

Miami Township Comprehensive Plan 2012

A Comprehensive Plan is important because it articulates the values and attitudes of the community as to how land should be used in the future. The main idea of the Plan is to promote and support community health, safety, and general well-being through sound resource management.

Prepared by
Miami Township Zoning Commission
with assistance from
Regional Planning and Coordinating Commission of
Greene County

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Miami Township Comprehensive Plan

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Chapter One: Introduction



Introduction

Planning for the future of Miami Township is not only a responsibility of its officials, but an absolute necessity if the existing values which undoubtedly attracted many of its residents to the area are to be preserved and protected.

The necessity of an effective response to this responsibility is obvious when experiencing the dramatic change in the environment in the formally rural areas of southern Montgomery, Warren and Butler Counties, as well as closer locations in western and southern Greene County. These areas, at one time,

were very similar to today's rural and scenic Miami Township prior to being changed forever by development. While some are taking steps to mitigate further loss to their once scenic environment and attempting to cope with the disproportionate increase in property taxes, for most people it is too late to achieve any meaningful balance between development pressures and environmental preservation.

History of Miami Township Planning

In 1961, Miami Township undertook the task of administering its own zoning responsibilities and adopted the Miami Township Zoning Resolution as provided for in Chapter 519, of the Ohio Revised Code. At that time the Miami Township Trustees appointed a Zoning Commission and a Board of Zoning Appeals.

In 1978, *Perspectives: A Future Land Use Plan for Greene County, Ohio* was developed by the Regional Planning and Coordinating Commission of Greene County. This was the first county wide Land Use Plan. The *Perspectives* Plan attempted to coordinate local Plans with the Regional Plan adopted by the Miami Valley Regional Planning Commission.

In 1992, a Growth Management Planning Study was conducted for the Village of Yellow Springs and Miami Township. The study was conducted in three phases. The first defined the needs, constraints and possible solutions regarding growth management and related planning in the community; the second developed a Township/Village Growth Management Solutions Plan based on the findings of the first phase; and the third revised the Township and Village zoning ordinances according to recommendations.

In 2000, The *Greene County Farmland Preservation Plan* was adopted. This Plan recognizes that farmland is one of the county's and state's most important resources. The *Greene County Farmland Preservation Plan* was developed to raise awareness; to promote in an orderly fashion; recommend methods to assist local jurisdictions on how to conserve and maintain our

agricultural resources and made recommendations for passing or modifying legislation to protect farmland.

In 2001, *Perspectives 2020: A Future Land Use Plan for Greene County, Ohio*, was adopted by the Regional Planning and Coordinating Commission of Greene County. It is based on the strong foundation provided by previous plans and studies. This Plan is a policy document for growth management, which sets forth desired types of physical growth within Greene County. It represents the first update of the County Land Use Plan, which attempts to coordinate the planning efforts of all the various political jurisdictions within Greene County and presents a singular statement of how the county should develop.

In 2005, the Miami Township Trustees commissioned a private consultant to develop a Comprehensive Policy and Development Guidance Plan to assist the Township Zoning Commission with the development of a Comprehensive Land Use Plan. The Plan identified the major issues that existed within the Township, provided a brief history of previous planning efforts and comprised the general aspirations for the desired future of the Township as a guideline for the preparation of a Comprehensive Plan.

In 2010, *Vision Yellow Springs and Miami Township (2010)* was the result of an intensive year-long, citizen-based initiative asking the question “What is needed for Yellow Springs and Miami Township to be the best that they can be?” This effort created a holistic, collaborative vision and action plan for the future of the village and township. The Vision brought together a diverse group of citizens to chart a course toward a common future that reflects the community’s shared values. The Vision identifies goals for most aspects of quality of life in the village and township—from arts and culture to economic health to land stewardship. It also presents specific actions to realize a preferred future. This is a strategic guide to achieving the community’s aspirations for the future.

Planning Influences

Miami Township is located in north central Greene County with its neighbor to the north being Clark County. The cities of Beavercreek, Fairborn, Springfield and Xenia together with the Village of Yellow Springs have the most immediate influence on the township. Planning for the future of Miami Township is not only a duty of its elected officials and its citizen boards, but an absolute necessity if the existing values (such as the important economic roll agriculture plays), natural characteristics and “rural feel” (defined in this document as open space consisting of wooded areas, streams and expanses of farmland) are to be preserved and protected.



There are two key planning influences for Miami Township. Within a ten mile drive a resident of the township can take advantage of many consumer opportunities that are provided within the Village of Yellow Springs and the Cities of Beavercreek, Fairborn, Springfield and Xenia. Economic vitality is another opportunity that influences Miami Townships future land uses. Economic vitality refers not only to the local

employment, wage levels and product sales it also includes the local economy's maturity, its ability to withstand difficult conditions and its ability to adapt to its environment. Once again the surrounding villages and cities provide a wonderful opportunity for Miami Township resident employment needs.



The Township has a diversity of natural landscapes including: John Bryan State Park; Clifton Gorge State Nature Preserve; Glen Helen Nature Preserve; and the Tecumseh Council Boy Scout Camp. These areas combined equal over 1,860 acres of natural habitat which provide for the enjoyment of the township residents.

The Little Miami Scenic Trail and its associated greenway is a good example of how open space enhances the community image, increases opportunities for recreation, supports commercial uses, attracts visitors and encourages tourism. This multi-purpose trail also provides an alternative transportation route for pedestrians and bicyclists.



