

CHAPTER SIX

UPDATE 2013 –
THE SANDUSKY COUNTY
COMPREHENSIVE PLAN

NATURAL RESOURCES

Summary

Natural resources play a vital role in Sandusky County. Not only do these various elements assist in the ecological well being of the many species that call Sandusky County home, but their abundance also helps to define the County's quality of life. They are also the basis for agriculture, which provides a livelihood for farmers in Sandusky County, contributes to the county economy, and helps to feed the world. It is very important that the growth and development framework that Sandusky County embraces in the future takes into consideration the conservation and promotion of these natural resources. While the use of federal and state dollars during development activities often requires administrative oversight by agencies above the County level, it is important that selective types of development that are not often part of this review process also embrace additional planning techniques, such as those that minimize stormwater runoff to limit groundwater contamination, or cluster developments that assist in the promotion of open space and land resources.



Because planning and zoning functions in the County are primary functions of local jurisdictions, although linked to the Sandusky County Regional Planning Commission and other County agencies, it is important that local officials have a good understanding of the location of these natural resources that may exist within their jurisdictions, and pursue the feasibility of incorporating additional conservation development techniques within their overall subdivision and zoning programs.

Planning Issues

The development of Sandusky County raises a variety of issues and concerns. This is largely due to common or unique physical constraints that exist within the County. If these constraints are not mitigated during the development process through engineering and other established methods, they can create new environmental challenges that can harm the quality of life of County residents.

Floodplains

Slightly more than thirteen percent, or 35,552 acres, of Sandusky County is located in flood-prone areas. Incorporated areas most prone to flooding include the portion of Clyde along Raccoon Creek, Fremont along the Sandusky River and Minnow Creek, and areas of Woodville located along the Portage River. Seasonal flooding also occurs along the low levels of the Portage River, and locations on the Swan and Muddy Creeks as they flow north into Ottawa County. However, due to increased development on or near the Sandusky River (and the fact that it runs through urban locations like Tiffin), Fremont and the Wightman's Grove area have been subjected to heavy flood damage in the past, and the U.S. Army Corps of Engineers has established levees along the river to mitigate flooding.

Areas in the southeast portions of the County near Bellevue are also prone to problems caused by sinkholes. Filling and/or blocking these sinkholes can increase localized flooding and should be avoided. This area was subject to major flooding in 2008 as a result of high groundwater levels. There were numerous road closures and serious damage to some homes. The current floodplain maps attempt to show some of the potential for this flooding, but cannot predict it to any great extent. USGS has placed a groundwater level monitoring well near Castalia that may be of some help in tracking and studying this issue.

Preservation of undeveloped and functioning wetlands and riparian corridors serves to decrease downstream flooding, improves water quality, preserves soil resources, and provides natural habitat.

Regulation and management of development activities within the floodplain is vital to public health and safety, as well as the natural environment. Although federal and state regulations set specific standards for development in designated floodplains, it is recommended that additional alternative development methods be pursued that mitigate future flooding problems.

Groundwater Pollution Potential

While all of Sandusky County has the potential for groundwater contamination, the risk is higher in some areas. These include the Karst areas in eastern Sandusky County (primarily in York and Green Creek Townships), the southern half of Washington Township, and small dispersed pockets throughout Woodville, Scott, and Jackson Townships.

The areas with the lowest potential for groundwater pollution include the northern half of Washington Township and vast percentages of Rice and Sandusky Townships. To ensure new development does not adversely impact the existing aquifers, it is recommended that further planning take place to examine which types of development would be most appropriate in the areas where the potential for groundwater contamination is high. Restoration and protection of the areas around the sinkholes located in the Bellevue area would serve to protect the vulnerable aquifer in this area.

Groundwater Resources

Sandusky County's groundwater supplies are adequate in most areas of the County. Yields of 100 gallons per minute are possible in roughly 125,706 acres or 47.5% of the County's total land acreage. There are areas in the County where higher groundwater yields are possible in excess of 500-1000 gallons. However, a high degree of hardness, dissolved solids, hydrogen sulfide and sulfates with this specific water source may require conditioning treatment before consumption.

To overcome these water constraints, residents and property owners within areas of poor water quality are welcoming the presence of Northern Ohio Rural Water (NORW) and the services they provide. While this infrastructure is sufficient to serve light and sprawling residential development, it may not be adequate to meet established fire flow standards for commercial and industrial clientele. Additional right-of-way and legal problems could also arise when municipalities wish to extend public services to areas where the overlapping NORW

infrastructure exists. A map of service areas, including the Northwestern Water and Sewer District centered in Wood County, as well as NORW, is found at the end of this chapter.

Ensuring safe and adequate drinking water is vitally important for the well being of County residents. However, it is also important that entities accountable to County residents guide Sandusky County's future. A tremendous amount of planning must occur to ensure not only that safe drinking water is provided to residents in selective areas of poor drinking water, but also so that future growth occurs in locations with adequate capacity to accommodate it.

The former limestone quarries in the Village of Gibsonburg and surrounding Madison Township have nearly 400 acres of surface water and have protected groundwater quantities during periods of drought. These water resources should be fully explored for commercial, industrial, and recreational use.

Prime Soils

Sandusky County is located in the former Black Swamp and consists of very fertile soils. A large portion of the County has soil types that are excellent for farming, and these soils have been utilized for generations to grow a wide variety of crops ranging from the more common corn, soybeans, and wheat, to a large variety of specialty crops such as tomatoes, cabbage, peppers, and cucumbers. However, the presence of some crops, including processing tomatoes, has been greatly diminished by decreased demand from nearby food processors.

Approximately 88% of the soil in Sandusky County is classified by the USDA as "prime."¹ when drained. The soil productivity of County soils may be a better indicator of soil fertility; roughly 200,276 acres, or 75% of the entire County consists of soils with productivity indexes of 70 or higher.

Because the agricultural sector provides a solid economic base to the County, and the land is productive, it is generally accepted that fertile soils remain for agricultural uses. Ensuring that these prime soils are utilized to their full agricultural potential will pose additional questions to the planning arena, especially when farmers often can receive greater profits in selling land than when farming it. Planners and landowners should evaluate the potential use of farmland protection opportunities and funding provided by State and Federal agencies. Organizations such as the Black Swamp Conservancy can be especially helpful in accessing these resources to protect prime farmland for perpetual agricultural use.

