Marcell Experimental Forest (MAR)

The Marcell Experimental Forest (MAR) was formally established in 1962 to study the ecology and hydrology of peatlands. MAR has been reserved for long-term research with the cooperation of the USDA Forest Service Northern Research Station, the Chippewa National Forest, the Minnesota Department of Natural Resources, Itasca County, and a private landowner. Although formally established in 1962, monitoring of streamflow, weather, and well data collection began in 1960. In July 1978 MAR became the first site in the U.S. where the chemistry of rain and snow was studied as part of the National Atmospheric Deposition Program (NADP). The Marcell Experimental Forest is operated by the Northern Research Station, Ecology and Management of Riparian and Aquatic Ecosystems, located at the Forestry Sciences Laboratory, 1831 Highway 169 East, Grand Rapids, MN 55744.

Site Description and Characteristics: The Marcell Experimental Forest is an 890-ha tract of land located 40 km north of Grand Rapids, Minnesota. Our new Marcell Research Center was completed in 2005 to accommodate expanding collaborative research and as a replacement for the old facility which was built in1963. The new facility has approximately 2,500 sq ft with the main building providing a laboratory, conference facility which seats 30 people, and living quarters for visiting researchers and graduate students.

The climate of the Marcell Experimental Forest is subhumid continental, with wide and rapid diurnal and seasonal temperature fluctuations. The average annual air temperature is 3°C (37°F), with extreme of -46°C (-50°F) and 38°C (100°F). Average annual precipitation at MAR is 78.5 cm (30.9 in.) with 75% occurring in the snow-free period (mid-April to early November).

Upland vegetation is highly variable among watersheds depending on forest management practices and soils. Peatland vegetation also varies greatly depending on hydrology.

Mineral soils of the Marcell Experimental Forest are derived from glacial processes that occurred during the Wisconsinan glaciation, which began about 75,000 years ago. Peatland organic soils vary in properties based on decomposition state.

Our Research Focuses On: The depth, variety, and length of water, soil, atmosphere, and vegetation databases at the Marcell Experimental Forest give graduate students and collaborative scientists a unique opportunity to study watershed and landscape aspects of northern Lake States upland and peatland ecosystems. Additionally, the experimental forest installs and monitors a variety of demonstration plots. Six peatland / upland forest watersheds have been instrumented, and have been studied in detail, including hydrology, nutrient and mercury

cycling and behavior, and release of organic carbon and acidity. Hydrologic monitoring and other related research continues at MAR:

- Peatland function, including studies of plant production, decay, nutrient cycling, and historic acid conditions in peat profile.
- Effects of timber harvest, prescribed burning, fertilizer and herbicide use, and grazing on water yield and quality.
- Best Management Practices for protecting wetlands and areas near surface waters while managing for timber.
- Testing of soil water to determine ecosystem health including acidification and methylization of mercury.
- Riparian linkages and modeling between uplands & wetlands.
- Maintaining nearly five decades of long-term records of meteorological and hydrological data sets. These data are important both locally and internationally.
- Peatland interactions such as methane production with the earth's atmosphere, including their effect on global climate change.
- Monitoring of rain and snow chemistry, as part of the National Atmospheric Deposition Programs National Trends Network & Mercury Deposition Network (one of two hundred sites in the U.S.)
- Studies of water flow, carbon dynamics, nutrient cycling, acid rain, mercury deposition, and the biogeochemistry of peatlands.
- Long-Term Soil Productivity (one of many sites in a national study). The main objectives are to quantify, validate, evaluate and understand soil disturbance on soil properties, long term productivity and management practices.
- Contribute to syntheses on hydrology and climate through online data sources including HydroDB and ClimbDB (http://www.fsl.orst.edu/climhy/) and our our website (http://www.ncrs.fs.fed.us/ef/marcell/)