The above mentioned planning influences provide Miami Township with the opportunity to remain a predominantly agricultural community with valuable open spaces that maintain a rural feel and supports planned growth of the Villages.

Concept and Scope of the Comprehensive Plan

In a free society the quality of life for everyone is largely determined by decisions made by individuals. This is particularly true regarding the use of private land, where choices made by an individual affect not only them but also their neighbors and the community as a whole.

When new uses of land begin, they usually become a permanent part of the landscape and the local environment. New land uses, especially those that require high levels of community services, deserve community attention as they are being planned.

A Comprehensive Plan is important because it articulates the values and attitudes of the community in relation to how land should be used in the future. The main idea of the Plan is to promote and support community health, safety, morals, and general well-being through sound resource management.

The Comprehensive Plan is intended to communicate to residents, property owners, local officials and developers the types of activities that should be considered when change of use is considered on a certain parcel of land. The Comprehensive Plan should serve as a practical foundation for the various development regulations that the Township Trustees, Boards and Commissions use when they enact/modify/revise or amend their Zoning Resolution or other

development regulations and policy documents. The Comprehensive Plan should be continually referred to when discussing development issues that arise.

In order to meet the goals of the Comprehensive Plan one needs to move beyond conventional mindsets to a more community based process - one that considers all the local needs and goals as a whole.

The Comprehensive Plan should not be viewed as a tool of implementation which presents an ideal picture of physical development at a specific date in the future. The development of the township will occur as a gradual and incremental process, making it impossible to apply a set of principles that work in every situation throughout the planning period. The Plan should be regarded as a guide to the future, not an end in itself.

Quality of life, whether individual or public is the central, basic goal of all our activities. Each choice we make, each goal we set, is made because we think it will improve our quality of life either immediately or in the future.

Plan Goals

The course of action that any community, organization, or governmental body pursues and the values by which it exists are in part determined by the goals which it adopts. A necessary task in any planning program is the process of establishing a set of goals that apply to the future. It must be emphasized, however, that planning is not merely the process of determining the most efficient way to achieve certain goals. Most importantly, it is the process of visualizing a better future and going after it. The process is a rational one and must be operated on a continual basis. The Miami Township Comprehensive Plan is based on the strong foundation provided by previous Plans. The primary goals of this Plan are as follows:

1. Maintain and enhance quality of life and be fundamentally fair to all our citizens while respecting their individual rights.
2. Promote manageable, sustainable, use of all areas of Miami Township recognizing the cooperative relationship between and among land uses.
3. Strike a balance between a land use pattern that promotes a high level of public health, safety, welfare, comfort, and convenience as well as supporting adequate levels of public services and facilities, and increasing or maintaining the township's natural characteristics.
4. Recognize the importance of viable agriculture and its positive contributions to Miami Township.
5. Promote sustainable land use practices which offer the agricultural community protection from unnecessary encroachment.
6. Identify, preserve and expand the physical, social, economic, and aesthetic qualities that contribute to the desirable and unique character of Miami Township.
7. Recognize the capability and limitation of Miami Township's physical resources to accommodate man's needs, identifying and protecting irreplaceable resources and the function they perform.

8. Provide a sufficient diversity of housing opportunities and a variety of community activities and services that will satisfy the various needs of existing and future residents of Miami Township.
9. Foster a relationship between transportation, utility services and land use that aims toward encouraging development patterns that can be served in a cost effective, swift, efficient, and environmentally beneficial manner.
10. Creatively integrate non-motorized transportation facilities into Miami Township providing connectivity with well-defined multi-purpose trails.
11. Improve the quality of essential public service and develop a wide range of community facilities located in a manner best suited to the well-being of existing and future residents of Miami Township.

Chapter Two: Planning Foundation

Introduction



Many of the things that we value most - like family, a safe and pleasant living environment, and the opportunity for personal growth - are guiding factors for making decisions in our lives. They can also be linked to the strengths of our communities. We tend to overlook the fact that many of the things that make life enjoyable, and that we share as a community, are the same things that make our communities an attractive place to live, work, and play.

To accomplish the goals of the Comprehensive Plan that have been established by Miami Township, each factor and component of the Plan needs to be undertaken together because of their interwoven relationships. To advance the quality of our communities in a balanced way, all issues and concerns need to progress in unison with the others.

The future vision of this document is intended to be general in nature. The graphic maps are simple drawings showing the location of natural and man-made features throughout the Township. The Comprehensive Plan then envisions the Township's land use into the future and more importantly it provides a policy framework to manage growth and development. It is the welding of information from: previous basic studies, plans, reports and inventories: the goals, objectives, and policies for future development; and the location of various types of land uses into a workable arrangement of the Township's vision which can be used as a guide for future development.

Land Use Compatibility/ Suitability Analysis

The principal question facing those responsible for developmental decisions is clearly, how shall we organize for sustainable development in order to control and coordinate the process of community growth so as to protect what we value most in our community? We must consider environmental, cultural and aesthetic characteristics of land while meeting the essential needs of our changing population, including new housing, roads, employment, open space and consumer opportunities.

Land itself is a resource that must be used with wisdom. It is therefore paramount to understand the interdependence between the environment and economic development. Through this understanding we strive to achieve sustainable development, which meets the needs of the present without compromising the ability of future generations to meet their needs.

