



# NATURAL RESOURCES

## AIR AND CLIMATE

## **Climate**

Climate is defined as the average pattern of weather at a particular place and measured over a specific, usually long, period of time. It is influenced by the relative position of oceans and continents, latitude, local conditions, altitude, and the impact of man's activities.<sup>1</sup>

The climate of Centre County is described as humid continental. It is a combination of the relatively dry Midwestern climate and the humid conditions typically found on the East coast.<sup>2</sup> A humid continental climate experiences frequent daily and seasonal temperature changes, abundant precipitation, warm summers, and cold winters.

Weather is defined as the condition of the atmosphere at a particular point in time or over a short period. It is identified by many meteorological recordings, including temperature, precipitation type and amount, cloud cover and sunshine, as well as wind speed and direction<sup>3</sup>.

Although Pennsylvania is in close proximity to the Atlantic Ocean, this body of water has only a limited effect on the weather. Prevailing westerly winds (wind that blows more frequently than any other in a particular direction) bring most of the weather disturbances from the Midwest.

The landscape of Centre County results in diverse weather conditions. Wind, temperature, and precipitation can all be affected by the topography of Centre County.

<sup>1</sup> Westwell, Ian, *FactFinder Guide: Weather*, London, Grange Books, 1999, p. 41.

<sup>2</sup> Pennsylvania State Climatologist website

<sup>3</sup> Westwell, Ian, *FactFinder Guide: Weather*, London, Grange Books, 1999, p. 154.

## **Winds**

The average velocity of surface wind in Centre County is 8 miles per hour.<sup>4</sup> In areas where there are few trees, the wind may blow a little stronger. Severe weather may bring about weather extremes. The county averages about one tornado every five to ten years.<sup>5</sup> The biggest tornado to occur in the county was on May 31, 1985. With wind speeds between 200 and 250 miles per hour, the tornado made its way through the Moshannon and Sproul State Forests, clearing large swaths of land. Fortunately, there were no injuries.

### **Centre County Weather Extremes**

**Highest Temperature-** 102° on July 9, 1936  
& July 17, 1988

**Lowest Temperature-** -20° on February 10, 1899

**Heaviest Monthly Snowfall-** 47.5" in. March 1942

**Wettest Year-** 59.30" in 1996

**Driest Year-** 24.81" in 1930

**Biggest Rainfall** (24 hr period) - 4.71" on June 23,  
1972

**Biggest Snowstorm-** 30.5" on March 30-31, 1942

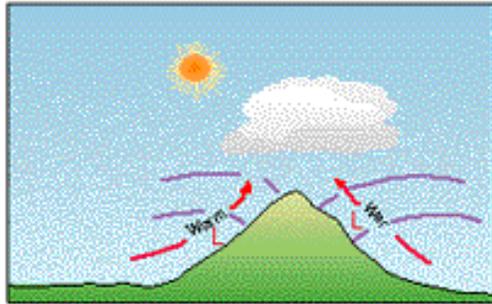
(Source: Penn State Weather Observatory)

In Centre County, valley breezes can occur throughout the day. This type of breeze occurs when air near the sides of

<sup>4</sup> *Directions for the Future: Guidelines for Decision Making*, Centre County Planning Commission, 1979.

<sup>5</sup> Email from William Syrett, Penn State Weather Station Coordinator, October 3, 2003.

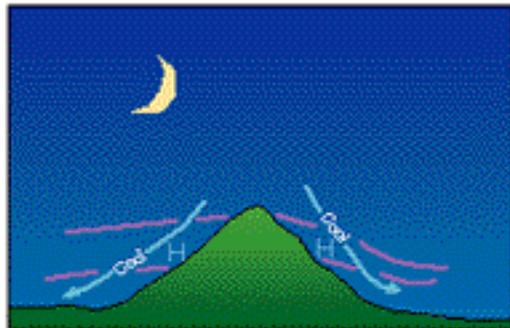
the mountains is exposed to sunlight for an extended period of time. As the mountainside air becomes warmer, it rises and is replaced with air from the valleys. Valley air continues to move upward throughout the day and is responsible for the clouds and precipitation that occurs over the mountains.<sup>6</sup>



Valley Breeze

Valley breeze (Source: Cooperative Institute for Mesoscale Meteorological Studies website)

At night, the air near the mountain slope quickly cools and sinks down into the valley. This movement of air is a mountain breeze. The air that comes off the mountains pools in the low-lying valley and it is here that the coldest air is often found. These areas are often the first to experience frost.<sup>7</sup> In the morning, fog may form if the air is moist enough.



Mountain Breeze

Mountain breeze (Source: Cooperative Institute for Mesoscale Meteorological Studies website)

<sup>6</sup> Cooperative Institute for Mesoscale Meteorological Studies website

<sup>7</sup> Ibid.

