

## Resources Needed for Sustainability

By Nathan Morgan  
Reference/Instructional Services Librarian  
Reinert–Alumni Memorial Library  
Creighton University

### Land

Nebraska is blessed with an abundance of productive land. Some of the most fertile agricultural land in the world allows Nebraska to produce vast amounts of corn, soybeans, and other crops. Nebraska grasslands support a large cattle ranching industry. Deep beneath the Nebraska landscape, groundwater quenches the thirst of many Nebraskans and is an essential part of Nebraska agriculture. Historically, land has provided stability, income and sustenance for Nebraskans. It can also provide many of the necessary resources for sustainability in the future.

Nebraska's total land area is 76,878 square miles and ranks 15<sup>th</sup> in the nation. Elevation rises gradually from the Southeast to the Northwest in a series of rolling plateaus from the lowest point in Richardson County in the extreme southeastern corner of the state and the highest point in Kimball County near the Wyoming border. (Nebraska Legislative Reference Bureau, 2009) Two major geographic areas make up Nebraska's landscape. The eastern fifth of the state consists of the Dissected Till Plains which were created when glaciers deposited rich soil building material called till as they retreated northward. Later windblown dust (loess) settled over the till material and was in turn dissected by streams that created the rolling hills characteristic of the area. (Nebraska Legislative Reference Bureau, 2009)

The Great Plains region stretches west across the rest of the state into Wyoming and Colorado. This region is made up of several smaller sub-regions. The Sand Hills is the largest of these and encompasses almost 20,000 square miles. The largest sand dune area in the Western Hemisphere; the Sand Hills were formed by wind forming sand into hills and ridges. The valleys in between these ridges contain streams, lakes and wetlands. Grasses colonized and stabilized the dunes. The combination of abundant grassland and water make this region a prime cattle ranching area. (Dappen, Merchant, Ratcliffe, & Robbins, 2007)

The intensively cultivated Loess Plains or "Rainwater Basin" region covers roughly 8000 square miles of south central Nebraska. This area is interspersed with lakes and wetlands making it an important habitat for migrating waterfowl. (Dappen et al., 2007) Windblown silt formed the Loess Hills region north of the Platte River and south and east of the Sand Hills. Farms and ranches predominate in here. (Nebraska Legislative Reference Bureau, 2009) Roughly 12,000 square miles of the High Plains lie west of the Sand Hills. This region includes the scenic Wildcat Hills and Pine Ridge of the Nebraska Panhandle. (Nebraska Legislative Reference Bureau, 2009)

Agriculture is the dominant practice that affects land use in Nebraska. That fact is obvious to anyone who has looked down from an airplane and seen the perfectly circular corn fields sustained by center pivot irrigation systems. Since European settlement Nebraska's landscapes have been transformed by intensive cultivation of the native prairie. Large native herbivores such as Bison have been replaced by cattle. Fires have been suppressed and non-native species have been introduced. These factors and others have contributed to how Nebraska's land is used. (Dappen et al., 2007)

In 2007 nearly 47% or over 23 million acres of Nebraska's land area was used for rangeland. Slightly more than 39% or over 19 million acres was used for cropland. These numbers have remained relatively steady over the last 25 years. In 1982 nearly 48% was in rangeland and nearly 41% was used for crops. (United States Department of Agriculture, Natural Resources Conservation Service & Center for Survey Statistics and Methodology, Iowa State University, 2009) Most of Nebraska's rangeland is found in the western two thirds of the state. Roughly 13 million of Nebraska's 23 million rangeland acres are in the Sand Hills alone.