Land capability/suitability analysis is a way of analyzing natural feature (resources) information along with man-made features to evaluate an area's tolerance for various land uses. Resource

data such as soil, topography, ground cover and floodplain are collected and their interrelationships assessed to determine the type of development for which an area is best suited. These features are then integrated with man-made features such as public utilities, transportation facilities and adjacent land use compatibility to identify the most suitable land use alternatives. The guiding principle behind land use capability/suitability analysis is that some land is better suited for development than others because of variations in the natural as well as man-made environment.

In this analysis, the following natural and man-made features are inventoried:

Natural Features

A large percentage of Miami Township is currently devoted to farming. However, there is also a significant amount of land dedicated to the preservation of natural features including: John Bryan State Park, the Clifton Gorge State Nature Preserve, and Glen Helen Nature Preserve. It is the farming, natural resources and the lack of infrastructure that has created Miami Township as it is today.



Scenic River: Associated with the most predominant physical landmarks and the primary aboveground water resource in the township is the Little Miami State and National Scenic River and its associated tributaries. The river corridor enters the township from the east near Clifton, funnels through a deep narrow channel at Clifton Gorge, flows through John Bryan State Park and portions of Glen Helen and exits to the south of the township. Geologically, the Little Miami River Corridor is an outstanding example of interglacial and post-glacial canyon cutting. The Little Miami River

and its local tributaries (Jacoby Branch, Yellow Springs Creek, and Clark Run) drain the vast majority of the Township. A small portion of the northwest corner of the Township is within the Mad River and Great Miami River watershed and is drained by Clear Creek.

Groundwater Resources: Almost all of the rural residents of the township get their drinking water from private wells, which are located on individually owned properties. Groundwater supplies largely depend upon the local geology, surface characteristics, water use, and seasonal precipitation.

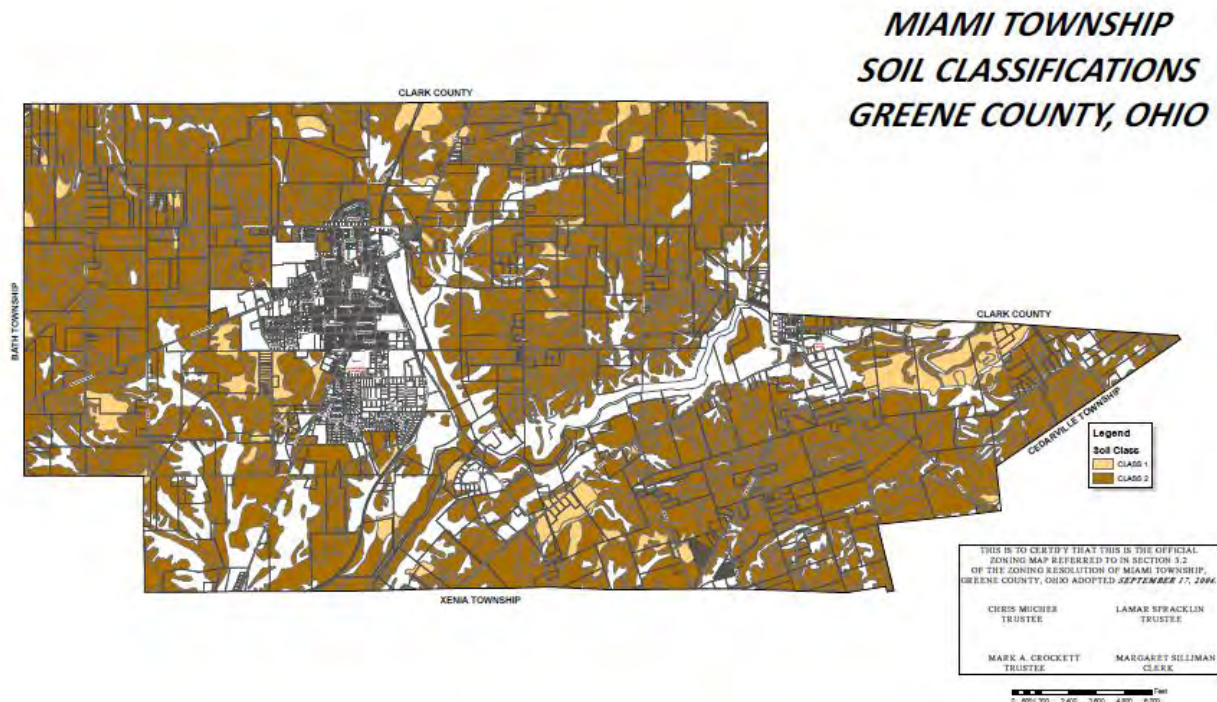
The Village of Yellow Springs has several wells which are located south of the Village of Yellow Springs and in Xenia Township. An additional private supply well is located upstream of the Village well field and provides water to the homes on Grinnell Circle. These wells get their water from the Buried Valley Aquifer.

Drainage: Miami Township lies mostly within the Little Miami River Basin. The drainage patterns reflect the influence of the Little Miami River. Man-made drainage systems help convey surface water to suitable outlets, so that desired land uses can be achieved.

