Lower Platte South NRD

DRINKING WATER PROTECTION MANAGEMENT PLAN

WAVERLY-COMMUNITY WATER SYSTEM PROTECTION AREA (CWSPA)

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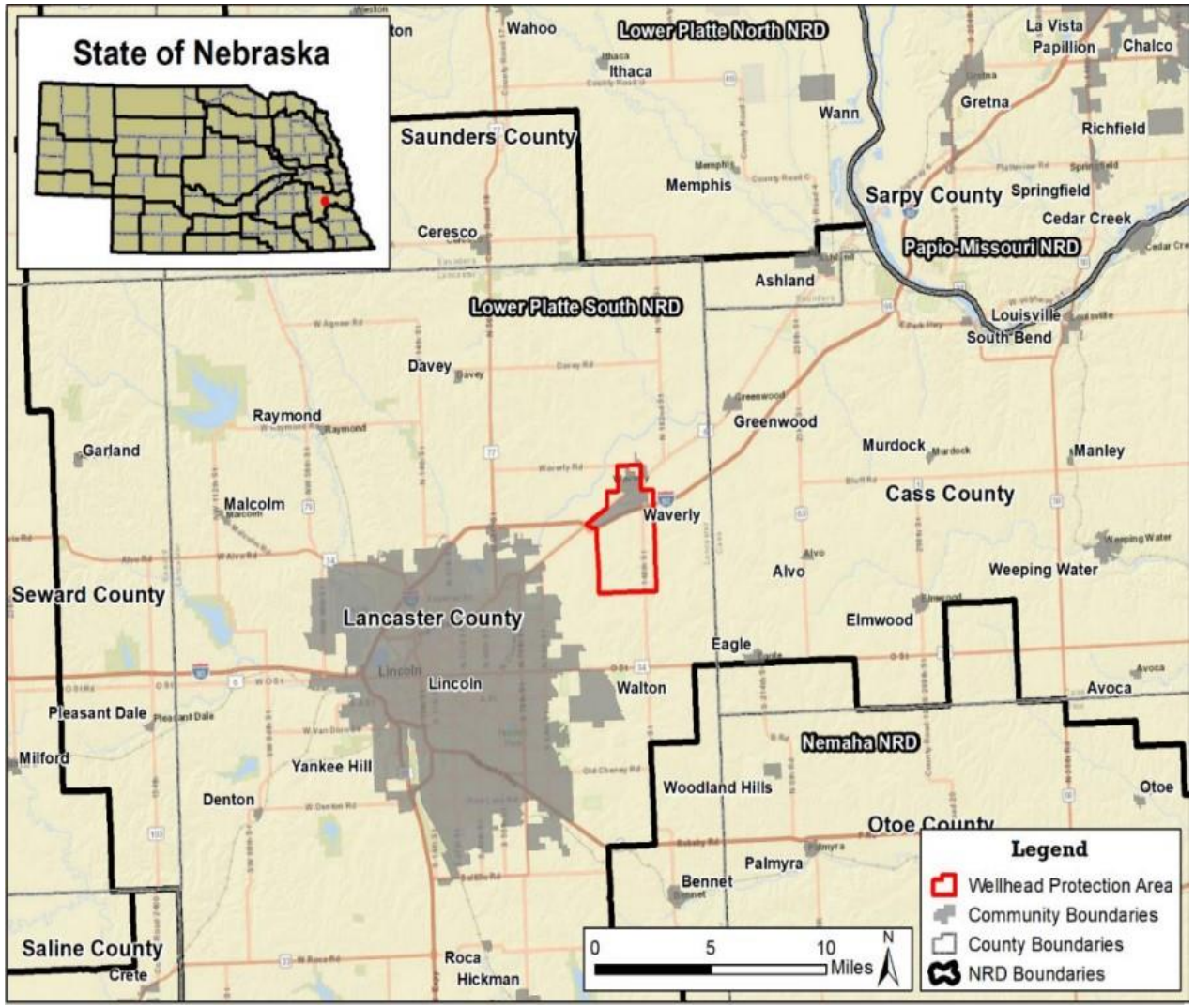
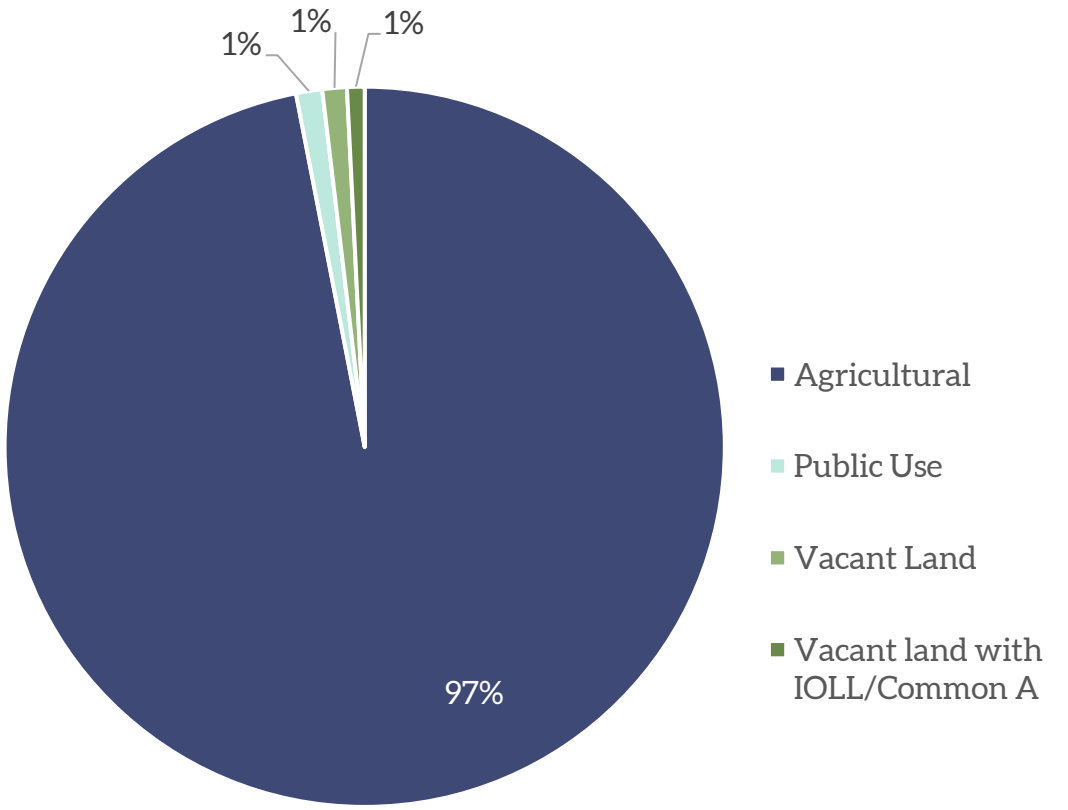
WAVERLY CWSPA (WHPA)