Sandusky River

The Sandusky River flows northward through the center of the County to the Sandusky Bay at the County's northern edge. The river continues to serve several functions: a source of drinking water for Fremont, a source of recreation and scenic beauty utilized well by the

¹ Soils classified by USDA as "prime" are those soils that are best suited for food, feed, forage, fiber, and oilseed crops

County's Park District and a well-known site for fishing during at least two springtime fish runs. The river provides an important wildlife habitat corridor and is especially important to many species of migratory birds traveling through the area in the spring and fall. . Planners and practitioners should recognize the significant benefit provided by eco-tourists participating in birding activities. From the county's southern border to Roger Young Park the Sandusky River holds the State Scenic River designation which protects and enhances this section of the River.

Soil Limitations

Sandusky County's soils pose certain limitations to activities such as building development, parks and recreation, and sewerage systems. Specific soil limitations² that exist within the County are:

- Over 96% of Sandusky County (257,318 acres) is classified as very limited for septic tank absorption fields.
- The building of homes with basements is very limited in 87.3% of the County (233,260 acres)

These soil limitations are demarcated within this chapter and should be incorporated to minimize the several problems that arise when development occurs in such limited areas without additional engineering and site preparation. The specific rating for each soil for these and many other uses can be found in the Web Soil Survey. (<http://websoilsurvey.nrcs.usda.gov/app/>)

Wetlands

The delineation of wetlands across Sandusky County is important, to ensure that most types of new development do not adversely impact them. Over 16,600 acres of various types of wetlands are scattered across the County, with the largest percentage of them being shallow marshes with emergent vegetation and wetlands comprised of shrub or scrub vegetation. To ensure a "no-net-loss" of wetlands, it is imperative that public and private officials develop additional planning and oversight tools that can expedite the development process and also protect wetlands.

Goals and Objectives

Natural Resources Goal: To protect and preserve Sandusky County's natural and significant resource areas, by addressing the following objectives:

Objectives

1. Identify areas of natural and significant resources within Sandusky County;

² Severe soil limitations can be mitigated through additional engineering and site preparations.

2. Encourage participation in existing Conservation organizations working towards conservation, restoration, and preservation methods to assist in the retention of farmland, natural amenities, and scenic beauty;
3. Encourage site design that protects the natural terrain and groundwater, preserves or restores significant vegetation and scenic views, and incorporates native vegetation into landscape plans;
4. Limit or mitigate development within flood hazard areas.

Trends and Characteristics

Sandusky County contains approximately 261,888 land acres, of which approximately 94.3 % is unincorporated and considered rural. Forty-five different soil types are present within the County, the majority of which are poorly drained and very poorly drained clay loams, silty clay loams, and silty clays that are very productive when drained. The County has approximately 6,106 water acres, which provide for a bountiful supply of surface water. The County's water acreage consists of about 154 acres of lakes, in addition to 400 acres of surface water in Gibsonburg area quarries, and approximately 240 linear miles of streams and rivers. This wide array of water resources does increase the probability of certain areas to be flooded.

However, the County's physical environment is unique and poses several constraints to selective types of development within certain areas. These constraints, while not debilitating in themselves, do pose a threat to the general welfare of residents and environment if they are not mitigated through engineering and other technical endeavors. This chapter will highlight the various types of physical constraints that exist in Sandusky County, such as:

- Septic Sewerage System Constraints
- Soil Constraints for Dwellings with Basements
- Groundwater Pollution Potential (DRASTIC index)
- Groundwater Resources
- Floodplains
- Wetlands (and other Natural Resource Areas)
- Karst (Groundwater) Flooding

Sandusky County is also home to thirty-two fertile prime soils; roughly 52.1% of these soils have a productivity index of 80 or more (out of 100) and are well suited for cash grain and specialty crops. Having a good awareness of the location of these soils, as well as the location of all other soils termed "prime," is very important, especially when the preservation of fertile soils is a general goal of the comprehensive plan.

Several other natural resource areas such as floodplains, wetlands (forested and non-forested), and wooded areas also exist within Sandusky County. The location and general awareness of the latter two natural resources categories is not only important due to federal and state regulations that mitigate their conversion to other uses, but because their sole existence brings harmony to the ecosystem. Developing within floodplains can also increase the width and flow of the existing flood hazard area and cause irreparable harm to buildings and properties. Currently, 34,891 acres, or 13.1% of Sandusky County's total acreage, are located in flood hazard areas.

A. Sandusky County Soils

1. Physiography, Relief, and Drainage

Sandusky County is mainly in the broad lake plain section of the Central Lowlands Province. The County was covered by several glaciers. The last glacier was the Late Wisconsin glacier, approximately 10,000 to 15,000 years ago. The glacial drift varies in thickness throughout the County. Most of the glacial drift was later covered by water. The soils formed mainly in glacial till or lacustrine sediments and they commonly have clayey subsoil.

When the Late Wisconsin glacier melted and receded northward, large glacial lakes formed in front of the ice sheet. These lakes essentially covered the County. During this period, lacustrine sediments were deposited. Glacial Lake Maumee had several stages and occurred at the highest elevation. The other glacial lakes that covered parts of the County were, in order of decreasing elevation, Whittlesey, Arkona, Warren, Wayne, and Lundy. Prominent sandy or gravelly beach ridges were left at the margins of these glacial lakes.

The surface slopes generally from south to north. The highest elevation is in the southeast corner of the County, and the lowest is next to Sandusky Bay, in the northern part. The elevation ranges from 575 to 810 feet above sea level.

Exceptions to the nearly flat topography dominant throughout the County are the beach ridges in the southeastern and southwestern parts of the County; the areas next to the Sandusky River; and the bedrock highs, mainly in the western and southeastern parts. Bedrock is exposed in places along the Sandusky and Portage Rivers and their tributaries.