Floodplains: As with most river corridors, the Little Miami River has a defined 100-year floodplain. These are areas where there is a one percent chance of flooding on an annual basis. Within Miami Township this generally occurs within the confines of the various parks and nature preserves. Miami Township does experience flooding, the county has established floodplain regulations designed to minimize the amount of development that could occur in the floodplain area to protect the safety of our residents. The township zoning resolution also contains provisions for the protection of the 100-year floodplain that comply with the National Flood Insurance Program and FEMA regulations for the purpose of protecting Miami Township residents.

Wetlands: Wetlands are defined as areas that are inundated or saturated by surface or groundwater at a frequency and duration that supports vegetation adapted for life in saturated soil conditions. Wetlands provide habitats for many species of plants and animals, so care should be taken to protect these areas. There are only small pockets of wetlands in Miami Township.

Soils: Wise soil management is important to humans because, to some degree, all of man's activities relate to the soils. Whether we are building roads and houses, reforesting the land or using the land for pasture or raising crops, success or failure depends in part upon the land's soil characteristics. Knowledge of an area's soil types and capabilities is vital information for any land use planning effort. Each type of soil possesses specific characteristics which may place constraints on agriculture usage and development alternatives.



All land in Miami Township has been grouped into specific soil capability classes. The soils are grouped according to their limitations when used for agriculture, the hazards associated with this use, and the way they respond to treatment. The first two groupings, Class I and II, are considered to be prime agricultural soils in Greene County. Class III includes soils that have severe limitations for growing crops. Class IV and higher means they have very severe limitations for crop production. For a more in depth understanding of soils classification, refer to the *U.S. Department of Agriculture's Soil Conservation Service Soil Survey for Greene County.*

Topography: is the “lay of the land,” the degree and variation of slopes which characterize the site. A varied topography usually makes for an attractive site and is typical of many areas of the Township. At the same time, the amount and pattern of steeply sloped land limits the degree to which new development can occur at a reasonable cost with minimal environmental damage. Building development is strongly affected by the slope of the land. The costs of adjusting structural or foundation systems, providing measures to prevent erosion, locating proper septic systems, and constructing roads increase as the steepness of the slope increases. In addition, there are often costs associated with “consuming” the more attractive areas of a site with buildings as opposed to leaving them open for recreational use or merely to us as open space. Topographic features like ridges, hilltops, and valley areas contribute to the overall form of a site; mitigating constructing in such areas saves money and helps to maintain the marketability of the overall site. Topography can be an amenity of development by providing for variation in terrain to maximize solar orientation, to develop walk-out basement units, and separate different development types or uses. Slopes too steep for development can be used to add character to open space through strategic placement of trails and overlooks.

Vegetation: Wooded lots, hedgerows, and mature trees add beauty and variety to development. They enhance aesthetic quality by: creating a sense of closure and privacy, providing shade and cooling, serving as windbreaks, soften the visual impacts of manmade elements, providing for erosion control, and creating benefits for wildlife. Existing hedgerows/tree stands can be used to separate different residential development or different uses within the area. The presence of environmentally sensitive lands or natural features can be transformed into community assets (open space, wildlife habitat and to perform their natural functions). These assets can be incorporated into the development adding value to the home sites or the development.

Man Made Features

Man-made features are as important as the natural features when considering any changes in land use. The most significant man-made features are the two incorporated villages located in Miami Township: part of Clifton in the northeast, and Yellow Springs in the center.



Village of Yellow Springs: Soon after Ohio became a state in 1803, the first log cabin was built in the Yellow Springs area by Lewis Davis. He established a trading post and general store serving those who were visiting the nearby medicinal springs. By the mid 1850's a flourmill, grain elevator, two general stores, and a hotel were located at the intersection of Xenia Ave and Corry Street. The Little Miami Railroad came through town in 1846

and brought increased commerce, inhabitants, and tourism. In 1853 Antioch College was founded. Moderate growth occurred after World War II. By the end of the 60's the Village began to put the brakes on growth out of a concern to preserve the small town character and values of the Village. The desire to keep the Village relatively small, and relatively self-sufficient, exist to this day in local government policy. The Village occupies a total area of 1.9 square miles of land. The population was 3,487 at the 2010 census.



Village of Clifton: The area of Clifton and the vicinity were inhabited mostly by farmers until Owen Davis came in 1802 and built what he understood to be vital for a successful settlement; a sawmill, a gristmill, and a distillery along the rushing waters of the Little Miami River. The area was perfect for the milling industry, the rich soil was excellent for farming, and the wooded terrain was plentiful with game. In 1842 the Little Miami Railroad chose not run its tracks through Clifton. The area was left to rely, to this date, on the

physical qualities of the river and the rich soils for its farming industry. The Clifton Mill is still in existence today and is one of the largest water powered grist mills in Ohio. The Village occupies 0.2 square mile of land. The population was 104 at the 2010 census.



Rural Non-Farm Lots: The Township is primarily rural in nature. Development can principally be found in the form of low density housing scattered about the area, mostly on lot splits. Few housing subdivisions exist in the Township. Presently, the Agricultural Zoning District allows for individual non-farm lots to occur when there is 300 feet of road frontage and 3 acres.

Lots Created and Housing Units

Local information such as lot creation data and building permit data can provide an accurate estimate of how change is occurring in Miami Township. Information provided by the Regional Planning and Coordinating Commission of Greene County shows that the number of lots created has fluctuated over the years ranging from two new lots created in 2009 and 2010 that are 10 acres or less in size to 22 in 2005. The number of single family dwelling units permitted each year from 1999 to 2010 is shown in the table below for a total of 52 over the past 12 years.