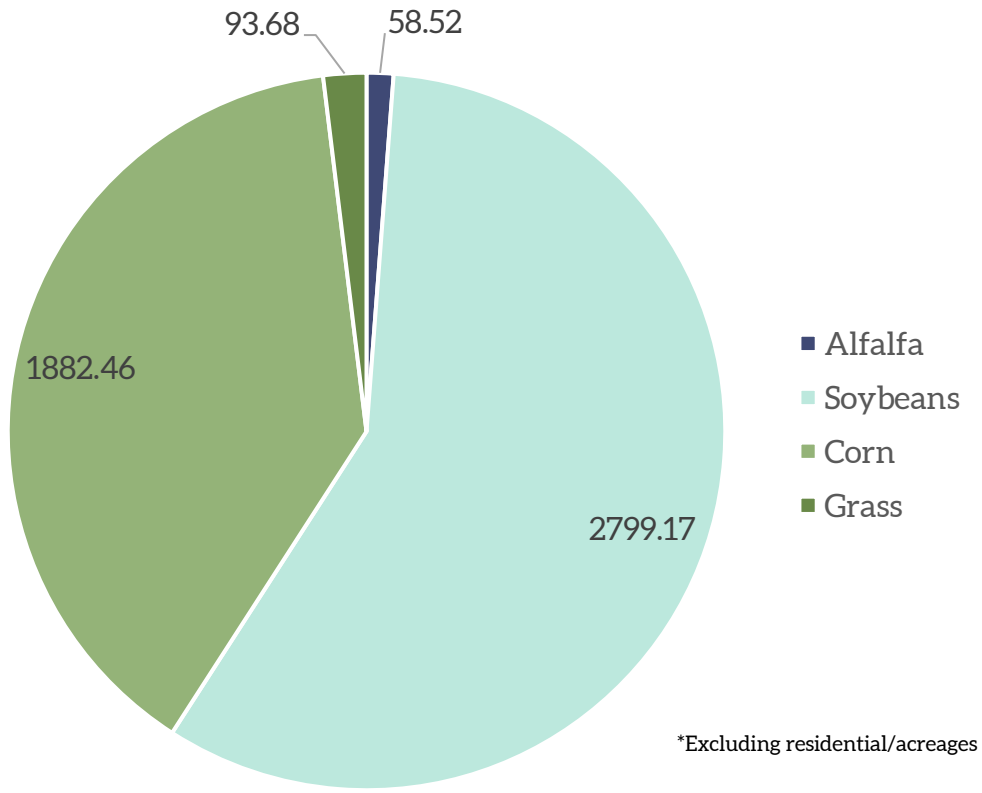


WAVERLY CWSPA (WHPA)