## Temperature

The mountainous areas of the county tend to be colder as air molecules hold less heat as elevation increases. Consistent differences in average monthly temperatures of 3° to 5° Fahrenheit (F) exist between mountains and valleys.<sup>8</sup> Because of the mountain breezes, freezing temperatures occur later in the spring and earlier in the fall resulting in a shorter growing season in the valley. However, growing seasons are long enough to produce crops, averaging 166 days and typically extending from April 29 to October 12.<sup>9</sup>

## Precipitation

Precipitation in the valleys is also affected by nearby mountain ranges. The average annual rainfall total for State College is 38.51 inches and the average annual snowfall total is 45.9 inches.<sup>10</sup> Greater totals can be found in the higher elevations of the county, sometimes even twenty percent greater.<sup>11</sup> The wettest month of the year is June and the driest month is February.

Rain during the warmer months often occurs during the afternoon and evening and is normally produced from thunderstorms that come from the southwest. The county averages between 30 and 40 thunderstorms per year, almost all occurring between April 15<sup>th</sup> and October 15<sup>th</sup>.<sup>12</sup> Occasionally hail, wind, lightning, and local flash flooding from these storms have the potential to cause property damage as well as personal injury. Storms from the east come into the county mostly in the

<sup>8</sup> Penn State Weather Station website

<sup>9</sup> Ibid.

<sup>10</sup> William Syrett (Source: Penn State Weather Observatory)

<sup>11</sup> Penn State Weather Station website

<sup>12</sup> William Syrett (Source: Penn State Weather Observatory)

winter and spring months, bringing rain, snow, sleet, and ice. Measurable snowfall typically occurs from October through April.<sup>13</sup>

### Unique climate environments

Occasionally topography, geology, vegetation, development patterns, and other factors combine to form unique temperature variations. Two such variations existing within Centre County are noted below.

### Scotia Barrens

Hailed as the “coldest Region in Pennsylvania once the sun sets”<sup>14</sup>, the Scotia Barrens has a unique microclimate.<sup>15</sup>

The Scotia Barrens (or the Barrens) average high temperature closely resembles that of nearby State College. It is the average low temperature that makes the Barrens special. During or after sunset, the temperature can fall over 9° F per hour and the average nighttime temperature can be up to 30° F lower than surrounding areas.<sup>16</sup>

This change in temperature is made possible by its topography and vegetation. Cold air from the surrounding ridges drops down into the narrow valley and because it is enclosed by hills on either end, the cold has no place to go.<sup>17</sup> In addition, because this area was stripped for iron and charcoal in the 1800’s the vegetation has not had a chance to recover which further adds to the chilly temperatures.

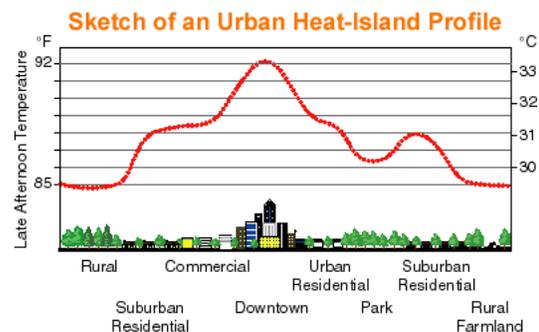
<sup>13</sup> Penn State Weather Station website  
<sup>14</sup> Pennsylvania State Climatologist website  
<sup>15</sup> The climate of a small, specific place within an area as contrasted with the climate of the entire area. (Source: www.dictionary.com)  
<sup>16</sup> Pennsylvania State Climatologist website  
<sup>17</sup> Earth System Science Center website

### Urban heat island

An urban heat island is an area that has a warmer temperature than the surrounding regions. Dark surfaces like asphalt and rooftops absorb heat and with less vegetation to provide shade and cool the air down, a heat island effect is created. At night, urban areas release the heat that has collected throughout the day much slower than the surrounding rural area. As a result, urban areas retain the heat much longer while rural areas quickly cool down.

Warmer temperatures result in the quicker formation and dissipation of smog. In addition, more electricity is used to cool homes and businesses in these areas, resulting in increased pollution from energy producers.

Unofficial data suggests that an urban heat island exists around State College. Measurements show a two to three degree difference between State College and the surrounding area.<sup>18</sup>



Source: LLBL Heat Island Group

To mitigate the urban heat island effect, trees and other vegetation can be planted to shade heat-absorbing surfaces and to help cool the air. Existing rooftops and paved surfaces in need of replacement as well as new construction should use

<sup>18</sup> Email from William Syrett, Penn State Weather Station Coordinator, October 3, 2003.

heat reflective roofing and paving in place of heat absorbing materials.

### **Air Resources**

Air is defined as a colorless, odorless, tasteless gaseous mixture, mainly nitrogen (approximately 78%) and oxygen (approximately 21%) with lesser amounts of other gases as well as varying amounts of moisture, low-altitude pollutants, and particulate matter, enveloping the earth.<sup>19</sup>

Because air is so vital to the process of life, it is important that negative impacts to air quality be recognized and solutions sought. The following text discusses legislation and tools that help to improve air quality.

### **Clean Air Act**

Congress passed the first piece of legislation dealing with air quality called the Air Pollution Control Act of 1955. The purpose of this Act was to make citizens more aware of air pollution.