The eastern third of Nebraska is given over predominantly to cropland. (Center for Advanced Land Management Information Technologies, 2007)

Nebraska's soils are well suited to agricultural use. Central and western Nebraska soils are broadly classified as Entisols according to the US Soil Taxonomy and are of recent geologic origin.(Encyclopedia Britannica, 2010a) They are generally rather shallow and are not rich in organic matter which makes them unsuitable to intensive cultivation. They are ideal for soils for grasslands and support and large and productive ranching industry.(Natural Resources Conservation Service, 2010) Eastern Nebraska soils are classified as Mollisols. Mollisols are deep, fertile and have an abundance of organic matter. They usually form under a prairie landscape and are very conducive to cultivation. (Encyclopedia Britannica, 2010b) Mollisols support large scale corn and soybean production in the eastern third of Nebraska. Center pivot irrigation is practiced in areas without sufficient rainfall in this region.(Center for Advanced Land Management Information Technologies, 2007)

Soil erosion is a major issue for intensively cultivated areas and Nebraska is no different. Over the past 25 years water erosion rates in Nebraska have dropped significantly. In 1982 Nebraska lost an average of 4.5 tons of topsoil per acre per year which was higher than the national average of 4 tons/acre/year. By 2007 due to soil conservation efforts both the state and national averages had dropped to 2.7 tons/acre/year. Wind erosion control efforts have not been as successful. Nebraska lost 1.5 tons/acre/year of topsoil due to wind erosion in 1982. In 2007 that average had increased to 1.9 ton/acre/year. During the same period the national average dropped from 3.3 to 2.1 tons/acre/year.(United States Department of Agriculture, Natural Resources Conservation Service & Center for Survey Statistics and Methodology, Iowa State University, 2009)

## **Water**

Water is essential to sustainability. Without access to a sufficient supply of clean water, human civilization and even human life itself is impossible. Human activity in Nebraska relies on a combination of surface and groundwater sources. Surface water is obtained from 9 major watersheds in Nebraska (Marten, )while the High Plains Aquifer serves as the source for an overwhelming majority of Nebraska's groundwater. (United States Geological Survey, 2009)

Water use in Nebraska grew substantially from 1990 to 2005, the last year for which data is available. In 1990 8,940 million gallons per day (mgd) were withdrawn from surface and groundwater sources in Nebraska. Of that total roughly 54% was from groundwater sources. (Solley, Pierce, & Perlman, 1996) Over the next 15 years the amount of water use would increase as would the percentage of that water supplied by Nebraska's groundwater resources. In 1995 59% of 10,500mgd was obtained from groundwater.(Solley, Pierce, & Perlman, 1998) By 2000, the total water use had risen to 12,300mgd and 62.4% of that was provided by groundwater sources. (Hutson et al., 2004) In 2005 total water use had climbed slightly to 12,300mgd and the percentage of that provided by groundwater had fallen slightly to 61.2%. (Kenny et al., 2009)

In 2000 roughly 78% of all water withdrawn for use in Nebraska was used for groundwater irrigation. Another 14.5% was used for surface water irrigation. Water used for industry, public supply, mining, and livestock made up less than 8% of all the water used in Nebraska.(Nebraska Department of Natural Resources, 2007a) By 2005, 81% of water withdrawn for use in Nebraska was used for groundwater irrigation. Surface water irrigation had dropped to 13% of the total. All other uses combined accounted for roughly 6% of the water used in Nebraska in 2005. (Nebraska Department of Natural Resources, 2007b)

Groundwater refers to the water found in an aquifer or an area below the surface of the earth where all the spaces between grains of rock or soil are saturated with water. The top of this saturated zone beneath the

earth's surface is called the water table.(University of Nebraska, Lincoln: School of Natural Resources, 1999) The vast majority of Nebraska's groundwater is provided by the High Plains Aquifer which underlies nearly 64,000 square miles of central and western Nebraska.(Miller & Appel, 2009)

While the rate of flow in streams and rivers is measured in feet per second, the rate of flow for groundwater is measured in feet per year. Groundwater moves like a giant conveyor belt until the water table intersects the land surface. That conveyor belt moves an average of 300 feet per year in Nebraska. When humans tap into that conveyor belt by drilling wells for irrigation or some other purpose, the amount of water that eventually enters a stream is reduced. Because groundwater moves so slowly, it may take decades or even centuries for that reduction in stream flow to be apparent. (Goeke, 2009)

Nebraska's groundwater resources are huge. The Nebraska portion of the High Plains Aquifer contains an estimated 2.145 billion acre/feet of water. (Goeke, 2009) An acre foot is the volume of water required to cover an acre of land at a depth of 1 foot. (United States Geological Survey, 2010) By 2003 the total available groundwater in the Nebraska portion of the High Plains Aquifer had been reduced by only 11.4 million acre/feet, or slightly more than half of 1% of the total amount. Unfortunately, the declines are not uniform. Some areas have seen little or no decline in the depth to the water table, while others, in Box Butte County for example, have seen declines of 40 to 50 feet. (Goeke, 2009)