WAVERLY CWSPA LAND USAGE

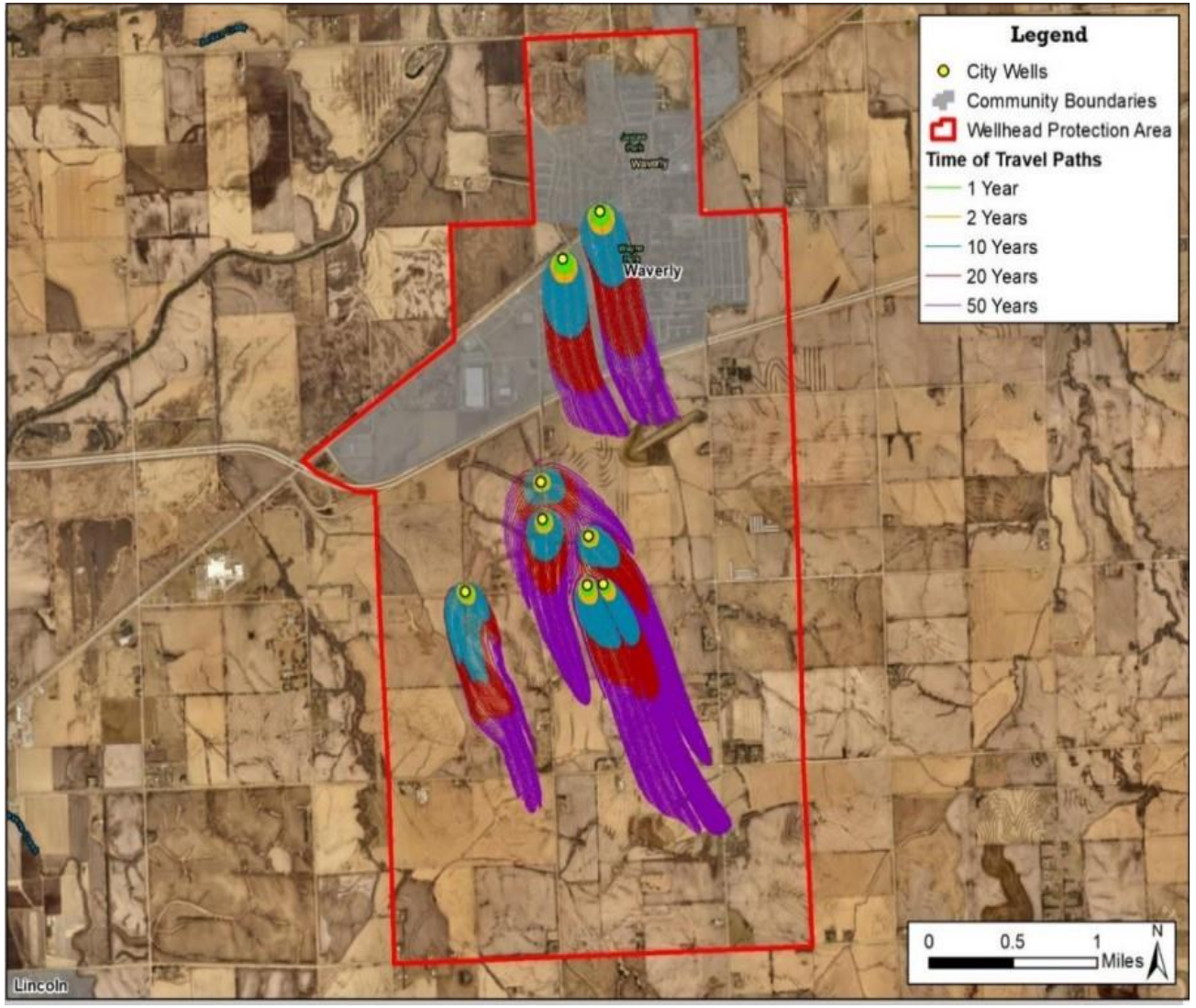


WAVERLY CWSPA ACRES 2023