The next piece of legislation was the Clean Air Act of 1963. This Act went further by identifying stationary sources (e.g. power plants and steels mills) as a cause of pollution and also by setting emissions standards for these sources. Subsequent amendments (passed in 1965, 1966, 1967, and 1969) went even further by authorizing that standards for auto emissions be set, expanding local air pollution control programs, establishing air quality control regions, setting air quality standards and compliance deadlines, and authorizing research on low emissions fuels and automobiles.<sup>20</sup>

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<sup>19</sup> *Webster's II New College Dictionary*, Houghton Mifflin Company, Boston, 1999.

<sup>20</sup> American Meteorological Society website

The Clean Air Act of 1970 set much more demanding standards to limit the levels of pollution in the air, set new standards for both stationary and mobile emissions to be enforced by both state and federal governments, and increased funds for air pollution research.<sup>21</sup>

Thirty years later, Congress enacted the Clean Air Act Amendments of 1990 (CAAA). This legislation was designed to reduce three major threats to humans and the environment: acid rain, urban air pollution, and toxic air emissions.<sup>22</sup> The amendments required that some programs remain at the federal level while others were to be adopted into state law. States are required to meet federally mandated air quality standards. The Department of Environmental Protection (DEP) is responsible for meeting these standards in Pennsylvania.

### **National Ambient Air Quality Standards**

The Environmental Protection Agency (EPA) uses six criteria pollutants as indicators of air quality. These pollutants are carbon monoxide (CO), nitrogen dioxide (NO<sub>2</sub>), ozone (O<sub>3</sub>), lead (Pb), particulate matter (PM 10 or PM 2.5) and sulfur dioxide (SO<sub>2</sub>). For each of these pollutants, a maximum concentration, above which public health is affected, has been established. The concentrations are known as National Ambient Air Quality Standards (NAAQS). There are two types of standards: primary standards (sets limits to protect public health) and secondary standards (sets limits to protect public welfare including

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<sup>21</sup> Ibid.

<sup>22</sup> *Pennsylvania and the Clean Air Act Amendments of 1990 Fact Sheet*, Pennsylvania Department of Environmental Protection, January 2002.

damage to animals, crops, vegetation, and buildings).

An area that consistently stays below the NAAQS is designated "Attainment." Areas that exceed the air quality standards set for any of these pollutants are identified as "Non-attainment" for that specific pollutant. Non-attainment areas are further classified in order of increasing severity, as: Marginal, Moderate, Serious, Severe, and Extreme. These classifications help to specify the measures that the area must take to reduce pollution levels and also the timeframe the area has to reach attainment. An area that was once in non-attainment but now holds to the NAAQS and has an EPA approved plan to maintain the standard is designated a "Maintenance" area.<sup>23</sup>

Centre County currently is in attainment for all pollutants. However, in early 2003, DEP recommended 8-hour ozone non-attainment area designations to the EPA. Centre County was included in this recommendation. Should EPA accept the recommendation put forth by DEP, Centre County would be in non-attainment for the 8-hour ozone standard effective April 2004.<sup>24</sup> If this were to happen, any regionally significant transportation plan, program, or project would fall under transportation conformity requirements.

Transportation conformity ensures that funding goes only to projects that are consistent with air quality goals such as reduced emissions.<sup>25</sup> This is done through a computer-modeling program. The Pennsylvania Department of Transportation (PENNDOT) assists

Metropolitan Planning Organizations and Rural Planning Organizations in assuring appropriate conformity requirements are met.<sup>26</sup>

### **Air Quality Index**

The EPA created a system to inform the public of the air quality levels in their community. Using five criteria pollutants, the Air Quality Index (AQI) measures pollutant concentrations and converts them into a number on a scale of 0 to 500. The resulting number corresponds to an interval on the AQI scale which may list a descriptor, general health effects, and cautionary statements if required.

The AQI is an information tool to advise the public and usually is found in the newspaper near the weather section. Using the AQI allows the public to determine their health risk for the day and plan accordingly. Those most at risk are children, older adults, and people who have respiratory conditions.

AQI values can vary between seasons. In the winter, carbon monoxide levels may be elevated because cold weather makes it difficult for car emission control systems to operate effectively. In the summer, ozone levels may be elevated because heat and sunlight causes ozone to form. Pollution from particles can exist at any time of year.

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<sup>23</sup> Ibid.

<sup>24</sup> Email from Michael Baker, Pennsylvania Department of Transportation, September 30, 2003.

<sup>25</sup> U.S. Dept. of Transportation, Federal Highway Administration website

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<sup>26</sup> Email from Michael Baker, Pennsylvania Department of Transportation, September 30, 2003.

## Air Quality Index

0-50 Good

Air quality is considered satisfactory and poses little or no risk.

51-100 Moderate

Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people who are unusually sensitive to air pollution.

101-150 Unhealthy for Sensitive Groups

Members of sensitive groups may experience health effects. The general public is not likely to be affected.

151-200 Unhealthy

Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects.

201-300 Very Unhealthy

Health alert: everyone may experience more serious health effects.

>300 Hazardous

Health warnings of emergency conditions. The entire population is more likely to be affected.