The southeastern and southwestern parts of the County have a series of sandy beach ridges. These remnants of ancient beaches formed along shores through the action of waves. The ridges indicate the various stages of the Lake Erie Basin since the retreat of the glacier. Three major beach ridges can be located with smaller interstages. In some areas these ridges are not continuous and are difficult to trace. They have been sources of sand over the years.

The bedrock in Sandusky County is primarily of the Silurian-aged Lockport Dolomite and Salina Group. A small amount of Devonian-aged Columbus Limestone underlies the extreme eastern portion of the County. There are more dolomite and limestone quarries in the County than in any other County in the state. The largest concentration of quarries is located in a line extending from Gibsonburg to Woodville, where the Lockport is

quarried. The Lockport is used for crushed rock, burned lime, agricultural lime, and chemical production. One quarry is located in the area underlain by the Columbus Limestone, which is used for crushed rock.

Sandusky County is drained by the Sandusky and Portage Rivers. Numerous smaller streams flow north into Sandusky Bay and Lake Erie.

2. Prime Farmland Soils

Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, forestland, or other land, but it is not urban or built-up land or water areas. The soil quality, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. In general, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. The water supply is dependable and of adequate quality. Prime farmland is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it either is not frequently flooded during the growing season or is protected from flooding. Slope ranges mainly from 0 to 6 percent.

Some prime soils that have a seasonal high water table can qualify for prime farmland only in areas where this limitation has been overcome by drainage measures.³ Certain limitations also exist for other prime soils that substantiate the necessity for on-site modifications. Onsite evaluation is needed to determine whether this limitation has been overcome by corrective measures. Please see **Map 1 - Farmland Classification**

About 230,157 acres in Sandusky County, or about 88% of the total acreage, meets the requirement for prime farmland. About 204,276 acres or nearly 89% of the prime farmland occurs as somewhat poorly drained or very poorly drained soils. A drainage system is needed in these areas for the productivity of these soils to be fully reached.

Over the past two decades, and since the adoption of the County's original comprehensive plan in 1975, thousands of acres of prime farmland have been converted to residential and other urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated. Since these losses are now a concern in regards to both conservation and agriculture, efforts to increase the number of acres placed under easements have been very successful. There are 1,968 acres in conservation easements in Sandusky County as of December 31, 2012, preserved as either Natural Areas or for perpetual agricultural production.

Soil Reference – Web Soil Survey (<http://websoilsurvey.nrcs.usda.gov/app/>) for site specific soils information.

³ Although most farm parcels in Sandusky County are currently drained, a specific on-site inspection of the parcel or area in question may still be warranted.

3. Engineering⁴

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, septic systems and sanitary facilities, and water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the “Soil Properties” section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design. Soil limitations can be defined as Very Limited, Somewhat Limited, and Not Limited. “Not Limited” means that soil properties are generally favorable and that limitations are minor and easily overcome. “Somewhat Limited” means that limitations can be overcome or alleviated by planning, design, or special maintenance. “Very Limited” means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures. In many cases these limitations can be overcome by proper design and planning.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

However, not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines.

This information can be used to evaluate:

1. The potential of areas for residential, commercial, industrial, and recreation uses;
2. Preliminary estimates of construction conditions;
3. Alternative routes for roads, streets, highways, pipelines, and underground cables;

⁴ This information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

4. Alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons;
5. Detailed onsite investigations of soils and geology;
6. Potential sources of gravel, sand, earthfill, and topsoil;
7. Drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation;
8. The performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

4. Building Site Development

All soils have limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered slight if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; moderate if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and severe if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possible increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

As noted, there are primarily severe soil constraints for homesites within Sandusky County (95% of the County has “severe” soil conditions). However, this does not mean that the entire County is not suitable for development. This only illustrates that many of the soils in the County may require additional preparation and more maintenance than other soil types.

Please see **Map 2 - Soils and Development Constraints: Small Commercial Buildings** to review these building constraints.

5. Sanitary Facilities

Certain soils have limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered slight if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; moderate if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitation; and severe if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possible increased maintenance are required.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness. Please see **Map 3 - Septic System – Leaching Trench and Absorption Field** to review these septic system constraints. This particular map was chosen for its representative nature. Other types of systems may have slightly different requirements and a qualified expert should be consulted.

B. Water Resources

Approximately 34 inches of precipitation fall on Sandusky County annually. Based on the 30-year precipitation record, the average rainfall is about 2.87 inches per month with February typically being the driest month and July the wettest. There can be, however, extreme differences in some years and in certain months within a year. Extremes of seasonal and yearly variability are not often seen when considering long-term precipitation information.

Sandusky County has two major drainage basins: the Sandusky Bay Watershed and the Portage River Basins (**See Map 4 - Wetlands and Marshes**). Major streams that drain other parts of the County include: Green Creek, Muddy Creek, Muskellunge Creek, Pickerel Creek, Pike Creek, Sugar Creek, Wolf Creek, and Toussaint Creek. All of these drainage basins are important because they empty into Lake Erie, which is a major water resource for several Midwestern states and southwestern Ontario.

The Sandusky River and Bay Basin drains a total of 1,168,035 acres and consists of 65 smaller watersheds known as “14-digit Hydrologic Unit Codes (HUC’s)” of which 17 of these watersheds fully or partially drain Sandusky County acres. The 130 mile long Sandusky River flows from the western side of Crestline, Ohio in Crawford County through Sandusky County to the City of Sandusky in Erie County where it enters Lake Erie. Sandusky County is one of 12 counties along the Sandusky River that drain to the Sandusky Bay providing 17.3% of the total Sandusky Bay watershed area. Sandusky County has a total of 202,182 acres or 76.6% of the county draining to the Sandusky Bay which is one of the world’s most unique Bay systems complemented by unique habitats not found anywhere else in the world.

The Sandusky River Watershed Coalition, formed in 1997, has been working for 15 years to improve water quality and conserves the natural resources in the watershed. Reference documents such as the Resource Inventory and Management Plan as well as the State Endorsed Sandusky River – Tiffin Watershed Action Plan outline plans of the Coalition to achieve improvements and can be found on their website at

www.sanduskyriver.org. The Coalition has also administered millions of dollars of activities both upstream and in Sandusky County to improve or conserve the condition of the river and watershed since its inception.