## Food

Agriculture is the overwhelmingly dominant use of the Nebraska landscape. 93% of Nebraska's land area, or roughly 45 million acres, is used for agriculture. Nearly 23 million acres are used for range and pastureland while over 21 million acres are in cropland. Nebraska ranks first in the United States in the commercial red meat production with over 7 billion pounds produced in 2009. It ranks first in acres of irrigated land, over 8.5 million in 2007, 2<sup>nd</sup> in pinto bean and proso millet production and 3<sup>rd</sup> in corn production. Cash receipts from Nebraska's farms totaled more than \$17 billion in 2008. Agricultural exports from Nebraska totaled nearly \$6 billion in 2008.(Nebraska Department of Agriculture, 2010) Agriculture not only has a huge impact on Nebraska's landscape, but on its economy as well.

The amount of land in used for agricultural purposes in Nebraska has stayed remarkably steady. In 1978 46.1 million acres were in cultivation, in 2008 that number had declined only slightly to 45.5 million. During that same time however, the number of farms declined sharply from nearly 64 thousand to less than 48 thousand. Understandably, the average size of Nebraska's farms grew by over 200 acres from 723 in 1978 to 953 in 2008. (USDA, National Agricultural Statistics Service, 2008b)

Nebraska farmers spend large amounts of money on fertilizers, chemicals and fuel to keep their farms productive. In 2007 roughly 30 thousand farms spent over \$914 million dollars on fertilizer, lime and soil conditioners. More than 27 thousand farms spent over \$404 million dollars on chemicals and more than 46 thousand farms spent over \$608 million on gasoline, fuel and oils.(USDA, National Agricultural Statistics Service, 2008c) In 2005 99% of the 8.5 million acres of corn raised in Nebraska was treated with Nitrogen fertilizer. On average 137 pounds of fertilizer was applied to Nebraska's corn crop. Approximately 60 pounds of phosphate and potash fertilizer was applied per acre as well. In the same year 98% of Nebraska's corn crop received herbicide applications and 20% received insecticide applications.(USDA, National Agricultural Statistics Service, 2006)

Alternative agriculture practices are a small but growing part of Nebraska's agricultural landscape. In 2002 there were 105 farms and 26,668 acres of certified organic agricultural land in Nebraska. (USDA, National Agricultural Statistics Service, 2004)By 2008, there were 162 certified organic farms with slightly more than 146,000 acres of certified organic agricultural land. Of that amount approximately 76 thousand acres was in cropland and 70 thousand acres was in pasture and rangeland. In 2008, organic product sales in

Nebraska totaled \$48.6 million.(USDA, National Agricultural Statistics Service, 2008a) Community Supported Agriculture (CSA) is a concept that has grown across the country. According to the USDA definition a” CSA consists of a community of individuals who pledge support to a farm operation so that the farmland becomes, either legally or spiritually, the community’s farm, with the growers and consumers providing mutual support and sharing the risks and benefits of food production.”(Adam, 2006) In 2007, the only year for which statistics are available, 161 Nebraska farms marketed products through Community Supported Agriculture. (USDA, National Agricultural Statistics Service, 2008d)

## Energy

Nebraska has the potential to provide a significant portion of its energy through renewable sources. Currently, non-renewable sources provide the vast majority of Nebraska’s energy. In 2007, Nebraska used 693 trillion British Thermal Units (Btus) of energy an increase of 3.6% from 2006. (Nebraska Energy Office, 2010f) A Btu is a standard unit of heat energy. As an illustration, it takes roughly 2000 Btus to make a pot of coffee. (Nebraska Energy Office, 2010b) Nebraska has to 13<sup>th</sup> lowest total energy consumption in the country. (Nebraska Energy Office, 2010f)