(Source: EPA)

In 2001, 71% of Centre County's days were spent in the good air quality category, 21 % were moderate, and 1% unhealthful.<sup>27</sup> In 2002, the maximum AQI level reached 167 (unhealthful) and the median level was 40 (good).<sup>28</sup>

Centre County's air quality is monitored at two sites: Penn State University at the Arboretum site and at Penn Nursery, located off Route 322 in Potter Township.

<sup>27</sup> Scorecard website ([www.scorecard.org](http://www.scorecard.org))

<sup>28</sup> Ibid.



Monitoring station at the Penn State Arboretum

Pollutants can travel great distances from their sources. Air pollution suffered in one state or county does not necessarily come from contaminants within that area. Pollutants do not follow political boundaries and states and communities cannot work independently to combat them. Often it is most cost effective to reduce emissions from upwind sources.

Pennsylvania is a member of the Ozone Transport Commission (OTC). The OTC is comprised of states from Virginia to Maine, as well as Washington D.C. This Commission was created by the 1990 CAAA to combat the regional problem of ground-level ozone.

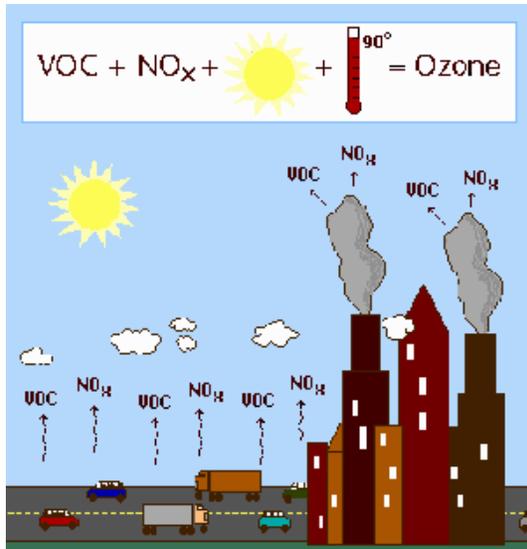
### Common pollutants

#### Ozone

Ozone is important because it protects us from the harmful rays of the sun. It is when ozone begins to form at ground level that it becomes a pollutant capable of damaging human health, vegetation, and property.

Ground-level ozone is produced when oxides of nitrogen (NO<sub>x</sub>) and volatile organic compounds (VOC) combine in the presence of heat and sunlight. Motor

vehicles, power plants, factories, chemical solvents, fossil fuel combustion, and consumer products all contribute to the creation of ozone. Because of the conditions required for this pollutant to form, ozone is considered a summertime pollutant with the ozone season spanning from May to September when the sun is at its hottest.<sup>29</sup>



(Source NJ DEP website)

On days when there is a high concentration of ozone in the air, people may experience problems breathing, eye irritation, cough, chest pain, congestion, throat irritation, aggravated asthma, and an increased chance of respiratory illnesses. Those who spend a lot of time outdoors in the summer, children, the elderly, and those with chronic respiratory problems are most at risk.

Ground-level ozone is responsible for one to two billion dollars in reduced crop production in the U.S. each year.<sup>30</sup>

<sup>29</sup> *Ozone: The Good, The Bad, The Smoggy Fact Sheet*, Pennsylvania Department of Environmental Protection, July 2003.

<sup>30</sup> *Regional Approaches to Improving Air Quality*, Environmental Protection Agency, May 1997.

Ozone interferes with the ability of plants to produce and store food causing the susceptibility of disease, insects, and harsh weather to rise. The leaves of trees and other plants are also damaged by ozone.

Ozone is a main component of smog. Smog is a fog containing smoke that is generated by the combustion of fossil fuels or other pollutants.<sup>31</sup> When smog forms there is the chance for reduced visibility potentially causing dangerous driving conditions.

When conditions are right, a temperature inversion can occur. Warm air stalls over cooler air trapping the air and any pollution within close to the ground. Until a strong enough wind comes along to get the warm air mass moving, the pollutants will continue to build up to unhealthy levels. The area most likely to suffer from temperature inversions in Centre County is the Bald Eagle Valley, although all ridge and valley areas are susceptible.<sup>32</sup>