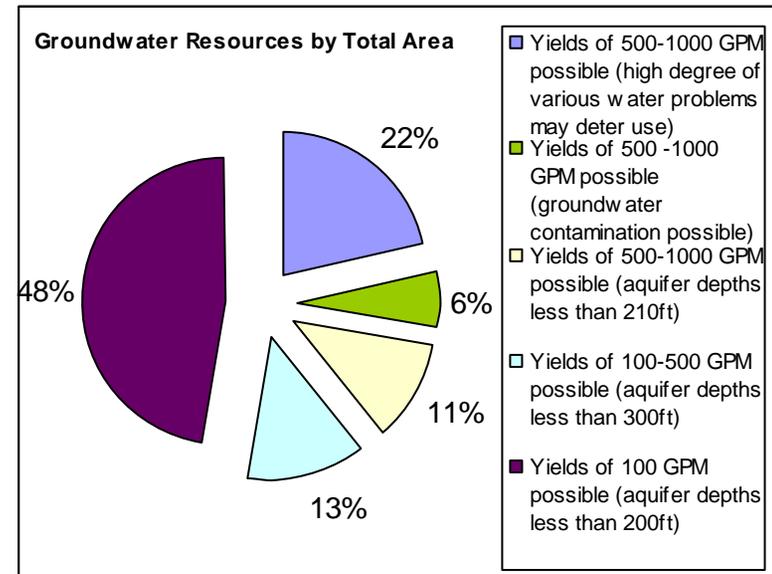
The Portage River Basin Council was formed in 1994 to preserve and restore the integrity of all waterways in the Portage River Basin. The Council has developed and received endorsement from the State of Ohio on a Watershed Action Plan that outlines the work needed to preserve and protect the basin. The Portage River is 60.6 miles long and stretches from McComb, in Hancock County, Ohio to Port Clinton in Ottawa County where it enters Lake Erie. Sandusky County contributes drainage from approximately 83.6 square miles (20.4% of the county) to the Portage River Basin. The Portage River Watershed Action Plan was endorsed in early 2012, moving the Council to focus on implementation efforts. The Portage River Basin Watershed Action Plan can be found at <http://www.tmacog.org/prbc.htm>.

The Sandusky River from the county line to Roger Young Park is part of the State Scenic River designation. This designation is monitored and reviewed by the Ohio Department of Natural Resources Division of Watercraft – Scenic Rivers. The Scenic Rivers Program provides Public Project Review, landowner assistance and education, and water resource protection to areas within the designation. For more information visit <http://ohiodnr.com/watercraft/ScenicRivers/tabid/2310/Default.aspx>.

1. Ground Water Resources

Ground water is a major water source for households in Sandusky County. Approximately 42 percent of all households in the County use ground water, and nearly 34 percent of all households have a private well. The remaining 8 percent use public water supplies with ground water as the source. All other households in Sandusky County use public water supplies derived from surface-water sources.

The County has a number of political subdivisions that have public water systems. They are: Bellevue, Clyde, Fremont, Gibsonburg, Green Springs, Lindsey and Woodville. Four of the 6 public water systems in the County are supplied solely by ground-water sources: Gibsonburg with 3 wells, Green Springs with 6 wells (and from a new water line from Clyde), Lindsey with 2 wells, and Woodville with 8 wells. Clyde serves its population with surface water from the Raccoon Creek and Clyde reservoirs. Fremont serves its population with surface water supplied by the Sandusky River to an upground Reservoir and the City of Fremont holds a State Endorsed Source Water Protection Plan to address the protection of its source waters.



The primary source of ground water is the carbonate aquifer of limestone and dolomite that serves as an adequate water supply for individual wells for several County villages, such as Gibsonburg, Green Springs, Lindsey and Woodville. Limestone mainly consists of calcium carbonate; dolomite is very similar but contains magnesium carbonate, as well as calcium carbonate. Both are commonly referred to as limestone, which is familiar to most Ohioans as a construction material. Regional ground water recharge zones are located to the south and west of the County in Hancock, Wyandot and Seneca counties. Ground water in general moves toward Lake Erie with some localized flow impacts in the Eastern side of Sandusky County causing variations to this movement.

Well yields of 500 to 1,000 gallons per minute (GPM) may be developed in the eastern end of the County (See **Map 5 - Groundwater Resources**). This yield potential decrease in the westward direction, with almost the entire western half of the County showing yields usually limited to less than 100 GPM. Farm and domestic supplies are usually obtained at depths of 70 to 100 feet. The yield of a well will vary considerably depending on age and depth of the well and its construction, diameter of the casing, pump capacity and age, and more importantly, properties of the geologic formation. Some of the older wells, at shallow depths, produce only a few gallons per minute, while some newer wells drilled to a greater depth may yield several hundred gallons per minute.

2. Groundwater Pollution

Approximately 23.5% of Sandusky County has the highest relative potential for contaminating or polluting groundwater resources (see **Map: 6 - Groundwater Pollution Potential**). Most of these areas are located in the eastern portion of the County, where a high content of porous limestone, sinkholes, and caves is present. Flowing artesian wells in portions of Riley, Green Creek, and Townsend Townships also pose additional problems. Because the water table elevation at the recharge zone is higher than the land elevation in these areas, flowing artesian wells exist.