Over the past 20 years, Nebraska’s total energy consumption has grown by 28.3%. During those 20 years the sources of Nebraska’s energy have remained fairly stable. The amount of energy provided by each of those sources has varied somewhat. From 1987 to 2007 the percentage of Nebraska’s energy provided by petroleum has decreased from roughly 35% to 32%. At the same time coal has risen from 22% to nearly 30%. Natural gas has remained fairly stable at roughly 20% of Nebraska’s energy mix while nuclear power has dropped slightly from 17% to 16%. (Nebraska Energy Office, 2010f)

Renewable sources (hydroelectric, wind, ethanol, solar, geothermal, biomass) contributions to Nebraska’s energy mix have dropped over the last 20 years, from 4.82% in 1987 to 2.78% in 2007. Most of that reduction has come from the hydroelectric sector. Despite the potential for wind power in Nebraska, only .3% of the energy consumed here comes from wind power. The amount of energy consumed from biomass sources has stayed roughly the same increasing from 1.2% to 1.5%. (Nebraska Energy Office, 2010e)

Wind energy has the potential to provide a large portion of Nebraska’s energy needs. The American Wind Energy Association estimates that Nebraska has 868 billion kilowatt hours per year in wind energy capacity, ranking 6<sup>th</sup> among the states. (American Wind Energy Association, 2009) Currently Nebraska produces approximately 400 million kilowatt hours of electricity through wind power.(Nebraska Energy Office, 2010g)

Maps of Nebraska’s mean annual wind speed show that most of the state averages between 14.3 and 16.8 mph.(Nebraska Energy Office, 2005) The predicted wind power density (a measure of how much energy is available at a site for conversion by a wind turbine)for most of Nebraska is a level 3 (fair) or 4 (good) according to the National Renewable Energy Laboratory. Wind power density levels range from 1 to 7. (National Renewable Energy Laboratory, 2010)

In 2008 the U. S. Department of Energy released a report calling for the United States to produce 20% of its electricity using wind power by 2030.(United States Department of Energy, 2008) In response to that report the National Renewable Energy Laboratory published a report that estimated the economic benefits of producing 20% of Nebraska’s electricity using wind power. Over a 40 year period that includes the construction and operation of the necessary wind power facilities, an average of between 1600 and 3000 full time jobs would be provided. The total economic output to Nebraska over the same period would be between 8 and 14 billion dollars. (Lantz, 2009)

In 2007 solar energy provided roughly 30 million Btus of energy out of a total 693 trillion Btus of total energy use in Nebraska. National Renewable Energy Laboratory maps show that significantly more potential for solar power exists in Nebraska. Eastern Nebraska can produce roughly 4.5 kWh/m<sup>2</sup>/day and

Western Nebraska can produce roughly 5.5 kWh/m<sup>2</sup>/day. As a comparison, desert areas of southern Arizona have a potential of 6.8 kWh/m<sup>2</sup>/day. (National Renewable Energy Laboratory, 2008)

Nebraska ranks 2<sup>nd</sup> in the nation in ethanol production capacity, trailing only Iowa. Nebraska currently produces 1.7 billion gallons of ethanol or roughly 14% of the nation's total production. (Nebraska Energy Office, 2010d) In 2007 Ethanol provided roughly 1.5% of Nebraska's energy consumption in the transportation sector. (Nebraska Energy Office, 2010a) Most ethanol in Nebraska is sold as blended fuel, either E-10 (90% gasoline, 10% ethanol) or E-85 (85% ethanol with 15% gasoline). Consumption of all ethanol blended fuels has risen from roughly 200 million gallons in 1998 to roughly 550 million gallons in 2009. (Nebraska Energy Office, 2010c)

## **Construction and Demolition Materials**

There are two major aspects of any discussion of sustainability and construction materials; the availability and use of green construction materials and the disposal of those materials during the demolition process. Essential to this discussion is an understanding of just what makes construction materials green. While there are not universal standards green standards for construction materials, literature on sustainable design and construction defines five broad categories of sustainability for construction materials.