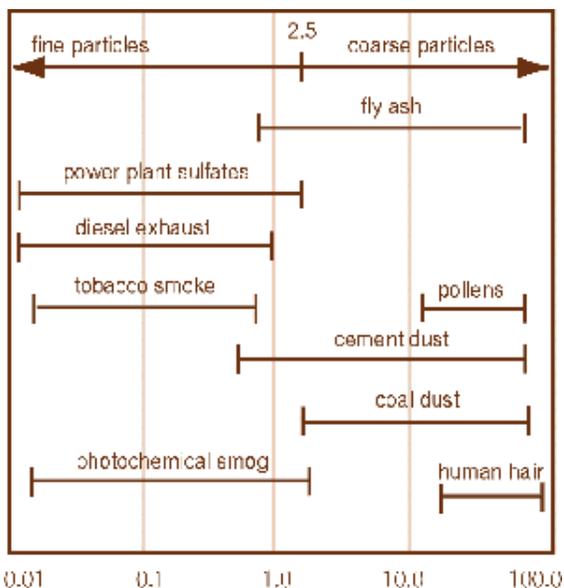
#### Particulate Matter

Another pollutant that can cause harm is particulate matter. Particulate matter, which includes solid particles and liquid droplets in the air, comes from a variety of sources and in varying sizes. "Coarse" particles are larger than 2.5 micrometers and typically come from sources such as driving on unpaved roads, surface mining, crushing and grinding operations, agricultural fields, and fuel combustion in vehicles. "Fine" particles are those less than 2.5 micrometers and result from fuel combustion in motor vehicles, power plants and industrial facilities, residential fireplaces, woodstoves, and wildfires.

<sup>31</sup> Westwell, Ian, *FactFinder Guide: Weather*, London, Grange Books, 1999, p. 130.

<sup>32</sup> *Centre County Comprehensive Plan 1970 Phase I Background Study*, Clifton E. Rodgers and Associates, July 1970.

Particulate matter also forms from gases in the atmosphere such as sulfur oxide,  $\text{NO}_x$ , and VOC.



General size range of selected particles in micrometers. *Not drawn to standard scale.* (Source: EPA Regional Approaches to Improving Air Quality)

When breathed in, fine particles can penetrate deep into the tissues of the lungs causing significant health problems including breathing difficulty, nose, throat and eye irritation, aggravated asthma, and an increased chance of respiratory illness. In severe cases, respiratory failure can occur. Those most at risk are children, the elderly, and those with chronic respiratory problems. Property damage is also a possibility as particulate matter can discolor structures and other property such as clothing and furniture.

### Haze

Particulate matter absorbs and scatters light creating a haze. This haze limits the ability to see distant objects. Some particulates, sulfates and nitrates for example, grow in size as the humidity in

the air increases.<sup>33</sup> This in turn increases the amount of haze and causes further reduced visibility. Haze is usually worse in the summertime when the humidity rises and the air tends to be stagnant. Particles can remain in the air for days and can be transported great distances causing visibility impairment in areas far from the pollution source including areas in which people recreate.

Generally, the eastern United States has poorer visibility than the western United States. Eastern United States visibility should naturally be about 90 miles. Pollution has reduced this range from 14 to 24 miles.<sup>34</sup>



Visibility Impairment caused by haze. (Source: EPA Regional Approaches to Improving Air Quality)

### Acid Rain

When sulfur dioxide ( $\text{SO}_2$ ) and  $\text{NO}_x$  combine with oxygen and water vapor in the air, sulfuric and nitric acids are formed. The primary sources of  $\text{SO}_2$  are power plants that burn coal, oil, and natural gas.  $\text{NO}_x$  emissions also come from power plants, but the biggest producer is mobile sources. In 1999,

<sup>33</sup> *Regional Approaches to Improving Air Quality*, Environmental Protection Agency, May 1997.

<sup>34</sup> *Ibid.*

5,644 tons of NO<sub>x</sub> emissions in Centre County came from mobile sources.<sup>35</sup>

The Ohio River Valley leads the United States in SO<sub>2</sub> and NO<sub>x</sub> emissions because power plants here burn high-sulfur coal.<sup>36</sup> Because the emissions are released high up into the air and can be carried great distances, those areas receiving the most acid rain are usually downwind.



Ohio River Valley  
(Source: www.plumdigital.com)

As a result, Pennsylvania receives some of the most acidic rain of any place where records are kept.<sup>37</sup> Acid rain is measured using the logarithmic pH scale which ranges from 0 (most acidic) to 14 (basic). A pH of 7 is neutral. Uncontaminated rain has a pH of 5.6, anything less is considered abnormally acidic.<sup>38</sup> In 1996, the average pH of precipitation in Pennsylvania was 4.3.<sup>39</sup> This is approximately 20 times more acidic than uncontaminated rain.

Acid can fall to the ground as precipitation (rain, snow, sleet, fog or mist) or as sulfate or nitrate particles.

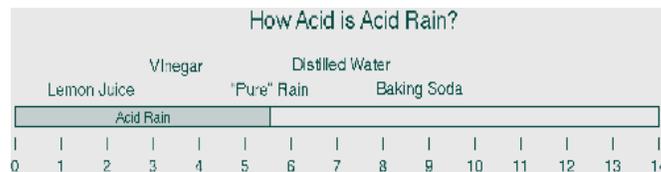
<sup>35</sup> Scorecard website

<sup>36</sup> *Regional Approaches to Improving Air Quality*, Environmental Protection Agency, May 1997.

<sup>37</sup> *Acid Rain: The Pennsylvania Connection*, Penn State College of Agricultural Sciences Cooperative Extension, 1999.

<sup>38</sup> Ibid.

<sup>39</sup> Ibid.