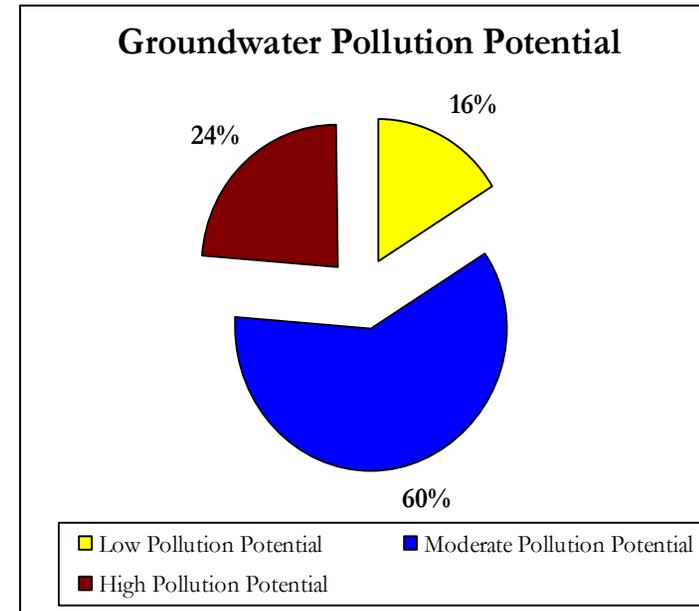
With water so close to the surface and due to the limited natural water filtration process, the potential for groundwater contamination is high and development in these areas should be limited or required to utilize effective sewage disposal techniques (preferably public sanitary sewer services). This is especially important in parts of the County that have the highest replacement and failure rates for individual septic systems (see **Map 3 - Septic Systems: Leaching Trench and Absorption Field**).

Other possible areas in the County that would be better served with public systems would include the Karst areas in eastern Sandusky County (primarily in York and Green Creek Townships), the southern half of Washington Township, and small dispersed pockets throughout Woodville, Scott, and Jackson Township.

Sixteen percent of Sandusky County has the lowest potential for groundwater contamination. These areas include the northern half of Washington Township, and vast percentages of Rice and Sandusky Townships. To ensure that new development does not adversely impact upon the existing aquifers, it is recommended that further planning take place to examine which types of development would be most appropriate in the areas where the potential for groundwater contamination is high.

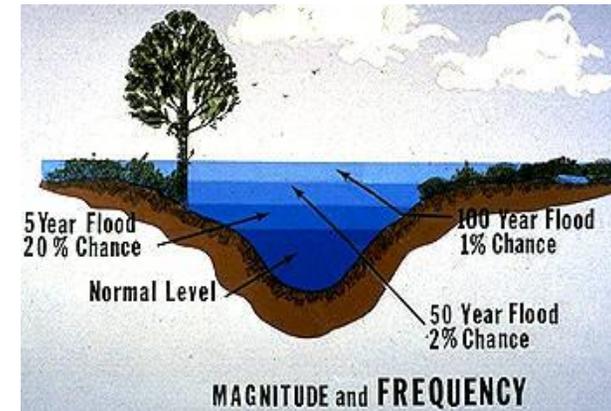
3. Water Quality

As water moves through the fractured limestone underlying Sandusky County, it dissolves and carries in solution minerals contained in the bedrock. Ground water in the western half of the County generally has a low mineral content compared to the generally high mineral contents in the eastern portion of the County. Ground water in the eastern portion of the County tends to be hard with high sulfide, chloride and/or iron content. Sometimes it may be undesirable for use. Ground water in the western half of the County has a more appealing smell and taste due to lower dissolved solids. Human activity has had some influence on the quality of ground water in Sandusky County. In 1987, 183 wells in the County were sampled for nitrate



concentration. Three of these wells tested at more than 10 mg/L nitrate-nitrogen, which exceeds the safe drinking water standard. Ten of the wells tested at between 3 mg/L and 10 mg/L, which is considered in the safe range, but indicates the influence of human activity. Another 10 wells tested in the range of 0.31 mg/L to 3.0 mg/L, indicating the possibility of human activity. The average nitrate level in the County was 0.71 mg/L.

Another aspect of water quality in Sandusky County is sediment and nutrient loading in the streams and rivers. Since 2003 the Sandusky River at Fremont has had an annual average load of 294,400 metric tons of sediment per year passing the Tindall Bridge monitoring station operated by Heidelberg University's National Center for Water Quality Research. These sediments are detrimental because they fill in the reservoirs and the channels of the river. The river also carries pollutants from human activities such as lawn and agricultural chemicals, agricultural nutrients, septage and industrial waste. The major challenges for the people of Sandusky County are to reduce soil erosion and the movement of nutrients and pesticides into the water supply.



Since the mid-1990's, a new water quality issue involving Dissolved Reactive Phosphorus (DRP) has been emerging and in 2011 the Harmful Algal Blooms it creates have been the worst in Lake Erie history. The issue created upstream by the loss of dissolved phosphorus loads has created the largest contaminant from the Sandusky and Portage River watersheds to Lake Erie, exceeding the problem of sediment loading. Since 2003 the Sandusky River average annual load of DRP has been 144 metric tons per year with total phosphorus loads averaging 608 metric tons per year. The environmental impact of DRP is that it is 100% bio-available to feed the Harmful Algal Blooms seen in recent years. For this reason, everyone needs to help reduce these losses by implementing Best Management Practices that reduce surface runoff, coupled with efforts of Stormwater Management discussed later in this chapter.

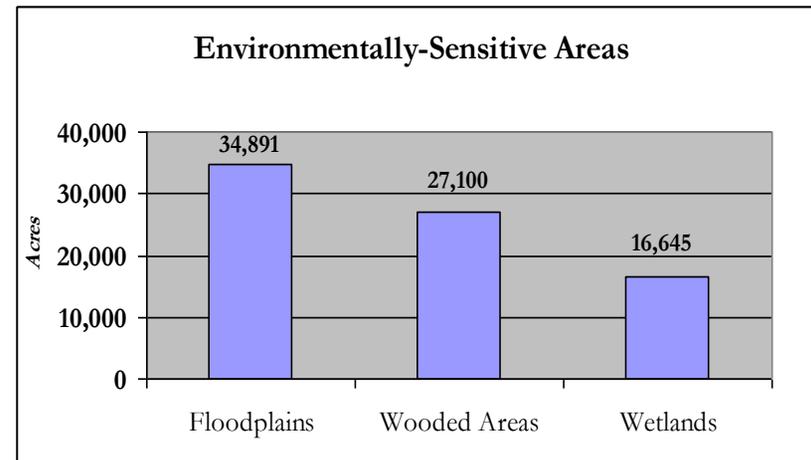
C. Floodplains

Approximately 35,552 acres, or 13.5 percent of Sandusky County is located in flood-prone areas (**See Map 4 - Wetlands and Marshes**). Areas most prone to flooding include the portion of Clyde along the Raccoon River, Fremont along the Sandusky River, Woodville located along the Portage River, and southeast portions of the County near sinkholes. Seasonal flooding also occurs along the low levels of the Portage River, and locations on the Swan and Muddy Creeks as they flow north into Ottawa County. Fremont has been subjected to heavy flood damage in the past, and now has U.S. Army Corps of Engineers levees along the river to mitigate flooding. This is largely due to ice jams and increased development on or near the Sandusky River and the fact that it runs through urban locations like Tiffin. The planned removal of the Ballville Dam will have little effect on flood levels for most areas, though the possibility of ice jams may increase. Early plans have identified the possible need for an Ice Control Structure to reduce this risk.