Products made with salvaged, recycled or agricultural waste content make up the first category. These products include bricks, lumber and plumbing fixtures that are salvaged from a demolished building for use in new construction and materials that use recycled post consumer content and therefore are diverted from landfills. Products that conserve natural resources include those that use less material than standard products, those with exceptional durability or low maintenance costs compared to standard products, certified wood products that come from sustainably managed forests, and rapidly renewable products such as cork, jute and organic cotton and wool. (Environmental Building News, 2006)

The third category is made up of products that avoid toxic emissions. These include products that do not contain ozone-depleting chemicals, those that are minimally processed and avoid the release of harmful chemicals during manufacture, and products that reduce or eliminate the need for pesticide treatments. Also included in this category are products such as porous paving products and vegetated roofing systems that prevent storm water pollution. (Environmental Building News, 2006)

Category four includes products that conserve energy and/or water. Building components are a major part of this category. Insulated concrete forms and structural insulated panels reduce the amount of energy necessary to heat or cool a structure. Equipment that conserves energy and manages loads includes high efficiency appliances and lighting. Renewable energy equipment such as photovoltaic solar panels and wind turbines also is included in this category. Fixtures and equipment that conserve water are included in this category as well. (Environmental Building News, 2006)

The final category includes products that contribute to a safe and healthy built environment. Products that do not release toxic chemicals into the building are a major component in this category along with those that remove pollutants and improve light quality. (Environmental Building News, 2006)

Construction and demolition (C&D) materials are generated whenever new structures are built or existing structures are renovated or demolished. These materials include wood, drywall, metal, plastic, roofing, masonry and concrete among others. The amount of C&D materials produced in a given year is dependent on the amount of activity that takes place in the entire construction, demolition, renovation and maintenance industry. (United States Environmental Protection Agency, 2009)

A general lack of data hampers the accurate measurement of the amount of C&D materials produced in the United States. Statistics on the amount of activity in the building construction, demolition and renovation industry are available from the U.S. Census Bureau. Data on the amount of waste generated by these activities were estimated by averaging the results of waste sampling studies performed at specific job sites around the country. None of the sampled sites were located in Nebraska. Since construction styles, sizes and materials vary it is unknown if the waste sampling data collected in the EPA study referenced in this report can be applied to the construction industry across the country. (United States Environmental Protection Agency, 2009)

Additionally, there is little data on the amount of C&D materials that are recycled, reused or used as sources of energy. The EPA relies on data from state environmental agencies and few of those agencies collect that sort of data. Again, the EPA study referenced by this report estimates the amount of recovered C&D materials from the limited amount of data that is available. (United States Environmental Protection Agency, 2009)

With the understanding that their results are based on rather small samples, the EPA has estimated the total amount of C&D materials waste produced in the United States in six different sectors of the construction industry. The residential construction sector consists of the construction of new single and multi-family homes. C&D materials waste in this sector in 2003 was estimated at 10 million tons. The non-residential sector, consisting of office, manufacturing, educational and religious buildings among others, produced an estimated 5.01 million tons of C&D materials waste. C&D materials waste in residential demolition was estimated at 19 million tons. Non-residential demolition produced approximately 65 million tons of C&D materials waste. Residential and non-residential renovation activities produced and estimated 37.8 and 29 million tons of C&D waste respectively. An estimated total of 170 million tons of C&D waste materials were produced in 2003. This is equal to 3.2 pounds of C&D materials waste per capita per day (pcd). (United States Environmental Protection Agency, 2009)

As mentioned earlier the EPA relies on data from state environmental agencies to determine the amount of C&D waste materials that are recycled or recovered in some form. Nebraska is not one of the eight states that collect this data. On average, 48% of C&D materials waste is recovered in the eight states that collect such statistics. Since this figure may not be fully representative of the entire country it does provide an indicator of C&D materials recovery in the United States. (United States Environmental Protection Agency, 2009)

## References

Adam, K. L. (2006, Community Supported Agriculture. *ATTRA: National Sustainable Agriculture Information Service*, Retrieved from <http://attra.ncat.org/attra-pub/PDF/csa.pdf#xml=http://search.ncat.org/txis/search/pdfhi.txt?query=statistics&pr=ATTRA2010&rprox=page&rorder=500&rprox=500&rdfreq=500&rwfreq=500&rlead=500&rdepth=0&sufs=0&order=r&cq=&id=4be9d90d7>

