Soil Health Project Monitoring

In addition to crop production, this project will track a variety of physical, chemical and biological soil parameters to monitor changes in soil quality on the study plots. Standard soil samples will be submitted annually to quantify nutrient status and changes in organic matter. In 2011 a baseline Soil Food Web Analysis was completed to document the number and type of critters present in the soil prior to treatment. This test will be repeated at the end of the trial to see if anything has changed. In 2013 the NRCS will also assist in conducting an Active Carbon Assessment of each plot to evaluate biological activity.

2012 Selected Soil Test Results

	%Organic Matter	Nitrogen (lbs/ac)
Tilled Barley	4.1	28
No-Till Barley/Peas	4.8	54
No-Till Barley	4.2	30
Baseline Grass	5.0	28
Cover Crop	5.2	50

Baseline Soil Food Web Analysis Results

Active Bacteria-	Above Range
Total Bacteria-	Above Range
Active Fungi-	Below Range
Total Fungi-	Above Range
Flagellates-	Low
Amoebae-	Low
Ciliates-	Low
Nematodes-	Low

Outreach

Local ranchers came out to see the cover crop and no-till plots first hand at the 2012 field tour. Here they are standing in the cover crop cocktail looking at a patch of healthy sorghum/sudangrass, which is not typically grown in this part of the state.

For the past two summers the Ruby Habitat Foundation has worked with the Ruby Valley Conservation District and the Sheridan NRCS field staff to host a tour of the Soil Health project site. This field day provides an excellent opportunity for local land managers to hear what is going on out here and see the results first hand.

Walking through the field, listening to the buzz of pollinators, picking turnips, and digging in the soil is really the best way to understand this effort.

Please join us again in 2013 to see what is happening in the field!

RUBY HABITAT foundation

USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service

Soil Health Project 2013 Update

Look for:

Soil Health Basics

- Keep the Soil Surface Covered
- Reduce Disturbance
- Encourage Diversity
- Keep Living Roots in Soil for as Long as Possible
- Incorporate Proper Livestock Grazing

Why So Much Interest in Soil Health?

Across the nation Soil Health is being discussed more and more at agricultural producer meetings, USDA offices, the halls of Congress, and local diners. Much of the conversation is focused on improving soil structure and biological activity to address environmental concerns and improve crop production.

Soil Health is not a new idea. For centuries people have recognized that productive soils are alive and thriving with life. Whether or not they knew the names of the bacteria and fungus doing all the work did not matter.

They saw firsthand that crop residue, manure, and plant diversity were good for production. While excessive tillage, erosion, depletion of soil nutrients, and crop monocultures could lead to a host of problems.

As we have "progressed" in agriculture, some of these stewardship fundamentals have been set by the wayside as chemicals and other tools have been developed to deal with poor fertility, compaction, insects, weeds and drought. We keep inventing expensive band-aids, but often fail to address the underlying problems.

The Soil Health movement aims to incorporate basic soil health fundamentals back into modern agriculture. By recognizing the importance of soil biology we can address underlying problems and build soils for long term success.

Healthy Soil Provides Countless Environmental Benefits While Allowing for Sustained Crop Yields.

We sometimes hear "these concepts don't apply here." However, that is simply untrue! The importance of Soil Health applies everywhere, including the Ruby Valley. The trick is to learn how we can use progressive tools and techniques to meet our local objectives

Did You Know?

A Handful of Healthy Soil Contains over 6 Billion Living Organisms

Bacteria in Legume Roots Can Fix Free Nitrogen From the Atmosphere

Proper Livestock Grazing Stimulates Production Both Above and Below-ground

Soil Health Project Overview

Since 2011, the Ruby Habitat Foundation has been working with the Natural Resources Conservation Service on a 5-year Soil Health trial to evaluate the effectiveness of no-till seeding and cover crop cocktails in Southwest Montana.

Nationwide, these technologies are being touted as important tools for improving soil health. No-till seeding reduces disturbance to biological systems, maintains soil structure and preserves surface residue.

Cover crops can be used for many things including reducing compaction, smothering weeds, fixing atmospheric nitrogen, attracting wildlife and pollinators and on and on.

However, these tools are unproven in our area, and many landowners have questions about their effectiveness and economic feasibility in local agricultural systems.

Therefore, the Ruby Habitat Foundation has set aside 45 acres to experiment with these technologies over a 5 year period. In addition the study will evaluate the benefits of commercial fertilizer in each treatment.

This project will allow us to measure crop yields and track changes in soil fertility while comparing production costs between traditional, no-till and cover crop farming systems.

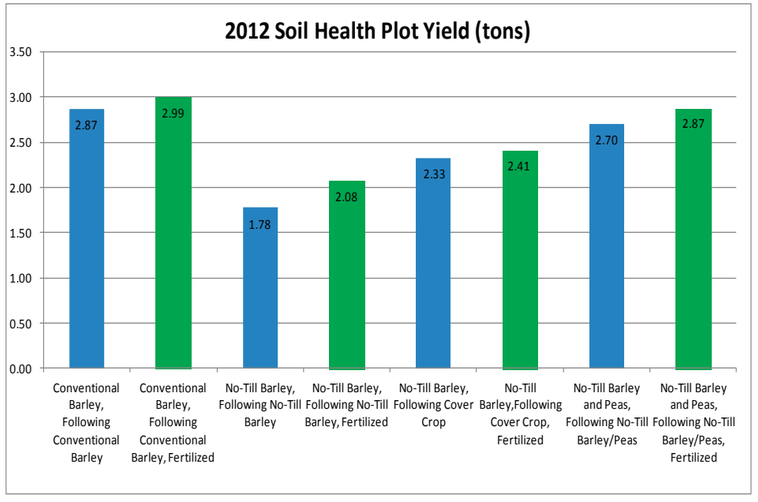
2012 Production Results

This chart illustrates differences in production among treatments in 2012.