LOTS CREATED AND HOUSING PERMITS ISSUED
PER YEAR

Year	Lots Created Less than 10 acres *	Single Family Dwelling Permits Issued **
1999	11	5
2000	3	7
2001	11	3
2002	7	5
2003	7	4
2004	4	4
2005	22	8
2006	11	2
2007	13	8
2008	4	5
2009	2	1
2010	2	0

* Source: Regional Planning and Coordinating Commission of Greene County

** Source: Greene County Building Department



Farmland: The township has historically been an agrarian township with farmland in agricultural production being the dominate land use. A major threat to farmland is the encroachment of development and the conflicts that arise between farm and non-farm uses.

Land enrolled in the Current Agricultural Use Value (CAUV) program is an integral part of Miami Township's economy, landscape and natural resource base. Each year more farmland

is being converted to non-farm uses. It is important for us to remember that past and present land use decisions greatly affect future production capabilities, and for this reason, the need to preserve productive farmland becomes increasingly important for future generations. The development decisions made both now and in the future should consider factors such as stewardship, sustainability and our responsibility to future generations.

Infrastructure

Urban Service Boundary/Facility Planning Area: Urban service areas are lands that can be served by public water and wastewater collection. Urban service boundaries are a result of designating the separation of urbanized land from rural land. Utility extension should only occur within these areas. Regional Planning has recommended this area for Miami Township while Yellow Spring has designated a more specific area for its land use. Outside the Urban Service

Area the Village expects the sanitary wastewater will be treated with on-site or semi-public systems as delineated by the Facilities Planning Area document approved by the Environmental Protection Agency.

Public Water: In Miami Township public water supply systems exist only in Yellow Springs. There are 5 productive wells providing drinking water. The water distribution infrastructure is well positioned to service future needs when land within the Village is developed or when land is being considered for annexation. The Village has a policy to only extend water to lands that are annexed.

Public Wastewater Collection: Both Yellow Springs and Clifton have public wastewater collection systems. Yellow Springs has a wastewater treatment facility designed to treat 1.2 million gallons per day. Approximately 500,000 gallons were being treated in 2010. The Village of Clifton has a package treatment facility. It is a secondary treatment facility using extended aeration with a daily flow of approximately 15,000 gallons a day. Due to geologic formations found in the area the collection system is a vacuum type system.

Private Sewage Treatment Systems and Private Water Systems Protection and Operation: Within the unincorporated areas of Greene County where public water and wastewater collection systems do not occur, private sewage treatment systems and private water systems protection and operations are governed by the rules and regulations of the Greene County Combined Health District, Environmental Health Division. For private sewage treatment systems, the Environmental Health Division designs or approves submitted design plans for new or proposed sewage treatment systems. The staff will also work with homeowners who need to alter or repair existing sewage treatment systems in Greene County that are not working properly. The Environmental Health Division of the Greene County Combined Health District also helps residents with private wells and other types of private water systems, to ensure “safe” water for use by residents not using public water systems. The Environmental Health Sanitarians will conduct inspections of private wells and water systems that have been issued permits for installation or alteration. Staff will also collect water samples to test for the presence of bacteria, pollutants, and other types of contamination. Private water systems include dug wells, drilled wells, cisterns, hauled water storage tanks, springs and ponds. The Health District recommends that private water systems be tested annually for bacteria. Staff will also inspect private water systems at the request of the system owner or potential buyer of the property.



Roadways: Traffic patterns in Miami Township have not changed much over the years. Rural roadways that provide access to farm fields, open space, home sites, the Village of Yellow Springs and the Village of Clifton still offer adequate levels of service and vistas of Miami Township’s rural feel. When considering transportation needs it is important to remember that the township has little authority. The maintenance and improvements of the 13.43 miles of local roadways is the responsibility of the township. Greene County is responsible for maintaining and improving county roads, which include most of the connector

and arterial roads that cross the township. Finally the State of Ohio is responsible for State Routes 72, 343, 370 and U.S Route 68.



Planned Roadway Improvements: The Miami Valley Regional Planning Commission (MVRPC) develops and maintains a Transportation Plan for Greene, Miami and Montgomery Counties and part of Warren County. The current Plan identifies only one project in Miami Township and that is improvements to Yellow Springs-Fairfield Road. This project would consist of widening Yellow Springs-Fairfield Road from West Enon Road to the Little Miami Scenic Trail, to construct shoulders and soften sharp curves; including new bike/pedestrian paths, reconstructed roadside ditches, storm drainage

system improvements, and widening of the underpass beneath the Little Miami Scenic trail.

Access: The roadways within Miami Township constitute an integrated network of roadways interconnecting all areas of the community serving as access to property and for the safe, efficient movement of people and goods. The transportation network represents an irreplaceable public asset essential to the public health, safety and general welfare. Miami Township and Greene County has an obligation to preserve and maintain this system, to protect the public investment in the system, and to ensure its continued use in meeting the local transportation needs. Access management and sound engineering standards that reduce roadway congestion, minimize traffic delay, improve traffic flow, preserve capacity, and reduces conflicts is the key to the development, design, and operation of a roadway to deter the roadway's designed and intended traffic function and that require excessive expenditure of public funds to correct.

