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Division of Resource Conservation & Forestry

# Trees and Energy

## Rural Savings

- Snow removal
- Feed costs
- Heating costs
- Lower input costs
- Increased yields
- Floodplain protection
- Greater income potential

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## Urban Savings

- Lower summer temperatures
- Lower cooling costs
- Cleaner air
- Lower water demand
- Reduce noise
- Higher property values
- Greater human comfort
- Better health
- Reduced stress

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In today's world of increasing energy costs anything we can do to save energy is important. Using trees to moderate our South Dakota climate is one way to save energy.

## Rural Areas

Rural tree planting along roads can reduce snow removal cost by 30 to 50 percent. A 544 foot long living snow fence in Minnesota was shown to save over \$34,000 using snow removal costs of \$3.00 per ton. As fuel and labor costs continue to climb these saving will increase (2004 communication with Minnesota Department of Transportation).

University of Nebraska studies show that field windbreak systems have a positive impact on grain production in the Great Plains. For example if a corn/soybean farmer with a 160-acre field planted four single-row, parallel windbreaks equally spaced across the field, the cost of establishment and the costs associated with land planted to windbreaks would be recovered within 10 years. By year 15, the return would be several thousand dollars. By year 30, the return on the original investment would be \$30,000 (University of Nebraska Cooperative Extension publication EC 00-1778-X). These savings are based on reduced production costs and increased yields. Yield increases of 5 to 45 percent have been shown depending on the crop that is planted. Wind erosion causes lower soil productivity through the loss of fine soil particles, organic matter and nutrients. In most cases these losses are made up by adding fertilizer. Field windbreaks reduce erosion and lower fertilizer requirements.

A well designed farmstead/feedlot windbreak can reduce winter heating cost by 20 to 40 percent depending on local site and climate conditions, quality of home construction and living habits. In areas with hot summer winds a 15 to 35 percent saving in summer cooling cost can be obtained by planting well placed shade trees or foundation plantings.

Feedlot windbreaks have been shown to reduce energy required by livestock for basic maintenance in winter months. Canadian researchers found that cattle on unprotected winter range require a 50 percent increase in feed for normal activities. An additional 20 percent increased was needed to overcome the direct effect of exposure to a combination of cold temperature and wind. Purdue University found that energy requirements for cows in good condition increased 13 percent for each 10 degree drop in windchill temperature below 30 degrees. Properly placed windbreaks will reduce or eliminate snow drifts around buildings, forage and grain storage areas, travel lanes and feed aprons. This saves on fuel expenses for snow removal, reduces wear on equipment, and saves on labor requirements.

A waterbreak is a planned floodplain system of linear woody buffers oriented to reduce flooding impacts and provide supplemental benefits. Flood damage evaluation and on site observations from the 1993 Midwest Flood (500-year flood event) showed that field protected with trees corridors experienced 25 to 75 percent lower reclamation costs. Reclamation costs varied from \$25 to \$3000 per acre (Agroforestry Notes April 2000).

## Urban Areas

Rural landowners are not the only ones who can benefit from energy savings provided by trees. Studies have shown that urban trees provide benefits worth many times the cost of planting and upkeep. According to the Center for Urban Forest Research, most communities can care for their largest trees for a little as \$13/tree/year. Each tree returns an average of \$70 in energy savings, cleaner air, better managed stormwater, extended street life, and increased property values.

The rapid urbanization during the past 50 years has been associated with increased downtown temperatures of nearly 1 degree a decade. Increases in temperature are largely due to more heat absorbing surfaces, such as dark rooftops, parking lots and streets. As temperature increases energy demand for cooling increases. This leads to increased carbon dioxide emissions from fossil-fuel power plants, larger de-

mand on municipal water systems, more smog emissions, and greater human discomfort. Neighborhoods with well-shaded street can be 10 degrees cooler than neighborhoods without street trees. Shaded parking lots can be 20 degrees cooler than parking lots with no trees. Well-placed trees around a home can lower air conditioning bills up to 56 percent and windbreak trees can save up to 25 percent on winter heating costs. A study in Bismarck, ND showed that for every dollar spent on a tree it would give back \$3.09 in benefits.

Trees reduce noise pollution by acting as a buffer and absorbing urban noise, especially high-frequency sounds that are most distressing to people. Trees reduce exposure to ultraviolet light from the sun, lowering the risk of skin cancer and cataracts. Views of nature have been shown to reduce stress and help hospital patients recover faster with less medication following surgery.

Trees are great at cleaning the air. They store carbon dioxide in their leaves, branches, trunks and roots. They absorb sulfur dioxide and nitrogen oxide, two major components of acid rain and ozone pollution. They intercept particulate matter, like dust, ash, smoke and pollen, while releasing oxygen through photosynthesis. Research shows that 100 trees can remove 53 tons of carbon dioxide per year from the atmosphere, and 100 trees can remove about 4,300 pounds of pollutants per year. This includes 720 pounds of ozone and 810 pounds of particulates.

Planting trees in our urban centers and rural communities has multiple benefits. From living snow fences to field shelterbelts to the tree in your backyard, the benefits of trees are evident in cleaner air, cleaner water and significant savings in energy costs.