American Wind Energy Association. (2009). *Wind Energy Potential*. Retrieved 6/15, 2010, from [http://www.awea.org/faq/wwt\\_potential.html](http://www.awea.org/faq/wwt_potential.html)

Center for Advanced Land Management Information Technologies. (2007). *Delineation of 2005 Land Use Patterns for the State of Nebraska Department of Natural Resources*. Lincoln, NE: University of Nebraska - Lincoln. Retrieved from [http://www.calmit.unl.edu/2005landuse/data/2005\\_NE\\_landuse\\_finalreport.pdf](http://www.calmit.unl.edu/2005landuse/data/2005_NE_landuse_finalreport.pdf)

Dappen, P., Merchant, J., Ratcliffe, I., & Robbins, C. (2007). *Delineation of 2005 Land Use Patterns For the State of Nebraska Department of Natural Resources*. Lincoln, NE: Center for Advanced Land Management Information Technologies; School of Natural Resources; University of Nebraska - Lincoln. Retrieved from [http://dnr.ne.gov/Publications\\_Studies/2005\\_Landuse\\_FinalReport.pdf](http://dnr.ne.gov/Publications_Studies/2005_Landuse_FinalReport.pdf)

Encyclopedia Britannica. (2010a). *Entisol*. Retrieved 4/29, 2010, from <http://search.eb.com/eb/article-9032719>

Encyclopedia Britannica. (2010b). *Mollisol*. Retrieved 4/30, 2010, from <http://search.eb.com/eb/article-9053264>

Goeke, J. (2009). *Surface Water and Groundwater Relationships in Nebraska*. Retrieved 6/1, 2010, from <http://watercenter.unl.edu/Downloads/ResearchInBrief/GoekeLegislatorsBriefingMaterialsOctober10.pdf>

Hutson, S. S., Barber, N. L., Kenny, J. F., Linsay, K. S., Lumia, D. S., & Maupin, M. A. (2004). *Estimated Use of Water in the United States in 2000* No. 1268)U. S. Geological Survey. Retrieved from <http://pubs.usgs.gov/circ/2004/circ1268/htdocs/table01.html#>

Kenny, J. F., Barber, N. L., Hutson, S. S., Linsey, K. S., Lovelace, J. K., & and Maupin, M. A. (2009). *Estimated Water Use in the United States in 2005* No. 1344)U. S. Geological Survey. Retrieved from <http://pubs.usgs.gov/circ/1344/pdf/c1344.pdf>

- Lantz, E. (2009). *Economic Development Benefits from Wind Energy in Nebraska: A Report for the Nebraska Energy Office*. Washington, DC: U S Department of Energy. Retrieved from [www.nrel.gov/docs/fy09osti/44344.pdf](http://www.nrel.gov/docs/fy09osti/44344.pdf)
- Marten, D. *Water Use in Agricultural Watersheds*. Lincoln, NE: University of Nebraska - Lincoln.
- Miller, J. A., & Appel, C. L. (2009). *Groundwater Atlas of the United States: Kansas, Missouri and Nebraska*. Retrieved 6, 2010, from [http://pubs.usgs.gov/ha/ha730/ch\\_d/D-text2.html](http://pubs.usgs.gov/ha/ha730/ch_d/D-text2.html)
- National Renewable Energy Laboratory. (2008). *Photovoltaic Solar Resource of the United States*. Retrieved 6/17, 2010, from [http://www.nrel.gov/gis/images/map\\_pv\\_national\\_lo-res.jpg](http://www.nrel.gov/gis/images/map_pv_national_lo-res.jpg)
- National Renewable Energy Laboratory. (2010). *Wind Maps*. Retrieved 6/17, 2010, from <http://www.nrel.gov/gis/wind.html>
- Natural Resources Conservation Service. (2010). *Entisols Map*. Retrieved 4/29, 2010, from [http://soils.usda.gov/technical/classification/orders/entisols\\_map.html](http://soils.usda.gov/technical/classification/orders/entisols_map.html)
- Nebraska Department of Agriculture. (2010). *Nebraska Agriculture Fact Card*. Retrieved 6/4, 2010, from <http://www.agr.ne.gov/facts.pdf>
- Nebraska Department of Natural Resources. (2007a). *Nebraska Estimated Total Water Withdrawals by water use category for the year 2000*. Retrieved 6/1, 2010, from [http://dnr.ne.gov/watertaskforce/Resourcematials/WaterWithdrawals\\_2000.pdf](http://dnr.ne.gov/watertaskforce/Resourcematials/WaterWithdrawals_2000.pdf)
- Nebraska Department of Natural Resources. (2007b). *Nebraska Estimated Total Water Withdrawals by water use category for the year 2005*. Retrieved 6/1, 2010, from [http://dnr.ne.gov/SurfaceWater/Total\\_Withdrawals\\_2005.pdf](http://dnr.ne.gov/SurfaceWater/Total_Withdrawals_2005.pdf)
- Nebraska Energy Office. (2005). *Mean Annual Wind Power Density of Nebraska at 50 Meters* Nebraska Energy Office. Retrieved from [http://www.neo.ne.gov/renew/windresources/NE\\_spd50m\\_0408052.pdf](http://www.neo.ne.gov/renew/windresources/NE_spd50m_0408052.pdf)