Access onto roadways must be done in ways to protect the public health and safety; to preserve the operational and functional integrity of the roadway system; to promote the safe and efficient movement of people and goods; and to provide reasonable ingress and egress to properties along those roads.

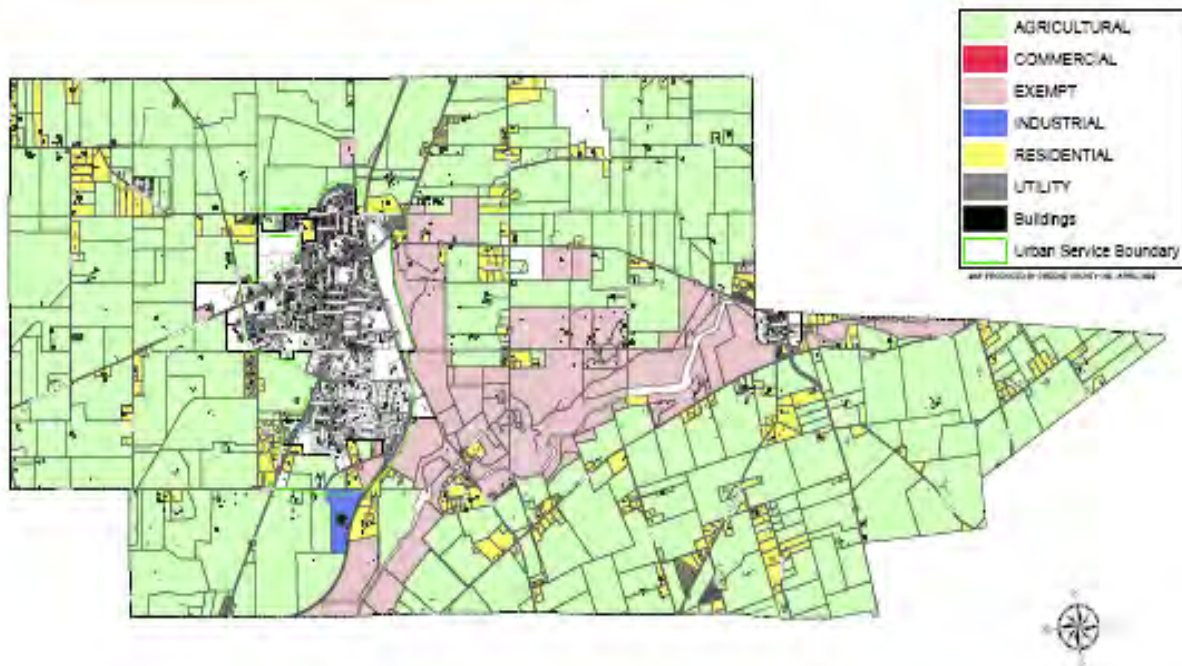


Multi-Purpose Trails: The Little Miami Scenic Trail runs north/south through the center of the township. This trail follows the former railroad grade and connects with many miles of trails in southwest Ohio. The construction of multi-use trails throughout the township should connect destinations, specifically a connection to the Village of Clifton should be considered.

Archaeological & Historic Resources: Miami Township is known to have a significant history and prehistory. For these reasons, changes to the land surface (including any excavating and grading) merit prior archaeological review.

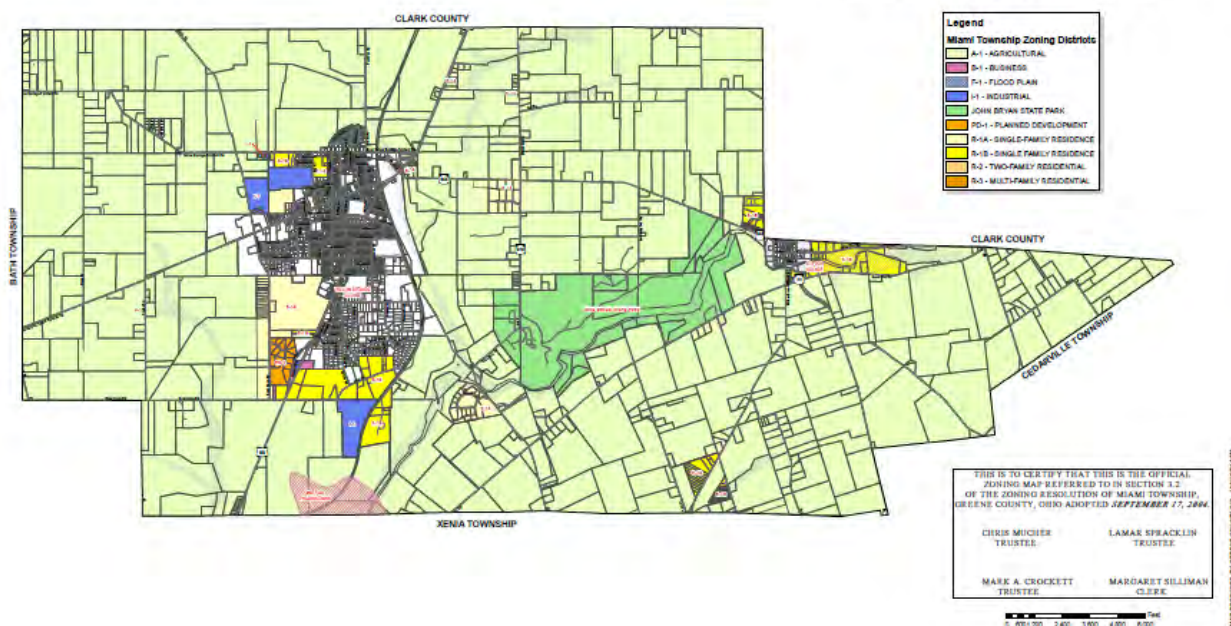
Existing Land Uses

**MIAMI TOWNSHIP LAND USE
WITH URBAN SERVICE BOUNDARY
GREENE COUNTY, OHIO**



Current Zoning (2007)

