



Middle Niobrara Natural Resource District Wood Waste Utilization Case Study



Contrast between a grassland where eastern red cedar trees were controlled and where they were not in the Verdigre Creek drainage. Photo by Eric Fowler

The Middle Niobrara Natural Resource District (MNNRD) is a local government entity that consists of parts of Rock, Brown, Key Paha and Cherry counties comprising over 2.98 million acres of land in North Central Nebraska. It is one of three Natural Resource Districts that make up the Niobrara River Basin. Each of the 23 natural resource districts are autonomous and governed by a locally-elected board of directors. MNNRD has seven Board of Directors.

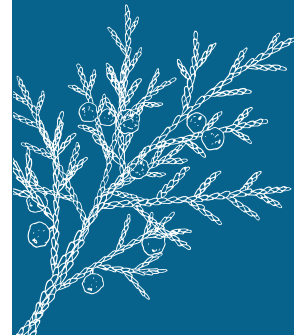
While NRDs share a common set of responsibilities, each district sets its own priorities and develops its own programs to best serve local needs. There are 12 statutory requirements for Natural Resource Districts. Seven of these requirements are related to MNNRD's wood waste utilization and composting efforts.

One priority identified by MNNRD is to develop strategies to minimize fire risk by reducing forest fuel loads. In the Niobrara River Valley, Eastern Red Cedar (ERC) and dog hair stands of ponderosa pines have become a major fuel load. ERC trees also represent a major threat to rangelands. The University of Nebraska Extension estimates that a single cedar tree with an 8-foot diameter could reduce forage production by 3 pounds. If you had a density of 200 trees per acre, that would translate into nearly a 1/3 loss in forage production because of the effects on area coverage, moisture use, and shading.

Timber removal will increase the amount of available grazing lands, promote the quality of grassland wildlife habitat, optimize native forest growth and enhance wetland habitat. Wood chipping the timber is a good alternative to burning it, improving air and water quality. The MNNRD has also served communities by grinding tree debris resulting from storms and strong winds.

Among the many services MNNRD provides to communities and producers is custom wood chipping resulting from tree removal. This has

Eastern Red Cedar trees have become a major threat as forest fire fuel loads as well as a threat to rangelands for foraging livestock.





led to researching uses for the woody biomass they generate. They have worked with UNL Biological Systems Engineering to apply animal manure and wood chips on field plot studies near Ainsworth and Valentine. These plot studied the effects of wood chips at single and double application rates; wood chips mixed with cattle manure; wood chips mixed with hog manure/compost; wood chips with liquid Nitrogen 32%; and a control plot. The research found that the wood chip only applications aided in moisture retention, erosion control, reduced soil temperature and tied up nitrogen. The applications mixing wood chips with animal manure showed a 5-10 bushel increase in yields.

After documenting increased yields with the wood chip and animal manure mixture application, the MNNRD started a compost operation in 2016 with the purchase of a compost turner. This equipment aided the mixing of the wood chips and animal manure. They mix the wood chips and manure on a 1:1 basis. Animal manure is in high demand among farm producers due to the increased cost of commercial fertilizer. As a result, MNNRD does pay a delivery fee of \$6-\$8 per load mile for the manure. Annually they compost roughly 100 tons each of wood chips and animal manure. The material is composted on a (soil) pivot corner near Valentine. The compost is turned based on the temperature of the compost which is taken regularly.

The finished compost is applied on field test plots. The size of the plots varies as they attempt to have test plots 30 feet wide for the length of the field.

Woody biomass utilization improves forestry health, reduces water use, and helps improve water and air quality.

Equipment used in their operation includes a Vermeer XL2100 wood chipper, front-end loader, Case 210 HP tractor, 20 foot dump trailer with cover, 5.5 ton dump truck, Vermeer CT612 compost turner and a manure spreader. The MNNRD has leased some of their equipment out to producers to use. For example, an organic farmer used the compost turner to mix moldy hay with sheep manure to produce compost for his field.

They sell wood chips at a rate of \$50 per cubic yard. The finished compost has not been sold publicly as the compost has been used primarily on test plots. Local producers are currently having to transport compost for field utilization. By creating compost locally MNNRD provides significant cost savings.

Some of the challenges that MNNRD experienced in developing their composting program included finding the right equipment as well as the capital to purchase the needed equipment. For example, the tractor used to pull the compost turning equipment needed an IVT/CVT transmission so that they could move at a slow rate of 0.1-0.2 miles/hour to adequately mix and turn the compost. MNNRD was successful in obtaining grant funds from the Waste Reduction and Recycling Incentive Fund with the Nebraska Department of Environment and Energy as well as from the Nebraska Environment Trust and the Nebraska Recycling Council small equipment grant program to help finance the equipment acquisition. Another challenge was finding individuals with direct composting knowledge, MNNRD case staff learned as they experimented. It is also important to find producers willing to apply compost to their fields as well as an animal feeding operator willing to provide the manure as there is a growing demand for their product due to the high cost of commercial fertilizer. There are also challenges operating on a soil compost pad instead of a hard surface like concrete.

There are many benefits of MNNRD's efforts to utilize wood chips and animal manure in compost, like adding organic matter to the sandy soil in the region. The MNNRD is creating a marketable product that not only reduces solid waste but also improves soil health, aids in moisture retention, reduces soil temperature, increases yields and sequesters carbon. By turning trees into chips has reduced the amount of time land owners spend burning brush piles. Woody biomass utilization improves forestry health, reduces water use, and helps to improve water and air quality throughout the MNNRD.

For more information on the MNNRD's program email: mnnrd@mnnrd.org or call 402-376-3241. Their website is: www.mnnrd.org.

Additional Resources

<https://water.unl.edu/article/animal-manure-management/transforming-manure-%C2%B4waste%C2%B4-%C2%B4worth%C2%B4-rural-nebraska>

<https://water.unl.edu/article/manure-nutrient-management/how-can-animal-manure-help-my-soils-be-healthier-and-more>

<https://water.unl.edu/article/animal-manure-management/what-are-barriers-and-benefits-manure-use-cropping-systems-part-1-2>

<https://water.unl.edu/article/animal-manure-management/what-are-barriers-and-benefits-manure-use-cropping-systems-part-2-2>



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