The Nitrogen Cycle

The Nitrogen Cycle – good overview of nitrogen cycle and biological and chemical components
http://users.rcn.com/jkimball.ma.ultranet/BiologyPages/N/NitrogenCycle.html

Illinois State Water Survey – nitrogen cycle information, properties of nitrogen
http://www.sws.uiuc.edu/nitro/biogeo.asp

The Nitrogen Cycle – basic information about the nitrogen cycle, does not include uses and health issues
http://users.rcn.com/jkimball.ma.ultranet/BiologyPages/N/NitrogenCycle.html

Nutrient Cycles – Trinity College in Australia. Other information on Australian topics.


Environmental Impacts

Eutrophication – Site sponsored by Educational Network on Climate
Site describes impact of overload of nutrients on the environment, particularly the ocean and the impacts of eutrophication
http://www.atmosphere.mpg.de/enid/440f6a03086e972e952f1e3e3e99955c_55a304092d09/16e.html

Natural Resource Conservation Service – The Soil Biology Primer – Bacteria and soil nitrogen

Alberta Government, Environment, Algal Blooms – good resource on causes of algal blooms:

National Health Museum, Sewage systems


Natural Treatment System San Diego County, CA – natural treatment system for dry weather runoff – successfully removes nitrogen
http://www.naturaltreatmentsystem.org/what.html

http://ks.water.usgs.gov/Kansas/pubs/fact-sheets/fs.135-00.html

http://www.ext.colostate.edu/pubs/crops/00517.html


Health Issues


Iowa Women’s Health Study http://www.cancer.umn.edu/page/research/prevent6.html


Nitrates in water not linked to pancreatic cancer Reuters news site http://www.cancer.sutterhealth.org/health/healthinfo/reutershome_top.cfm?fx=article&id=16612


Nitrate in water tied to colon cancer risk in some, Amy Norton, Reuters Health Posting Date: November 27, 2003 http://www.oncolink.org/resources/article.cfm?c=3&s=8&ss=23&Year=2003&Month=11&id=10295

Nitrate in Drinking Water Associated With Increased Risk for NHL – National Cancer Institute site: http://cancerweb.ncl.ac.uk/cancernet/600355.html
http://www.cdc.gov/nasd/docs/d001201-d001300/d001233/d001233.pdf

ATSDR-CDC – Health Consultation - FORT PECK INDIAN RESERVATION, POPLAR, ROOSEVELT COUNTY, MONTANA Survey and discussion of health problems related to water quality contamination

Agency for Toxic Substances and Disease Registry (ATSDR) – Center for Disease Control site: Information on nitrate in water and methemoglobinemia
http://www.atsdr.cdc.gov/HEC/CSEM/nitrate/clinical_evaluation.html

http://www.cahe.nmsu.edu/pubs/_b/b-807.html

http://www.soil.ncsu.edu/publications/Soilfacts/AG-439-14/#Inorganic_Chemical_Effects:_Health_Concerns_from_Nitrate

Risk Assessment Information System – nitrates – toxicity summary for nitrate

Environmental Health Perspectives, NIH, Nitrogen Cycling Out of Control, Scott Fields, July 2004. Good summary of nitrogen cycle interactions with human.


Maryland Department of the Environment, 2004, Top Ten Sources of Nitrogen Oxides (NOx) in the Baltimore Area 1990
http://textonly.mde.state.md.us/Air/air_information/TopTenNOx.asp

Robson, S., 2003, Nitrate and nitrite poisoning in livestock: New South Wales Department of Industries, Agriculture, Agfact A0.9.67,

Scanlan, R. A., 2003, Nitrosamines and Cancer,
http://lpi.oregonstate.edu/f-w00/nitrosamine.html

Kendall, P., 1997, Diet Can Reduce Risk of Cancer
http://www.ext.colostate.edu/pubs/columnnn/nn970430.html
American Cancer Society (ACS), 2004, The Facts about Secondhand Smoke
http://www.cancer.org/docroot/COM/content/div_TX/COM_11_2x_The_Facts_about_Secondhand_Smoke.asp?sitearea=COM

Resources

World Resources Institute Earth Trends – database of global information on population, water resources, agriculture
http://earthtrends.wri.org/

Nitrogen the Family – basic chemical facts about nitrogen
http://www.carondelet.pvt.k12.ca.us/Family/Science/Nitrogen/thefamily.html

