Southwest North Dakota Soil Health Demonstration Project
To illustrate how no tillage and a diverse crop rotation including cover crops will improve soil health. Established 2008.



The Soil Health Demonstration site is located on the NE 1/4 of Section 24 T143N R96W Dunn County, North Dakota of the Dickinson Research and Extension Center two miles south of Manning, ND.

| Field 8<br>18.8 ac.<br>First year Alfalfa  | Field 1<br>18.4 ac.<br>10-way cover crop mix for<br>the entire growing season.                                  |
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| Field 7<br>18.1 ac.<br>First year Alfalfa in lieu<br>of Second year Alfalfa.   | Field 2<br>18 ac.<br>Spring Wheat<br>Winter Wheat will be planted after<br>Spring Wheat is harvested for grain. |
| Field 6<br>13.1 ac.<br>Spring Wheat in lieu of 3rd<br>year Alfalfa<br>Winter Triticale and Hairy<br>Vetch will be planted<br>after Spring Wheat is<br>harvested for grain. | Field 3<br>14.5 ac.<br>Field Pea<br>7-way cover crop will be<br>planted after pea crop is<br>harvested for hay. |
| Field 5<br>18.3 ac.<br>Barley in lieu of Winter Triticale/Hairy Vetch<br>7-way cover crop mix will be planted after<br>barley is harvested for hay.                        | Field 4<br>18.7 ac.<br>Corn<br>7-way cover crop mix will be planted<br>after corn is grazed in August.          |

## Range of Selected Benchmark Soil properties (0-5cm)

- Soil texture of fine sandy loam to silty clay
- Soil Organic Matter 2.3% to 3.0%
- Water infiltration rate 1.33 to 1.62 in/hr
- Soil Bulk density 1.43 to 1.67 gr/cc
- Iectrical Conductivity .43 to 1.06 dS/m

Sampling/Testing

Soil Food Web analysis

- Standard soil tests (NDSU or Agvise)
- Soil Quality test kit

## Soil Changes from 2008 to 2011

Averaged across all eight fields 0-5 cm (range of values measured)

- Organic Matter increased .06% (2.3% to 3.0%)
- Electrical Conductivity decreased .23 dS/m (.43 to 1.06 dS/m)
- Amoebate Protozoa increased 7,727 (no/gr) (5,000-30,000)
- Ciliate Protozoa decreased 12.4 (no/gr) (0-150)
- Total Nematodes decreased 4.9 (no./gr) (0-16)
- Spp. of Bacterial Feeding Nematodes increased 1.25 (2-6)
- Spp. of Fungal Feeding Nematodes increased 2.25 (0-5)
- Spp. of Fungal/Root Feeding Nematodes increased by 1.0 (2-5)
- Spp. of Root Feeding Nematodes decreased by .25 (0-3)

## Changes in Protozoa relative to plant species diversity (2008-2011)

- I2 or more species of plants on a field
  - Amoebate protozoa increased an average of 25,994 per gram of soil. (5,000-32,000)
  - Flagellate protozoa increased an average of 3,378 per gram of soil. (500-15,000)
- It or fewer species of plants on a field
  - Amoebate protozoa declined an average of 3,232 per gram of soil. (5,000-32,000)
  - Flagellate protozoa declined an average of 7,085 per gram of soil. (500-15,000)

## Observations to date (2011)

- Organic matter trending upward.
- Salinity trending downward.
- Amoebate Protozoa trending upward.
- Species diversity of Nematodes trending upward.
- Increased diversity of plant species resulting in greater protozoa numbers.
- Elimination of tillage and increase in plant diversity is having a positive affect on key soil physical and chemical properties and increasing the population and species diversity of key soil organisms.