Nebraska Energy Office. (2010a). *Energy Consumption in Nebraska's Transportation Sector*. Retrieved 6/17, 2010, from <http://www.neo.ne.gov/statshtml/18.html>

Nebraska Energy Office. (2010b). *Energy Terms Glossary*. Retrieved 6/15, 2010, from <http://www.neo.ne.gov/statshtml/glossaryb.htm#btu>

Nebraska Energy Office. (2010c). *Ethanol Blended Fuel Consumption in Nebraska*. Retrieved 6/17, 2010, from <http://www.neo.ne.gov/statshtml/65a.html>

Nebraska Energy Office. (2010d). *Ethanol Facilities' Capacity by State*. Retrieved 6/17, 2010, from <http://www.neo.ne.gov/statshtml/121.htm>

Nebraska Energy Office. (2010e). *Nebraska's Renewable Energy Consumption*. Retrieved 6/15, 2010, from <http://www.neo.ne.gov/statshtml/92.htm>

Nebraska Energy Office. (2010f). *Nebraska's Total Energy Consumption by Fuel Type*. Retrieved 6/11, 2010, from <http://www.neo.ne.gov/statshtml/01.html>

Nebraska Energy Office. (2010g). *Nebraska's Wind Energy Generation*. Retrieved 6/17, 2010, from <http://www.neo.ne.gov/statshtml/89.htm>

Nebraska Legislative Reference Bureau. (2009). In Heltzel K. (Ed.), *Nebraska Blue Book* (49th ed.). Lincoln, NE: Nebraska Legislative Council.

Solley, W. B., Pierce, R. R., & Perlman, H. A. (1996). *Estimated Water Use in the United States in 1990* (No. Report 1081)U. S. Geological Survey. Retrieved from <http://water.usgs.gov/watuse/tables/totab.st.html>

Solley, W. B., Pierce, R. R., & Perlman, H. A. (1998). *Estimated Use of Water in the United States in 1995* (No. 1200)U. S. Geological Survey. Retrieved from <http://water.usgs.gov/watuse/pdf1995/pdf/summary.pdf>

United States Department of Agriculture, Natural Resources Conservation Service, & Center for Survey Statistics and Methodology, Iowa State University. (2009). *Summary Report: 2007 National Resources Inventory*. Washington, DC and Ames, IA: Retrieved from [http://www.nrcs.usda.gov/technical/NRI/2007/2007\\_NRI\\_Summary.pdf](http://www.nrcs.usda.gov/technical/NRI/2007/2007_NRI_Summary.pdf)

United States Department of Energy. (2008). *20% Wind Energy by 2030: Increasing Wind Energy's Contribution to U.S. Electricity Supply*. Washington, DC: United States Department of Energy. Retrieved from [www1.eere.energy.gov/windandhydro/pdfs/41869.pdf](http://www1.eere.energy.gov/windandhydro/pdfs/41869.pdf)

United States Geological Survey. (2009). *Aquifer Basics: High Plains Aquifer*. Retrieved 6/2, 2010, from [http://water.usgs.gov/ogw/aquiferbasics/ext\\_hpaq.html](http://water.usgs.gov/ogw/aquiferbasics/ext_hpaq.html)

United States Environmental Protection Agency. (2009). *Estimating 2003 Building Related Construction and Demolition Materials Amounts* No. EPA530-R-09-002)EPA Office of Resource Conservation and Recovery.