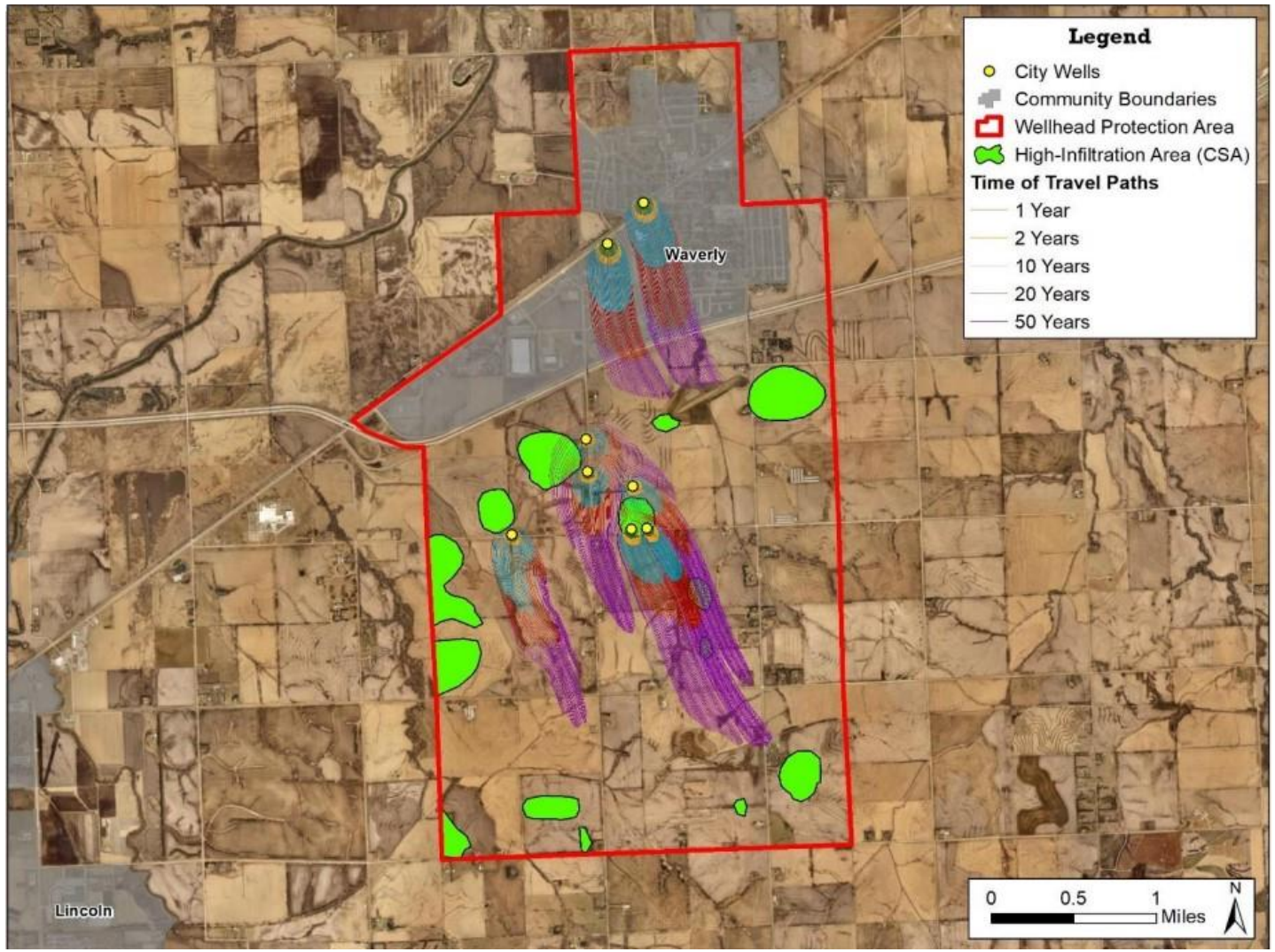


*Excluding residential/acreages

WAVERLY CWSPA (WHPA)