(Source: EPA Regional Approaches to Improving Air Quality)

The negative effects of acid rain are wide spread. Trees are affected when the soil in which they grow becomes contaminated by acid deposition. The acid may cause an increase in the soil's aluminum concentration resulting in damage to the root tips. This results in reduced uptake of essential nutrients like calcium and magnesium.<sup>40</sup> Over time, the tree weakens and is more susceptible to drought or disease. Saplings have a small chance for success in soil conditions resulting from acid rain.

There is the potential for groundwater and surface water to be impacted by acid deposition. Acid runoff episodes occur when precipitation or snowmelt overwhelms the ability of the stream or watershed to neutralize the acids in the runoff.<sup>41</sup> Groundwater quality is largely controlled by the bedrock it flows through. Streams that receive water from limestone are not as acidic. Those streams that are supplied from sandstones and shales are much more acidic.

Aquatic life can be impacted by the acidity. Algae and rooted plants die, reducing the amount of available food for insects and fish. Fish sensitive to acid can be physically harmed by suffering damage to their gills. Fish eggs and fry are very susceptible to high acidity. More tolerant fish species may begin to replace

<sup>40</sup> *Acid Rain: The Pennsylvania Connection*, Penn State College of Agricultural Sciences Cooperative Extension, 1999.

<sup>41</sup> Ibid.

original populations or the fish may disappear entirely.<sup>42</sup>

The Pennsylvania Fish and Boat Commission keeps track of stream acidity and has had to change their stocking methods over the years due to high acidity. Certain types of trout are more sensitive to acidity while others are more tolerant.

Drinking water can also be affected by acid rain. Acidic water can deteriorate pipes over time. Lead contamination is of concern because of the dangers associated with it such as central nervous system damage in children and high blood pressure in adults.<sup>43</sup>

Acid rain aids in the deterioration of buildings and monuments. Over time, the acid wears away certain types of stone causing damage resulting in lost dollars as well as aesthetics. The potential for the acid to eat away at house and automobile paint also exists.

### **Pollution in Centre County**

By far the biggest pollutant contributor in Centre County is mobile sources. Mobile sources include cars, trucks, and buses, as well as airplanes, and agricultural and construction equipment. In 1999, mobile sources (mostly highway vehicles) contributed 42,222 tons of air pollution to Centre County, of which 29,440 tons was carbon monoxide.<sup>44</sup>

The 2000 Census lists 63,097 workers in Centre County age 16 and over who commute to work. Two-thirds of these commuters drove alone and the average travel time to work was 19.6 minutes.

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<sup>42</sup> *Acid Precipitation*, Pennsylvania Fish & Boat Commission website

<sup>43</sup> *Acid Rain: The Pennsylvania Connection*, Penn State College of Agricultural Sciences Cooperative Extension, 1999.

<sup>44</sup> Scorecard website

Mile for mile, most emissions from a car trip occur during the first 15 minutes a car is running.<sup>45</sup> The Federal Highway Administration estimates that sixty percent of all automobile trips are less than five miles in length.<sup>46</sup> By giving into the convenience of the automobile, drivers miss the opportunity to walk or bike to their destination and more importantly, miss the opportunity to improve air quality.

Currently in Pennsylvania, only counties around Philadelphia and Pittsburgh are required to test vehicle emissions during annual inspections. However, starting at the end of 2003, all counties in Pennsylvania will undergo some form of emissions inspection.

Beginning between January 2004 and March 2004, most 1975 and newer vehicles in Centre County will be required to undergo a Gas Cap Test and a Visual Anti-Tampering Check during annual inspection. The Gas Cap Test determines if a gas cap seals correctly. Caps that do not have a tight seal allow fumes to escape from the tank into the atmosphere. The Visual Anti-Tampering Check is an examination to see if the vehicles emission control components have been removed or tampered with.

The second biggest pollution contributor is area sources. Area sources are polluters that emit less than ten tons of a single criteria pollutant or less than 25 tons of a combination of pollutants.<sup>47</sup> Examples of area sources cover a broad range and include dry cleaners, gas stations, and auto body paint shops, as

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<sup>45</sup> *Transportation Control Measures- Environmental Factsheet*, Environmental Protection Agency, December 1997.

<sup>46</sup> *Bicycle and Pedestrian Programs As a Transportation Control Measure- Environmental Factsheet*, Environmental Protection Agency, December 1997.

<sup>47</sup> Scorecard website

well as heating and cooling systems of commercial and residential buildings, paints, lawn mowers, and household barbecues. Open burning, landfills, and wastewater treatment also contribute to area source pollution. Individually each polluter may only emit a very small amount of pollution. Collectively, problems arise, especially in heavily populated areas where small sources may be in close proximity. In 1999, area source pollutants contributed 4,569 tons of particulate matter to Centre County.<sup>48</sup> Particulate matter is the main ingredient in haze.

The final contributor is point source pollution. This includes major industrial facilities including chemical plants, steel mills, and oil refineries. Point sources emit ten tons or more of any criteria pollutant or 25 tons or more of mixed pollutants per year. In Centre County, point sources accounted for 12, 868 tons of pollution in 1999.<sup>49</sup>

The following table lists the top nine Centre County facilities that pollute through air release (either directly into the air through stacks or indirectly through leaky valves). The data comes from the EPA's 2000 public data release and was compiled by www.scorecard.org.