United States Geological Survey. (2010). *USGS Water Science Glossary of Terms*. Retrieved 6/2, 2010, from <http://ga.water.usgs.gov/edu/dictionary.html>

University of Nebraska, Lincoln: School of Natural Resources. (1999). *Groundwater System*. Retrieved 6/2, 2010, from <http://snr-1349.unl.edu/navigation/satuatate.aspx>

USDA, National Agricultural Statistics Service. (2004). *Farms, Land in Farms, Value of Land and Buildings, and Land Use: 2002 and 1997. 2002 Census of Agriculture* (pp. 304). Washington DC: United States Department of Agriculture.

USDA, National Agricultural Statistics Service. (2006). *Nebraska Chemical Usage*. Retrieved 6/4, 2010, from [http://www.nass.usda.gov/Statistics\\_by\\_State/Nebraska/Publications/Biotechnology\\_Varieties/agchem06.pdf](http://www.nass.usda.gov/Statistics_by_State/Nebraska/Publications/Biotechnology_Varieties/agchem06.pdf)

USDA, National Agricultural Statistics Service. (2008a). *Farms, Land Use, and Sales of Organically Produced Commodities on Certified and Exempt*

Organic Farms: 2008. *2007 Census of Agriculture* (). Washington DC: United States Department of Agriculture. Retrieved from

[http://www.agcensus.usda.gov/Publications/2007/Online\\_Highlights/Organics/organics\\_1\\_01.pdf](http://www.agcensus.usda.gov/Publications/2007/Online_Highlights/Organics/organics_1_01.pdf)

USDA, National Agricultural Statistics Service. (2008b). Nebraska. *2007 Census of Agriculture: State Data* (pp. 7). Washington DC: United States Department of Agriculture. Retrieved from

[http://www.agcensus.usda.gov/Publications/2007/Full\\_Report/Volume\\_1,\\_Chapter\\_1\\_State\\_Level/Nebraska/st31\\_1\\_001\\_001.pdf](http://www.agcensus.usda.gov/Publications/2007/Full_Report/Volume_1,_Chapter_1_State_Level/Nebraska/st31_1_001_001.pdf)

USDA, National Agricultural Statistics Service. (2008c). Selected Characteristics of Irrigated and Nonirrigated Farms: 2007 and 2002. *2007 Census of Agriculture: State Data* (pp. 18). Washington DC: United States Department of Agriculture. Retrieved from

[http://www.agcensus.usda.gov/Publications/2007/Full\\_Report/Volume\\_1,\\_Chapter\\_1\\_State\\_Level/Nebraska/st31\\_1\\_011\\_011.pdf](http://www.agcensus.usda.gov/Publications/2007/Full_Report/Volume_1,_Chapter_1_State_Level/Nebraska/st31_1_011_011.pdf)

USDA, National Agricultural Statistics Service. (2008d). Selected Practices: 2007. *2007 Census of Agriculture* (pp. 605). Washington DC: United States Department of Agriculture. Retrieved from

[http://www.agcensus.usda.gov/Publications/2007/Full\\_Report/Volume\\_1,\\_Chapter\\_2\\_US\\_State\\_Level/st99\\_2\\_044\\_044.pdf](http://www.agcensus.usda.gov/Publications/2007/Full_Report/Volume_1,_Chapter_2_US_State_Level/st99_2_044_044.pdf)

United States Environmental Protection Agency. (2009). *Estimating 2003 Building Related Construction and Demolition Materials Amounts* No. EPA530-R-09-002)EPA Office of Resource Conservation and Recovery.

Environmental Building News. (2006) *Building Materials: What Makes a Product Green?*. Retrieved October 3, 2010, <http://www.buildinggreen.com/auth/article.cfm/2000/1/1/Building-Materials-What-Makes-a-Product-Green/>