D. Wetlands

Several pockets of forested and non-forested wetlands, approximately 16,645 acres of wetlands, exist throughout Sandusky County (**See Map 4 - Wetlands and Marshes**). The largest percentage of the County's wetlands is located in Riley and Rice Townships, and is owned by private recreational clubs or the State of Ohio. Other significant wetlands are located in Townsend and Washington Townships, and clustered along the Sandusky River at various locations in Sandusky and Ballville Townships.

The use of regulation to protect wetlands as integral and essential parts of the nation's waters began formally in 1972 through the Clean Water Act. Section 404 of the Clean Water Act establishes the federal authority to regulate activities in wetlands. Under Section 404, jointly administered by U.S. Army Corps of Engineers and the U.S. Environmental Protection Agency (EPA), the discharge of material into waters of the United States, including wetlands, requires a permit from the Corps based on regulations developed in conjunction with EPA Section 404(b) (1) guidelines. Failure to obtain a permit or comply with the terms of a permit can result in civil and/or criminal penalties.



Other federal regulations and guidelines have been issued which further the goal of “no-net loss” of wetlands and improved wetlands management practices. The 1985 Farm Bill included wetland conservation provisions which affect agricultural lands. Subsequent Farm Bills have continued and/or amended the original provisions; agricultural producers and planners should contact their local USDA office for current wetland provisions. Although many states (and local governments) have adopted additional wetlands regulations, Ohio has not. Wetlands in Sandusky County are regulated primarily based on federal regulations and guidelines. Regulated wetland mitigation banks operated by the Sandusky County Park District allow developed wetlands to be mitigated within the county. Strategically located, protected and restored wetlands can provide important water quality, soil protection, flood mitigation, and habitat benefits.

E. Other Significant Natural Resource Areas

The White Star Park mitigation site is located in Sandusky County within the boundaries of the metropolitan park of the same name, near Gibsonburg. The mitigation wetland will be approximately 123 acres, containing emergent herbaceous, wet meadow, scrub-shrub, and forested habitats. The Sandusky County Park District will integrate the wetlands into White Star Park, using the restored wetlands for environmental education.

The Blue Heron Reserve mitigation site is located in Sandusky County within the boundaries of the metropolitan park of the same name. The mitigation wetland is approximately 54 acres, containing emergent herbaceous/wet meadow (23 acres), wet meadow (12 acres), scrub-shrub (11

acres) and forested (8 acres) habitats. Restored wetlands at this site are designed around existing natural features, including a spring-fed wetland and a fen. The Sandusky County Park District has integrated the wetlands into Blue Heron Reserve, using the restored wetlands for environmental education, and continuing its attempts to expand the unique fen area. All restored wetlands are category 2 and 3 wetlands, managed and maintained as wetlands in perpetuity.

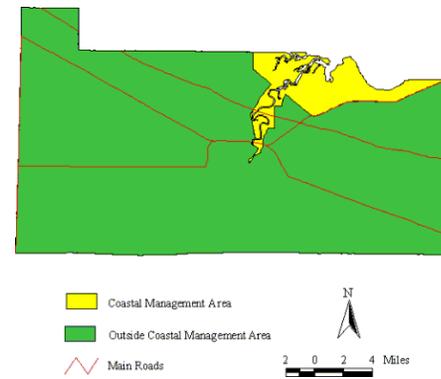
The other significant natural areas and preserves are:

- | Aldrich Pond State Wildlife Area
- | Miller Blue Hole Wildlife Area
- | Pickerel Creek State Wildlife Area
- | Raccoon Creek Reservoir
- | Resthaven State Wildlife Area (lies within both Erie and Sandusky Counties)
- | Willow Point State Wildlife Area (lies within both Erie and Sandusky Counties)
- | Decoy Marsh (operated by the Sandusky County Park District)
- | Wolf Creek Park (operated by the Sandusky County Park District)
- | Muddy Creek Reserve (operated by the Sandusky County Park District)
- | Ringneck Ridge Wildlife Area (operated by the Sandusky County Park District)
- | Creek Bend Farm (operated by the Sandusky County Park District)
- | Riverfront properties in Ballville Township

F. Sandusky County Coastal Areas⁵

A portion of Sandusky County lies within the state designated Lake Erie coastal zone. The boundaries of this zone are:

- | East from Woodrick Road along the County line to Church Road;
- | South on Church Road to petroleum pipeline;
- | Southeast on pipeline to Route 53;
- | Southwest on Route 53 to Port Clinton Road;
- | South on Port Clinton Road to the Norfolk and Western Railroad tracks;
- | South on the Norfolk and Western Railroad tracks to the Norfolk and Western and Conrail tracks;
- | South on the Norfolk and Western and Conrail tracks to State Street;



⁵ As designated by the State of Ohio. Unless otherwise noted, the coastal area includes the entire rights-of-way of railroads and highways. The coastal area includes entire coastal erosion areas in their entirety and moves landward, over time, in limited areas where necessary, with changes in the extent of coastal erosion areas.

-] East across the Sandusky River on East State Street to Sandusky Avenue;
-] Northeast on Sandusky Avenue to the Norfolk and Western Railroad Tracks;
-] Northeast on the Norfolk and Western Railroad tracks to North River Road;
-] North on North River Road to Kelley Road;
-] East on Kelley Road to Werth Road;
-] North on Werth Road to North River Road;
-] East on North River Road to Gable Road;
-] Northeast on Gable Road to the petroleum pipeline;
-] Southeast on the pipeline to Route 6;
-] East on Route 6 to Erie-Sandusky County line.