Rank	Facility	Pounds
1.	Cerro Metal Prods. Co., Bellefonte, Spring Twp.	51,119
2.	Sonoco Prods. Co., Milesburg, Boggs Twp.	45,817
3.	Rutgers Organics Corp., State College, College Twp.	9,350
4.	Corning Asahi Video Prods. Co., State College, College Twp.	6,548
5.	Montour Oil, Rebersburg,	2,431

<sup>48</sup> Ibid.

<sup>49</sup> Ibid.

	Miles Twp.	
6.	Hanover Foods Corp., Centre Hall, Potter Twp.	250
7.	Graymont (PA) Inc., Pleasant Gap, Spring Twp.	239
8.	Murata Electronics N.A. Inc., State College, Ferguson Twp.	20
9.	Con-Lime Inc., Bellefonte, Spring Twp.	4

It should be noted that, due to economic considerations, both Corning Asahi and Rutgers Organics closed their Centre County facilities in 2003.

### Energy Conservation

Using energy efficiently and conserving energy where possible not only can save money, but also can help to improve air quality.

Whenever a fossil fuel is burned, the air is polluted. Using less gasoline, natural gas, and electricity helps to better air quality. In addition, the American Petroleum Institute estimates that the United States has about 70 years left of recoverable oil at current consumption rates.<sup>50</sup> Reducing use of fossil fuels and using alternative fuels will help to insure that future energy needs can be met.

One conservation method is an alternative fuel vehicle. Any vehicle that relies on any fuel other than gasoline or diesel is considered an alternative fuel vehicle. The most common are natural gas, propane, and electric. Electric vehicles run on batteries and are the only alternative fuel vehicles that produce zero emissions.<sup>51</sup>

Pennsylvania has an Alternative Fuels Incentive Grant Program. This program

<sup>50</sup> Consumer Energy Center Website

<sup>51</sup> Ibid.

is open to (including but not limited to) schools, school districts, municipal authorities, counties, cities, boroughs, towns, townships, and residents of Pennsylvania. Examples of projects eligible for funding include the purchase of alternate fuel vehicles or the conversion of existing vehicles to the use of alternate fuels.

The Centre Area Transit Authority (CATA) currently has a fleet of buses that use natural gas as a fuel source. Natural gas burns clean and produces fewer harmful emissions than regular gasoline.

CATA offers a program called RideShare in which people are matched up for carpooling opportunities. Using information supplied by those interested, CATA uses a match program to match individuals who share the same commute. The interested commuter receives a custom list of names and phone numbers of participating commuters and it is up to them to make further arrangements.

CATA also participates in the Smart Commute Initiative. This mortgage program encourages home ownership near public transportation resources. It allows home buyers to capitalize on reduced commuting costs in the form of extra cash to quality for a home.<sup>52</sup> Anyone looking to purchase a home within one quarter of a mile of any CATA bus stop can benefit from this program.

In addition to these programs, CATA also is looking into establishing Park and Ride lots within the county. Currently, a lot is being considered in the Old Fort area of Potter Township and the Cold Stream Dam area of Philipsburg.

### **Alternative Energy Sources**

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<sup>52</sup> Centre Area Transit Authority Newsletter, April 2003.

Other sources of energy include solar energy and wind power.

Active solar systems can be installed to collect the sun's heat using large panels which heat air or liquid and then circulate it through the structure. In Pittsburgh, the IKEA furniture store uses solar panels as their source of electricity. This will reduce carbon dioxide emissions approximately 19 tons per year.<sup>53</sup>



Installation of solar panels.

A method of passive solar heating is locating a building in a spot where full advantage of the sun is utilized to help to create warmth. The addition of more windows or other materials that have the ability to hold heat also can help to conserve energy.

In areas where there is sufficient wind, electricity generated by wind turbines may be feasible. Wind power produces no air pollution. Pennsylvania has the potential to produce 5120 megawatts of electricity, or 45 kilowatt hours per year.<sup>54</sup> The largest wind farm in the state is the Mill Run/Somerset facility, which provides power to 8,200 homes and offsets about 75 million tons of carbon dioxide, 568 thousand pounds of sulfur dioxide, and 177 thousand pounds of oxides of nitrogen.<sup>55</sup> In rural areas, small wind electric systems may be an option for

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<sup>53</sup> Solar Electric Power Association website

<sup>54</sup> Robb, Drew, "Things get windy in Pennsylvania," *Pennsylvania Business Central*, August 15, 2003, p. 11.

