works seed into the ground and creates the seed to soil contact necessary for germination. Clay soils tend to experience more of this shrinking and swelling than sandy soils. This makes sense, since clay types hold more moisture, the component in soil responsible for expansion with freezing.



Soil honeycombing - cracks and perforations in the surface with frost heaving that help work the seed into the ground.

3. Soil conditions are hospitable to new seedlings, including drainage, pH, nutrient content. However, soils with a high N content, such as well-manured pastures, are not as ideal, as the extra fertility will cause the grass to take off at spring green-up and be overly competitive with new seedlings, in which case we may not see much clover until the summer.

4. The added species are appropriate. **Red clover (popular types include Freedom!, Milvus, and Common Medium Red)** is often recommended for frost seeding because of its small round seed size, excellent seedling vigor and shade tolerance, allowing it to thrive for a time under the canopy of grass or small grain. It tolerates a range of conditions, including pH, fertility, drainage, and drought. **White clover (varieties include smaller leaved, spreading Dutch white clover, medium whites like Alice, or larger leaved ladino types like RegalGraz**



Premium Clover blend mixed in a seed-spinner bag.

with less spreading) is acceptable as well. However, red clover is ideal for grazing or haylage-only systems as it provides better yields. **Premium Clover Blend, a mix of red and white clovers,** works very nicely in a pasture or small grain setting, and establishes greater diversity.

Alfalfas and grasses are often not as successfully frost-seeded, because the seed is larger and doesn't work through as easily into the soil surface. If you do use grasses with other species, keep in mind that because of varying size, each species will have a different reach when broadcast. Additionally, if you decide to try alfalfa, don't seed it into existing alfalfa (it is autotoxic). Grasses that have worked occasionally for frost seeding are the small seeded ryegrass or hulled orchard grass.

Some clover species are also not appropriate for pastures and/or this early-season time

frame. Mammoth Red Clover, for example, is shorter lived and doesn't fit in a perennial pasture or hayfield that is going to be cut or grazed on a regular basis.

If seeded in the fall, Mammoth will give us one big cutting the second year (after it overwinters). If seeded in the spring, it will give us one big cutting the first year, but later in the season that same year.

This could potentially be frost seeded for a "one time cut scenario" if it were the only legume seeded in a small grain, where the



Old-style Cyclone Seed-spinner bag

clover would be harvested after the fall grain harvest. It may also work

better planted with spring oats then left to grow after oat grain harvest for one big cut later in the year. But it doesn't fit well in with other perennial clovers and grasses that are getting grazed or cut on a 25 to 30 day basis.

Crimson clover is also not as suitable, as it is a winter annual (not a perennial for multiple cuts or grazings) and does best when fall planted and vernalized. (The seed is also too large for optimal frost seeding.)

5. Legumes are properly inoculated with the correct strain of Rhizobium bacteria, for optimal nitrogen fixation. Many of our clovers come with a coating that includes inoculant.