WAVERLY CWSPA (WHPA)



- Critical Source Area's (CSA)
  - Highlighted in Green
  - Defined as the high infiltration zones that contribute to recharge the most and are more susceptible to leaching

LPSNRD GROUNDWATER MANAGEMENT PLAN (GWMP)

- Adopted in 1995
- Monitoring groundwater quality and quantity in several different designated areas of management
  - NRDs have authority to address nonpoint source (NPS) ground water problems

MOST COMMON NPS GROUNDWATER CONCERN: NITRATE-NITROGEN (NO_3)

DRINKING WATER PROTECTION MANAGEMENT PLAN (DWPMP)

PRIORITY TO PROTECT AND IMPROVE THE QUALITY OF THE GROUNDWATER FOR CURRENT AND FUTURE GENERATIONS

- Improving soil and managing the groundwater responsibly.
- DWPS was created through a Section 319 Grant administered by Nebraska Department of Environment and Energy (NDEE).
- Educational outreach: Promote NRCS & NRD Cost-Share Programs and Implement Best Management Practices.

DRINKING WATER PROTECTION MANAGEMENT PLAN (DWPMP)

VOLUNTARY PLAN WHICH ADVISES THE CITY OF WAVERLY IN TWO PRIMARY WAYS

1. Quantifying the sources and loads of nitrate in the WHP area
2. Identifying the level of BMPs needed to reduce nitrate loading to the source water aquifer. The plan also identifies Critical Source Areas (CSAs) for BMP implementation

DRINKING WATER PROTECTION MANAGEMENT PLAN (DWPMP)

- Nitrate reduction target based on the LPSNRD's Phase II Groundwater Management designation trigger:
  (5.0 mg/L) – 50% of the Federal EPA MCL
- The maximum nitrate concentration in the most recent 5-year period was ***11.8 mg/L in City Well #11***
- The nitrogen load reduction from ***214,488 lbs/yr to 79,361 lbs/yr***
- The nitrate leaching reduction target is approximately **63% (16,798 lbs./yr.)**

Current Leaching
26,664 LBS./YR.

Leaching Reduction Target
9,866 LBS./YR.

WAVERLY CWSPA (WHPA) PLAN IMPLEMENTATION

- Promote:
  - Soil health, which increases productivity and profitability for producers
  - Improved efficiency in the use of manure and commercial fertilizers
  - The adoption of BMPs to reduce the potential for nitrate leaching to groundwater
- Continue to collect water quality and soil samples to enable a science-based approach
- Continue Vadose Zone sampling
- Engage and educate the City Council, LPSNRD Board of Directors, and other key stakeholders

BEST MANAGEMENT PRACTICES (BMP)

- Soil sampling
- Nutrient management
- Spring applications-SNAP
- Cover crops
- Fertilizer meter (including manifold)
- Irrigation management
- Well decommissioning
- Filter strips
- Grassed waterways
- Terraces
- Crop Rotation

WAVERLY CWSPA (WHPA) GOALS & OBJECTIVES

- Urban BMPs:
  - 101 acres per year; 404 acres total (from 5% existing treatment to 50% total treatment)
  - Reduced Fertilizer, Sprinkler Timers, Soil Testing, Lawn/Landscaping Changes
- OWTS Upgrades:
  - Upgrade 6 unregistered systems over 4 years (reduces overall failure rate)
- Agricultural BMPs:
  - Land Use Change/Crop Rotation: 478 acres per year; 1,912 acres total (40% of all existing cropland)
  - Nutrient Management: 717 acres per year; 2,868 acres total (100% of all remaining cropland)
  - Cover Crops: 717 acres per year; 2,868 acres total (100% of all remaining cropland)Irrigation Water Management: 173 acres per year; 692 acres total (100% of known irrigated cropland)

WAVERLY CWSPA (WHPA)

CITY ACTION:

1. The city will take necessary actions to reverse increasing nitrate contamination in the source aquifer and maintain a nitrate level below the current EPA MCL of 10 ppm
2. The city will work with LPSNRD, NRCS, and other resource agencies to meet the BMP installation targets identified within the plan
3. The city will work with LPSNRD, NDEE, UNL Extension, and other agencies to educate and inform property owners within the WHP area about source water protection and the purpose of the plan