**OFFICIAL ZONING DISTRICT MAP
MIAMI TOWNSHIP
GREENE COUNTY, OHIO**



Schools: The eastern portion of Miami Township is in the Cedar Cliff Local School District. The home-town atmosphere of small rural villages, the environment of a unique Christian college, and the pride of a distinctly supportive community all work together to provide a nurturing learning environment for the students of Cedar Cliff Local Schools. Because of its small size, approximately 700 students in grades K-12 in one building, the district is able to educate students in a setting where faculty members know each of the students personally. And each student, likewise, has a unique opportunity to get to know each of the faculty members as well. Because the students also typically know each other as well as the faculty, a warm, safe, and inviting environment prevails. This environment fosters the pursuit of academic excellence.

Within the district, the residents of the villages of Cedarville and Clifton, as well as those who reside on the rich farm land surrounding the villages, have fostered a long tradition of educational excellence. The district continues to be rated as an “EXCELLENT” school by the Ohio State Board of Education as well being awarded a bronze medal for two consecutive years by *U.S. News and World Report*.

The remainder of the Miami Township is in the Yellow Springs Exempted Village School district. This school district is committed to creating a challenging educational environment where each student contributes to the intellectual and cultural richness of the community. The district is also dedicated to meeting the needs of every child through a comprehensive academic program and a commitment to the fine arts, interscholastic athletics, and a variety of activities and clubs. All the schools in the district (Mills Lawn Elementary School, Yellow Springs Middle School and Yellow Springs High School) have been recognized as National Blue Ribbon Schools of Excellence.



Additional educational institutions in Yellow Springs including: Antioch University Midwest, Antioch College, The Antioch School, Yellow Springs Children Center, Morgan-The Greene County Educational Service Center. Antioch has always been a part of Yellow Springs and has had significant positive impacts on the development of the area. While the public school population has declined over the past thirty years, the quality of the educational system and support from the community has increased. The Antioch School remains a stable alternative to public primary education.

Chapter Three: Miami Township Future Vision

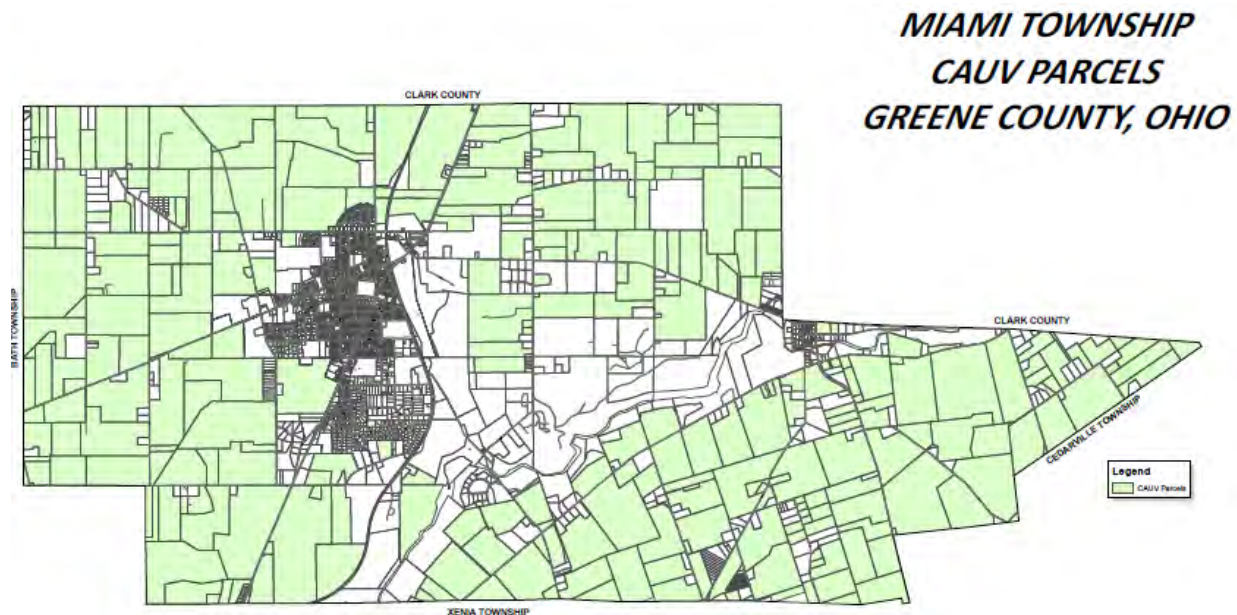
Township Vision

The thrust of this Plan is to retain Miami Township's historical land use patterns of agriculture and recognition of natural areas. This combination that includes expanses of farmland, wooded areas and streams and rivers creates what has been defined as 'rural feel'. With this Plan the township is building the foundation for balanced and managed uses of the land that will retain the character of Miami Township and preserve its physical beauty and natural resources. The success of this Plan depends on the support and cooperation of the surrounding communities, support of the township's residents and the future critical decisions that will be made by the Township.