<sup>55</sup> Ibid.

farms and residences. Turbines large enough to produce a significant portion of the electricity needed by the average U.S. home generally require an acre or more of land.<sup>56</sup>



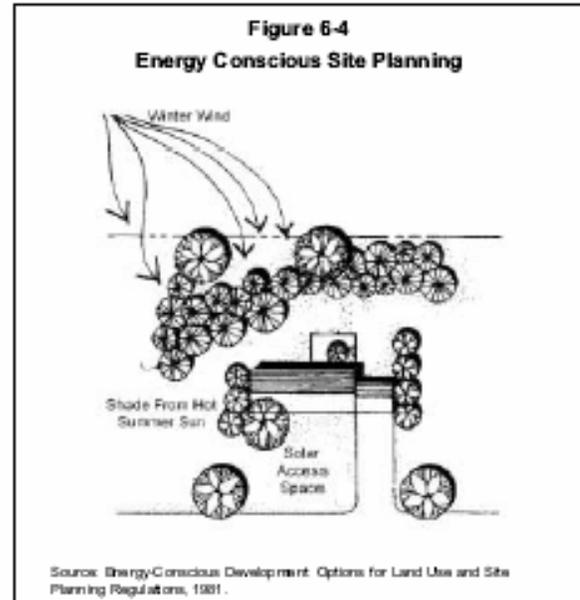
### Site Design

When planning subdivisions and commercial projects the nature of the site should be taken into consideration to maximize natural heating and cooling opportunities. Factors like breezes, access to the sun, wind protection, and shade should all be considered. Vegetation should be left untouched as much as possible to provide shade and protection from the wind. Trees not only help by providing shade, they also cool down the air by releasing water vapor. Neighborhoods with a 40% forest canopy save homeowners at least four percent in heating bills in the winter and ten percent on cooling bills in the summer plus energy savings can be as high as 30% when trees are planted on east and west sides of each home.<sup>57</sup>

Reducing the amount of impervious surface helps to cut down on heat-absorbing surfaces. During construction, if feasible, heat reflective roofing and paving materials should be used.

<sup>56</sup> *Small Wind Electric Systems: A Pennsylvania Consumer's Guide*, United States Department of Energy.

<sup>57</sup> "Envirocast- Weather & Watershed Newsletter," Final Edition, July 7, 2003.



(Source: Energy-Conscious Development: Options for Land Use and Site Planning Regulations, 1981.)

Neighborhoods and shopping centers that are built in close proximity to existing residential and commercial land uses can also help to conserve energy and reduce pollution. The distance one travels to go shopping or to work is reduced if needs can be met locally, thus reducing the need for gasoline and causing less pollution. If businesses are close enough, people may feel motivated to bike or walk to their destination instead of relying on a vehicle.

### Other methods of Conservation

There are many things that individuals can do to conserve energy and reduce air pollution.

Outside, a consumer can landscape with plants that will provide ample shade and protection from the sun and wind. Old, worn appliances can be replaced with new energy efficient ones. Homes can be better insulated and windows and doors weather-stripped to retain warm and cool air.

There are many ways to help reduce air pollution. Relying less on the automobile and walking, biking, using mass transit, or carpooling is one method of reduction. Combining trips when going out instead of making numerous trips throughout the day helps as well. Not topping off gasoline is a good idea because doing so increases the risk of fumes released into the air.

These are just a handful of tips to help conserve energy and reduce air pollution.

### **Conclusion**

The quality of the air in a particular place can determine the quality of the life citizens live. The negative impacts of poor air quality are widespread. It would be hard to find something that is not affected by air pollution in one way or another. People can suffer from illness due to pollution. Trees and vegetation can be damaged by pollution. Fish are not safe from harm if their waters have been polluted. Even buildings and monuments are not safe from pollution. The State and Federal government are doing their part to clear the air from pollution by enacting legislation. The key, however, is to educate citizens of the impact their everyday actions have on the air that we breathe. Through education, we can begin to clean up air pollution locally to improve quality of life. Education can provide an appreciation of air quality and help to protect the air for future generations.

**Natural Resources Plan  
AIR AND CLIMATE**

**GOAL**

Identify, preserve, and monitor Centre County's environmental natural resources for the benefit of present and future generations.

**OBJECTIVES**

Protect watershed features such as surface and underground water supplies, streams, floodplains, wetlands, fish and wildlife habitats, and aquifer recharge areas.

Promote and preserve the County's natural areas for scenic, educational, historic, environmental, recreational, and tourism purposes.

Use identified natural resource areas and public open spaces to provide guidance with land development activities.

Reduce air, water, land, noise, and visual pollution.

**RECOMMENDATIONS**

Promote car-pooling, public transit, walking and biking as alternative forms of transportation.

Encourage the establishment of pedestrian and bicycle paths to allow for non-motorized forms of transportation.

Encourage land use planning that would decrease automobile travel thereby reducing pollution and conserving energy.

Encourage the expansion of the public transportation system within the County.

Promote the use of programs such as the Smart Commute Initiative, RideShare, and Park and Ride.

Modify the Centre County Subdivision and Land Development Ordinance to include energy conscious site planning and conservation design principles.

Encourage Centre County municipalities to incorporate energy conscious site planning and conservation design principles into local land use controls.

Explore opportunities to purchase natural gas powered vehicles for Centre County's fleet or explore the option of converting gasoline run vehicles into natural gas run vehicles.

Coordinate land use and transportation planning to assist in achieving State and Federal standards for air quality.

Educate the public on the dangers of poor air quality and the need to reduce pollution and demonstrate ways in which the public can achieve these goals.