Yields were the highest in conventionally tilled systems. However, the inclusion of forage peas in the no-till plots increased yields considerably, almost matching the conventional system.

The no-till plots that were in a cover crop in 2011 had greater production than plots that were in hay barley in 2011. This suggests a cover crop can provide important nutrients for the following crop.

It was surprising to see how little yield was gained by applying conventional fertilizer.



The Ruby Habitat Foundation's 12' Truax No-Till Drill hard at work planting Hay Barley into an old grass stand on the Woodson Ranch

How Does No-Till Work?

Traditionally farmers and ranchers have relied on a variety of tillage implements to terminate crops, incorporate residue and manure into the soil, fight weeds, and break up compaction. Conventional tillage tools include moldboard plows, chisel plows, disks, harrows, culti-packers and more.

These tools have their place, and may still be needed in certain situations. However, intensive tillage destroys soil structure and biological systems that are critical for cycling nutrients, storing water, preventing erosion and a host of other important services.

No-till farming relies on chemical control of existing crops and weeds. Sharp metal disks on the no-till drill then create small slits through surface residue and the soil where the seed is then planted. Benefits are great due to reduced disturbance and lower labor and fuel costs.

The Numbers

While the utility of no-till farming for reducing disturbance and erosion is well documented, local producers are hesitant to convert to this technology due to perceptions of equipment costs and lost productivity.

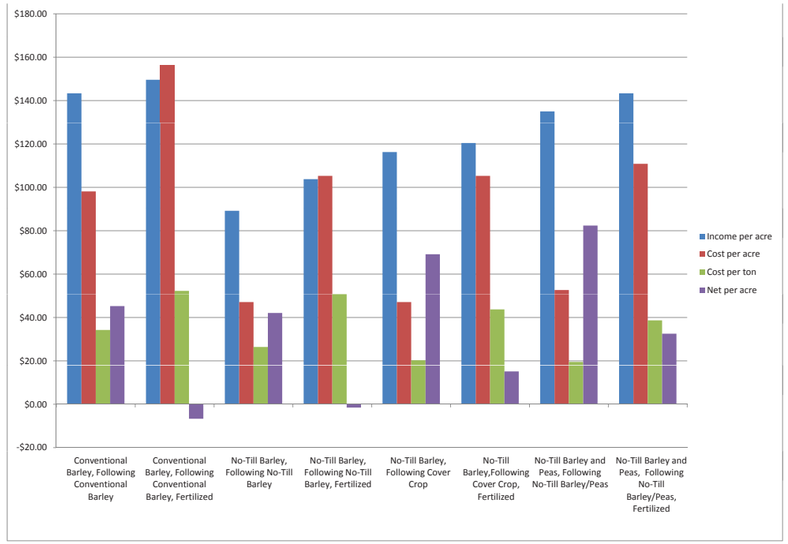
Our yield data indicate that production can indeed be lower in no-till situations, at least for the first couple years. Literature related to this phenomena suggests that yields can be lower when converting to no-till because nitrogen is initially "locked up" in bacteria that are eating the old residue. Oftentimes this can be offset with additional fertilizer in early years, until the biological system catches up.

Despite slightly lower production, the economic data from 2012 demonstrate that net profits from no-till can match or even exceed those of conventional farming.

Greater net per yield is due to lower input costs associated with no-till systems. No-till requires fewer passes with heavy tillage equipment which reduces both labor, equipment, and fuel costs.

The chart shows that highest profits in 2012 were realized in plots with no-till barley following a cover crop, and no-till barley and peas. The chart also demonstrates that commercial fertilizer does not always pay for itself.

Net profit was lower in every treatment when fertilizer was applied, and money was lost when fertilizer was used in the conventional and no-till barley systems.



What is a Cover Crop "Cocktail"?

Cattle from P&J Ranches dine on a mixture of Radishes, Turnips, Oats, Sunflowers, Millet and Peas at the Woodson Ranch. Forage production exceeded 2 AUMs per acre, making this cover crop cocktail a viable option for building soil while providing a nutritious late summer or fall forage for livestock.

Cover crop "cocktails" are becoming a very popular tool for improving soils and reducing expensive inputs.

Diverse mixes of annual crops can fix nitrogen, increase organic matter, reduce compaction, make deep nutrients available to subsequent crops, stimulate nutrient cycling, smoother weeds, and increase soil biological activity.

Just about any annual crop can be included in one of these cocktails. However, it is important to match the species mix with your local growing conditions and land management objectives.

For example, if fixing nitrogen for your next crop is your goal, include more legumes. If you want to increase organic matter and residual cover than consider high carbon species like corn, sorghum or other grasses. Radishes can be used to break up compaction, and turnips can scavenge nutrients from deep in the soil for subsequent crops.

Cover crops can make excellent late season forage. However, always make sure the "cocktail" does not contain any potentially toxic species for your class of livestock.