The University of Reading tutorial on nitrogen cycle – includes review questions and essay topics
http://www.ecifm.rdg.ac.uk/nutrient.html

Rutgers University: Building A Learning Community in Science and Mathematics through Educational Partnerships – nitrogen cycle lesson plan using aquarium.
http://mslc.rutgers.edu/nsfgk12/

USGS Water Posters – groundwater basics, water quality poster for the classroom, free.
http://water.usgs.gov/outreach/OutReach.html

USGS Nutrients in the Nation's Waters--Too Much of a Good Thing?
http://water.usgs.gov/nawqa/circ-1136/circ-1136main.html

USGS: Nitrate in the Ground Waters of the United States--Assessing the Risk
By Bernard T. Nolan and Barbara C. Ruddy, USGS FS-092-96, online
http://water.usgs.gov/nawqa/FS-092-96.html

Environmental Health News archives of articles dealing with nitrate issues
http://www.environmentalhealthnews.org/archives.jsp?sm=&tn=0subject&tv=nitrate&ss=1


Vision Learning module on Nitrogen Cycle – good source of links and background information.


Paper online, http://www.paperonline.org/
http://cwx.prenhall.com/bookbind/pubbooks/blb/chapter4/medialib/topics/04current2.html

Uses and Sources of Nitrogen

Zmaczynski, R., 2004, Haber-Bosh Process for Fertilizer manufacture: Good site
http://www.princeton.edu/~hos/mike/texts/readmach/zmaczynski.htm

http://www.psigate.ac.uk/newsite/reference/plambeck/chem1/p01263.htm

Trinitrotoluene - TNT
http://www.ch.ic.ac.uk/vchemlib/mim/bristol/tnt/tnt_text.htm

Environmental Science Published for Everyone Round the Earth (ESPERE) – Information on eutrification of oceans, worksheets and web links provided. Go to Climate Encyclopedia and then Oceans, basic.
http://www.atmosphere.mpg.de/enid/1442

http://www.extension.umn.edu/distribution/nutrition/DJ0974.html
http://www.extension.umn.edu/distribution/nutrition/DJ0974.html

Allied Kenco Sales – Meat preservation – Information on nitrate and nitrite
http://www.alliedkenco.com/data/data_sheets/nitrite_and_nitrate.htm

Bats Conservation International http://www.batcon.org/home/index.html

RIVM Dutch National Institute of Health and Environment, Global datasets and maps: Global NH₃ Emission Inventory for Agricultural Lands

The University of Hawaii NifTAL (Nitrogen Fixation by Tropical Agricultural Legumes) Center – information on legumes
http://www2.ctahr.hawaii.edu/tpss/research_extension/soliresearch/niftal/index.html

Europa – European Union portal – Pulp and paper manufacturing
http://europa.eu.int/comm/enterprise/forest_based/pulp_en.html

StonCor Africa, Pulp and Paper industry
http://www.stoncor.co.za/market_segment/pulpandpaper.html

Eckert, D., 2004, Efficient fertilizer use, Nitrogen,
Uhereck, E., 2004, Lower Atmospheric Basics, Nitrogen oxides – formation and relevance: Environmental Science Published for Everyone Round the Earth (espere): 
http://www.atmosphere.mpg.de/enid/23b.html

Vaughn, M. 2004, Student project on denitrification, Good graphic of process: 


Skyring, G. and Webb, A., 2004, Denitrification, 
http://www.ozestuaries.org/indicators/Def_denitrification.html

Experiments

Orchard Project
Test for nitrogen gas in the atmosphere:  http://www.orchardproject.org/nitrogen.htm

THE NITROGEN CYCLE: PRINCIPLES OF BIOREMEDIATION by Mark Murdock: Experiments dealing with soil nitrates and bacterial effects on nitrate content in soils 
http://www.che.wsu.edu/home/modules/98modules/murdock/NSF-WSU MODULE.htm - act1

Calculating Fertilizer Rates from Soil Test Recommendations, C. Owen Plank, Univ. Georgia Cooperative Extension Service, How to estimate fertilizer use for lawns 
http://www.cropsoil.uga.edu/lawn/

Ohio State Curriculum on Factors affecting nitrates in groundwater 
http://www-cms.ag.ohio-state.edu/AgSciLPs.html Environmental Science lesson plan Activity 3-3 has activity on nitrate leaching related to amount of fertilizer applied, placement of fertilizer, and role of plant matter and leaching of nitrate. Looks like a great experiment.