

Pine County Landfill Project

Objective

As a team of geoscientists from an environmental firm, your objective is to locate a site for a new landfill in Pine County, Minnesota. This landfill must be designed to receive 500,000 cubic yards of municipal waste (domestic waste and non-hazardous commercial and industrial waste) and have a footprint of approximately 20 square acres. The selection of this site should include careful consideration of the bedrock and surface geology, slope, population distribution, infrastructure (e.g., roads), land cover, land status, and other concerns. The recommended site(s) must also meet all of the Minnesota State regulations concerning landfills. Students will work in teams and will present their results in oral and poster format at the end of the semester.

Background

Pine County covers a 1,140 square mile region north of the Twin Cities. It is relatively unpopulated (27,100 residents; approximately 19 persons per square mile), but includes several cities and townships (e.g., Pine City, Hinckley, and Sandstone). Pine County is also home to several of Minnesota's parks and forests including Banning State Park, Nemadji State Forest, St. Croix State Park, St. Croix National Scenic Riverway, Chengwatana State Forest, Moose Lake State Park, and General Andrews State Forest. Recent landfill closures (e.g., Korf Brothers Sanitary Landfill north of Pine city in 1989) and the increasing population and increasing volume of solid waste necessitate the development of a new landfill in the near future. Siting a landfill in a relatively unpopulated region such as Pine County is less constrained by the NIMBY ("Not In My Back Yard") syndrome. However, large portions of the county are underlain by lake, marsh, or stream waters, and thus are unsuitable for solid waste landfill. Furthermore, recent geological studies (e.g., County Atlas Series Maps of Pine County) emphasize the importance of karst, paleochannel, and ancient fault structures in the region. Finally, large regions of the county are classified as park or forest and not available for development as a landfill.

Definition

A landfill is defined as "the engineered deposit of waste onto and into the land in such a way that pollution or harm to the environment is prevented and, through restoration, land provided may be used for another purpose."

Methods

Each team will compile a list of criteria for determining suitable landfill sites. These criteria will also be ranked according to relative importance. This process should be conducted in conjunction with an overview of landfill regulations and design criteria. Teams will use a set of maps that were prepared as part of the Minnesota Geological Survey County Atlas Series. This series includes maps of the Bedrock Geology, Quaternary Stratigraphy, Surficial Geology, Depth to Bedrock and Bedrock Topography, Bedrock Geophysics, and the Mineral Endowment. Students will also use available literature in conjunction with maps of topography, land cover, land use, population distribution, and cultural features to choose a suitable site. Each group will recommend three potential sites that are ranked according to suitability. The results will be presented to the group in an oral presentation and a poster.