

# THE ATMOSPHERIC RESERVOIR

*Examining the Atmosphere and Atmospheric Resource Management*

## "Degree-Days" Defined

By Mark D. Schneider

Without looking up the definitions, many scientists wouldn't be able to tell you precisely what growing, heating, and cooling degree-days are. The American Meteorological Society (AMS) defines a Growing Degree-Day (GDD) as "a heat index that relates the development of plants, insects, and disease organisms to environmental air temperature." In North Dakota, we most commonly associate GDDs with the amount of time a crop takes to reach maturity. Many farmers took a closer look at the average number of GDDs their crops would need to mature this year because of the late planting season. Temperatures this spring were cooler than average and as a result we saw plants and flowers blooming and maturing much later than normal. If farmland wasn't dry enough for planting by the beginning of June, chances are that land was left unseeded. The amount of GDDs for crops planted on this land would've stretched a potential harvest too late into the season.

The equation used to calculate GDDs is actually very basic. A GDD is equal to adding the daily maximum and minimum temperatures, dividing by two, and then subtracting the defined base temperature (usually 5-10 degrees Celsius). The base temperature is determined by the specific life cycle of each plant; wheat, barley, oats, and flaxseed typically have base temperatures of around 5 Celsius whereas soybeans and maize are closer to 10 Celsius. A plant's growth is equal to zero any time the environmental air

temperature is less than the base temperature.

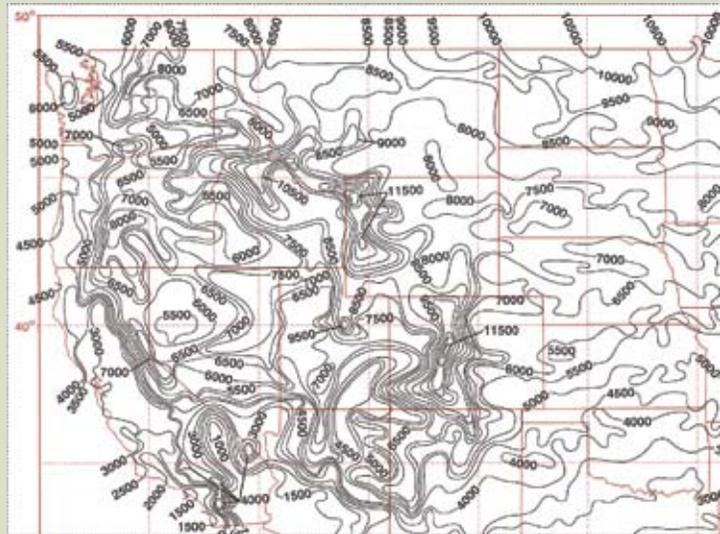
A glance at a monthly utility bill will reveal something called a Heating Degree-Day (HDD). A HDD is "a form of degree-day used as an indication for fuel consumption (AMS definition)." Specifically, every degree that the daily mean temperature drops below a base temperature of 65 Fahrenheit is considered one HDD. North Dakota's average annual HDDs rank among the highest in the United States (see graphic). This is very apparent, for example, when observing the furnace running regularly during a good portion of the year. Utility bills also include Cooling Degree-Days (CDD). CDDs are simply "a form of degree-day used to estimate the energy requirements for air-conditioning or refrigeration." Every degree that the mean temperature rises above 75 Fahrenheit is equal to one CDD. As you probably guessed,

North Dakota ranks lower than most states in annual CDD because of our cooler climate.

Why are there two different base temperatures for defining HDDs and CDDs? Think of 65 to 75 degrees Fahrenheit as a range of temperature that's representative of most residences and businesses. Any temperature below 65 would likely warrant turning the furnace or heating system on. Anything above 75 and people probably would want their air-conditioners running. HDDs and CDDs aren't used to calculate costs for your utility bills, but do serve as good energy consumption indexes, showing the current usage with reference to annual and seasonal trends.

There are indexes to categorize just about anything and GDDs, HDDs, and CDDs are very useful for farmers, utility companies, and consumers when it comes to planning purposes.

**ANNUAL HEATING DEGREE DAYS  
BASED ON NORMAL PERIOD 1961-1990**



National Climatic Data Center (NCDC)