FUNDING & COSTS

INITIAL FUNDS FOR THE DWPMP

NDEE (CASH)	$50,000
NDEE (IN-KIND)	$20,000
LPSNRD (CASH)	$140,200
WAVERLY (CASH)	$140,200
TOTAL	$350,400

- Estimated 3-year implementation cost - $565,000 ($188,000/year)
- Continue to advocate for funding or project assistance from partners and grant programs:
  - NDEE Section 319 Grant Program
  - NDEE
  - Source Water Protection Grants
  - Nebraska Environmental Trust Grants
  - Lower Platte South NRD
  - UNL Extension

KEY'S TO SOIL HEALTH

- Organic matter is essential for healthy soil structure, water retention, nutrient availability, and microbial activity.
- Balanced soil nutrients are crucial for plant growth and productivity.
- Soil pH can greatly influence nutrient availability to plants. Most crops prefer a slightly acidic pH range of 6.0-6.8. Adding lime to increase (acidic to basic) or sulfur to decrease (basic to acidic) adjust soil pH as needed.
- Soil biodiversity such as bacteria, fungi, earthworms, and insects.
- Proper water management is important for maintaining soil health. Know your soils water holding capacity.
- Erosion control to avoid depletion of topsoil and negatively impact soil health.

SOIL HEALTH

Macronutrients: N, P, K, Ca, Mg

- Nitrogen (N) - essential for plant growth and development, promotes green foliage
- Phosphorus (P) - important for root development, flowering, and fruiting (P1- 20-30 ppm and P2 40-60 ppm)
- Potassium (K) - aids in overall plant health and stress resistance (light colored soils-course textured 150-175 ppm & Dark Colored soils-heavy textured 175-250 ppm)
- Calcium (Ca) - helps to maintain soil structure and balance pH levels (calcium levels rarely change with ideal pH)
- Magnesium (Mg) - necessary for chlorophyll production and overall plant growth (100-250 ppm)

Micronutrients: Fe, Zn, Mn, Cu, B

- Iron (Fe) - vital for chlorophyll synthesis and enzyme activity (12-22 ppm)
- Zinc (Zn) - important for hormone regulation and enzyme function (1.8-2.5 ppm)
- Manganese (Mn) - essential for photosynthesis and nitrogen metabolism (14-22) ppm)
- Copper (Cu) - necessary for plant growth and overall health (1.2-1.8 ppm)
- Boron (B) - aids in cell wall formation and reproductive processes (1-1.5 ppm)

*Adequate soil sample results (ppm) are based upon Midwest Labs recommendations

KEY'S TO SOIL HEALTH

- The 4 M's

  -Maximize Biodiversity, Minimize Soil Disturbance, Maximize the living root, Maximize Soil Cover

- The 4 R's

  -Right Placement, Right Timing, Right Rate, Right Source

- The 4 C's

  -Irrigation Credit, Manure Credit, Residual Nitrogen Credit, Organic Matter Credit

Photo courtesy of SARE cover crop image library.

MICROBIAL ACTIVITY

- The C:N ratio in soil is an important factor that can influence the activity and diversity of soil microbes. Maintaining an optimal C:N ratio in the soil can enhance microbial activity, nutrient cycling, and overall soil health.
- Soil microorganisms have a C:N ratio near 8:1. To stay alive, they need a diet with a C:N ratio near 24:1, with 16 parts of carbon used for energy and eight parts for maintenance.
- If the C:N ratio is too high microbes may be limited by nitroger availability, leading to slower decomposition rates and lower microbial activity.
- If the C:N ratio is too low microbes may not have enough carbon to support their growth and metabolism, leading to a buildup of excess nitrogen in the soil.

Table 1. Carbon to nitrogen ratios of crop residues and other organic materials

Material	C:N Ratio
rye straw	82:1
wheat straw	80:1
oat straw	70:1
corn stover	57:1
rye cover crop (anthesis)	37:1
pea straw	29:1
rye cover crop (vegetative)	26:1
mature alfalfa hay	25:1
Ideal Microbial Diet	**24:1**
rotted barnyard manure	20:1
legume hay	17:1
beef manure	17:1
young alfalfa hay	13:1
hairy vetch cover crop	11:1
soil microbes (average)	8:1

Source: Carbon to Nitrogen Ratios in Cropping Systems
nrcs.usda.gov

LOWER PLATTE SOUTH NRD

Thank you!

CONTACT INFORMATION

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