It is recommended that all future development within the County's coastal zone area occur in a manner which is protective of its natural amenities and in accordance with federal, state, and local regulations.

A traditional site design for a development project increases the amount of stormwater runoff and associated pollutants due to the increase in impervious surfaces (streets, parking lots, and buildings) and soil compaction. Often a developer will construct a large detention basin to hold the water temporarily, and then pipe the runoff to a nearby stream or river. This solves the problem of removing runoff from the site as quickly as possible; however, such stormwater facilities are expensive to construct and maintain, and do not necessarily address the impacts downstream.

Conservation design is an approach that incorporates natural features for stormwater management into the site design of a development project. The objective of this approach is to scale back the level of impervious surface area at the site, thereby reducing runoff in the first place. In addition, this approach utilizes the landscape to naturally filter runoff before it leaves the development site.

Not only can conservation design techniques substantially reduce the volume of runoff from a site and the level of pollutants being washed into adjacent water-bodies, they can also reduce costs associated with site development, infrastructure maintenance, and replacement. Applied research also has shown that conservation design strategies may retain or even increase property values over a conventional site design, because the properties open up to natural areas and scenic vistas instead of someone else's backyard.

6.2 Promote additional site development planning to conserve natural resources Meets Natural Resources Objectives: 2, 3

Model site planning development principles can provide public and private officials and developers with additional design guidance for development projects within environmentally sensitive areas. The main objective of these principles is to provide planners, developers, and local officials with benchmarks to investigate where existing ordinances may be modified to reduce impervious cover, conserve natural areas, and prevent stormwater pollution. These development principles are not national design standards. Instead, they identify areas where existing codes and standards can be changed to better protect streams, lakes and wetlands at the local level. The development principles are divided into the three following areas:

-] Residential Streets and Parking Lots
-] Lot Development
-] Conservation of Natural Areas

Residential Streets and Parking Lots

1. Design residential streets for the minimum required pavement width needed to support travel lanes; on-street parking; and emergency, maintenance, and service vehicle access.
2. Reduce the total length of residential streets by examining alternative street layouts to determine the best option for increasing the number of homes per unit length.

3. Wherever possible, residential street right-of-way widths should reflect the minimum required to accommodate the travel-way, the sidewalk, and vegetated open channels. Utilities and storm drains should be located within the pavement section of the right-of-way wherever feasible.
4. Minimize the number of residential street cul-de-sacs and incorporate landscaped areas to reduce their impervious cover. The radius of cul-de-sacs should be the minimum required to accommodate emergency and maintenance vehicles. Alternative turnarounds should be considered.
5. Where density, topography, soils, and slope permit, vegetated open channels should be used in the street right-of-way to convey and treat stormwater runoff.
6. The required parking ratio governing a particular land use or activity should be enforced with both a maximum and a minimum in order to curb excess parking space construction. Existing parking ratios should be reviewed for conformance taking into account local and national experience to see if lower ratios are warranted and feasible.
7. Parking codes should be revised to lower parking requirements where enforceable shared parking arrangements can be made.
8. Reduce the overall imperviousness associated with parking lots by providing compact car spaces, minimizing stall dimensions, incorporating efficient parking lanes, and using pervious materials in spillover parking areas where possible.
9. Provide meaningful incentives to encourage structured and shared parking to make it more economically viable.
10. Wherever possible, provide stormwater treatment for parking lot runoff using bioretention areas, filter strips, and/or other practices that can be integrated into required landscaping areas and traffic islands.

Residential Lot Development

1. Advocate open space design development incorporating smaller lot sizes (in areas with public water and sewer facilities) to minimize total impervious area, reduce total construction costs, conserve natural areas, provide community recreational space, and promote watershed protection.
2. Relax side yard setbacks and allow narrower frontages to reduce total road length in the community and overall site imperviousness. Relax front setback requirements to minimize driveway lengths and reduce overall lot imperviousness.
3. Promote more flexible design standards for residential subdivision sidewalks. Where practical, consider locating sidewalks on only one side of the street and providing common walkways linking pedestrian areas.
4. Reduce overall lot imperviousness by promoting alternative driveway surfaces and shared driveways that connect two or more homes together.
5. Clearly specify how community open space will be managed and designate a sustainable legal entity responsible for managing both natural and recreational open space.
6. Direct rooftop runoff to pervious areas such as yards, open channels, or vegetated areas and avoid routing rooftop runoff to the roadway and the stormwater conveyance system.

Conservation of Natural Areas

1. Create a variable width, naturally vegetated buffer system along all perennial streams that also encompasses critical environmental features such as the 100-year floodplain, steep slopes and freshwater wetlands.
2. The riparian stream buffer should be preserved or restored with native vegetation. The buffer system should be maintained through the plan review delineation, construction, and post-development stages.
3. Clearing and grading of forests and native vegetation at a site should be limited to the minimum amount needed to build lots, allow access, and provide fire protection. A fixed portion of any community open space should be managed as protected green space in a consolidated manner.
4. Conserve trees and other vegetation at each site by planting additional vegetation, clustering tree areas, and promoting the use of native plants. Wherever practical, manage community open space, street rights-of-way, parking lot islands, and other landscaped areas.
5. Incentives and flexibility in the form of density compensation, buffer averaging, property tax reduction, stormwater credits, and by-right open space development should be encouraged to promote conservation of stream buffers, forests, meadows, and other areas of environmental value. In addition, off-site mitigation consistent with locally adopted watershed plans should be encouraged.
6. New stormwater outfalls should not discharge unmanaged stormwater into jurisdictional wetlands, sole-source aquifers, or sensitive areas.

6.3 Expand Floodplain Programs to minimize flood hazards Meets Natural Resources Objective: 4

Due to Sandusky County's proximity to Lake Erie and vast abundance of open water resources (roughly 13% of Sandusky County remains in flood hazard areas), specific locations in the County remain at risk of flooding and suffering flood damage. A variety of resources have been developed that offer political subdivisions and property owners the ability to create proactive floodplain management programs. These two FEMA-sponsored mitigation programs are the *Flood Mitigation Assistance Program* and the *Hazard Mitigation Program*. The Hazard Mitigation Program is especially helpful as it provides financial resources to communities for acquisition of properties located in the floodplain.

The National Flood Insurance Program's (NFIP) *Community Rating System* (CRS) was implemented in 1990 as a program for recognizing and encouraging community floodplain management activities that exceed the minimum NFIP standards. The National Flood Insurance Reform Act of 1994 codified the Community Rating System in the NFIP. Under the CRS, flood insurance premium rates are adjusted to reflect the reduced flood risk resulting from community activities that meet the three goals of the CRS: (1) reduce flood losses; (2) facilitate accurate insurance rating; and (3) promote the awareness of flood insurance. With better CRS ratings, individual communities within Sandusky County or Sandusky County itself (unincorporated areas) may be able to reduce the flood insurance premiums for their respective residents.

Application to the CRS is voluntary. Any community that is in full compliance with the rules and regulations of the NFIP may apply for a CRS classification better than class 10. The applicant community submits documentation that it is doing activities recognized in the CRS. A community applies by sending completed application worksheets with appropriate documentation to its FEMA Regional Office.

A community’s CRS classification is assigned on the basis of a field verification of the activities described in its application. The Insurance Services Office, Inc. (ISO) conducts these verifications. ISO is the entity that has been conducting community grading for fire insurance for many years and is now performing the grading of communities under the newly implemented Building Code Effectiveness Grading Schedule. There are ten CRS classes by which political subdivisions can receive points:

Class 1 requires the most credit points and gives the largest premium reduction; class 10 receives no premium reduction. The CRS recognizes 18 creditable activities, organized under four categories numbered 300 through 600: Public Information, Mapping and Regulations, Flood Damage Reduction, and Flood Preparedness.

Public Information

This series credits programs that advise people about the flood hazard, flood insurance, and ways to reduce flood damage. These activities also provide data needed by insurance agents for accurate flood insurance rating. They generally serve all members of the community and work toward all three goals of the CRS.

Mapping and Regulations

Credits will be given to political subdivisions for programs that provide increased protection to new development. These activities include mapping areas not shown on the Flood Insurance Rate Maps (FIRM), preserving open space, enforcing higher regulatory standards, and managing storm water. The credit is increased for growing communities. These activities work toward the first and second goals of the CRS, damage reduction and accurate insurance rating.

Flood Damage Reduction

This series credits programs for areas in which existing development is at risk. Credit is provided for a comprehensive floodplain management plan, relocating or retrofitting flood zone structures, and maintaining drainage systems. These activities work toward the first goal of the CRS, damage reduction.

Flood Preparedness

This section consists of flood warning, levee safety, and dam safety programs. These activities work toward the first and third goals of the CRS, damage reduction and hazard awareness.

Credit Points	Class	SFHA*	Non-SFHA**
4,500+	1	45%	5%
4,000 – 4,499	2	40%	5%
3,500 – 3,999	3	35%	5%
3,000 – 3,499	4	30%	5%
2,500 – 2,999	5	25%	5%
2,000 – 2,499	6	20%	5%
1,500 – 1,999	7	15%	5%
1,000 – 1,499	8	10%	5%
500 – 999	9	5%	5%
0 – 499	10	0	0

*Special Flood Hazard Area
 **Preferred Risk Policies are available only in B, C, and X Zones for properties that are shown to have a minimal risk of flood damage. The Preferred Risk Policy does not receive premium rate credits under the CRS because it already has a lower premium than other policies.
 Although they are in SFHAs, Zones AR and A99 are limited to a 5% discount. Premium reductions are subject to change.

6.4 Continue to identify and inventory Sandusky County's natural resources Meets Natural Resources Objective: 1

It is very important that public and private officials throughout Sandusky County have knowledge of the specific location of the County's natural resources so that they may properly promote and implement, as warranted, the several natural resources strategies highlighted in this section. One such tool to promote the conservation and protection of these resources is to utilize the various natural resources maps located within this section that highlight groundwater resources, floodplains, wetlands, and soils.

To ensure these maps reflect the most current data, it is important that public and private officials contact the Sandusky County Regional Planning Commission. The Planning Commission recently acquired the necessary geographic information systems (mapping) software to assist local decision makers and developers in identifying the location of the County's natural amenities.

6.5 Encourage the continual preservation of the Sandusky River/Bay Watershed and Portage River Basin⁶ and Coastal Zone

Meets Natural Resources Objective: 2,4

Watershed planning applies to a single watershed (or to a group of adjoining watersheds). The goals of watershed-level planning are to maintain long-term ecosystem integrity, to protect Sandusky County's culturally important areas, and to protect recreational and scenic values. These goals, guided through the assistance of the Sandusky River Watershed Coalition and Portage River Basin Council, are achieved by establishing specific reserves that protect the County's:

- } Floodplain resources
- } Coastal Zone area (as previously delineated)
- } Sensitive soils and unstable terrain
- } Endangered plant and animal species
- } Cultural values
- } Scenic and recreational values
- } Linkages among different watershed-level planning areas

For a complete listing of goals and objectives of the Sandusky River Watershed Coalition, please see the Sandusky River Watershed Resource Inventory and Management Plan. This document can be accessed by visiting the Coalition's website at www.sanduskyriver.org. For the Portage River basin Council goals and objectives visit <http://www.tmacog.org/prbc.htm> to reference the State Endorsed Portage River Watershed Action Plan.

⁶ As it pertains to the areas of the watershed within Sandusky County.

A variety of federal and state funding sources exist to help preserve the Sandusky River Watershed, Portage River Watershed and coastal zone area. One such program is the Ohio Coastal Management Program (OCMP). The Ohio Coastal Management Program (OCMP) is designed to integrate management of Ohio's Lake Erie coastal area in order to preserve, protect, develop, restore and enhance its valuable and sometimes vulnerable resources. The OCMP is a cooperative action of the state and its political subdivisions to manage coastal resources, control activities that affect them, and foster their sustainable use for the benefit of all citizens of the state. OCMP grant applications are available in October of each fiscal year (contingent upon funding) and due in November/December, with funding commencing usually in July.