The unincorporated areas of Miami Township outside of its Villages and protected natural areas is predominantly farmland. This Plan calls for minimal new development in the farmland areas of the Township and supports logical and planned growth of the Villages.

Farmland

Miami Township has historically been an agrarian community. Farming has been the dominate land use in the township for decades and still occupies approximately 12,500 acres. This represents around 76% of the total land area within Miami Township. As a predominant industry, farming plays a vital role in Miami Township's economy.



Within Miami Township there is a desire to preserve and protect the land necessary for the continuation of farming in the township. A strategy for regulating development in our rural areas is vital to the future of farming. We must do all we can to retain this historically important industry, which contributes so strongly to our sense of wellbeing. We must also focus our



attention on the needs of a healthy farming community and the issues and concerns that the development of our rural township brings to the viable farmland within Miami Township.

Farming also results in the continuation of the township's rural feel. The visual appearance of open space that results from the land being farmed can provide some essence of community well-being through: 1) community identity and separation; 2) aesthetic quality; and 3) resource protection. The entire community can capitalize on the open space qualities of this farmland resource.

Farmland Goals

1. Protect current farmland, which is a limited natural resource, with special attention placed on preserving prime soils.
2. Preserve the open space character of the township for future generations to enjoy.
3. Promote responsible land use practices to help preserve active agriculture in the township.

Farmland Strategies

1. Maintain documentation that identifies where the prime agricultural soils are in the township.
2. Maintain documentation that identifies where in the township current farmland is most vulnerable to development pressures.
3. Establish zoning resolutions which will effectively protect current farmland from premature and unnecessary development.

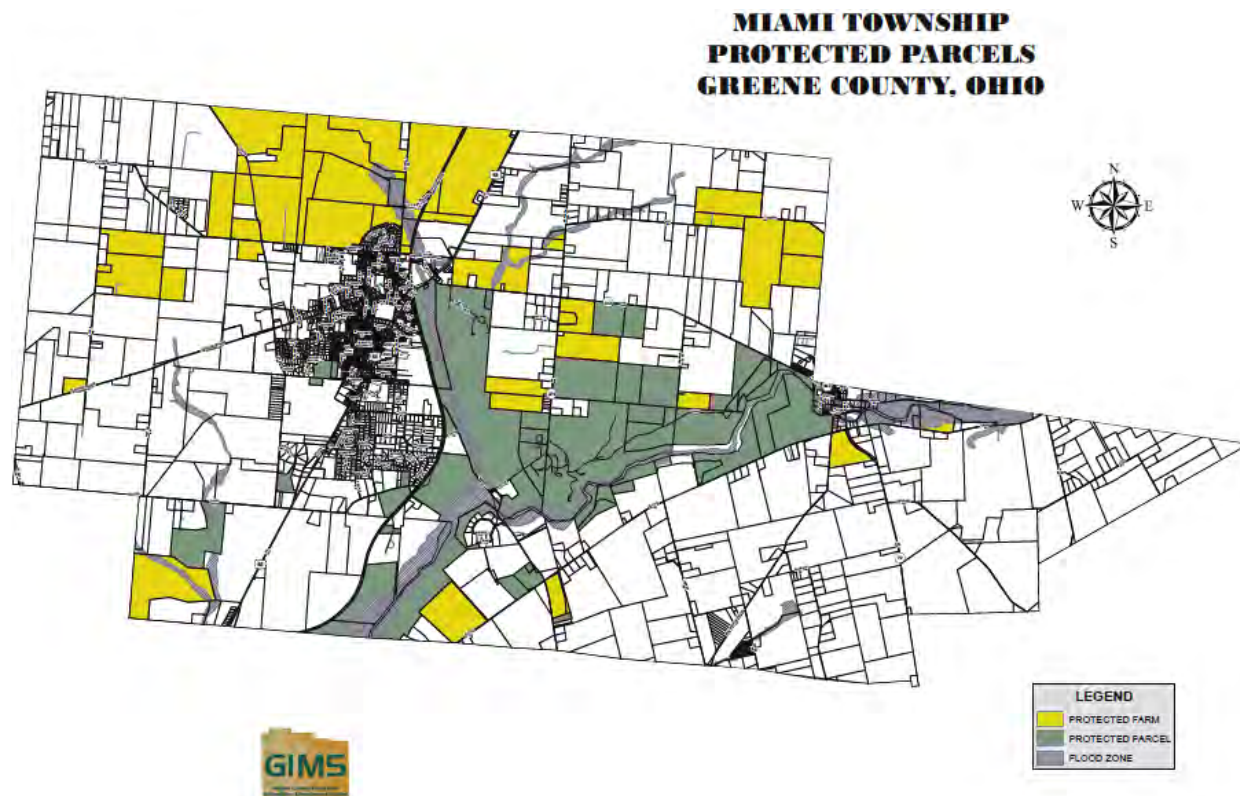
Farmland Land Use Policies

1. Encourage land uses that involve active farming operations above other uses in areas where Class I and Class II soils exist according to Greene County soil survey records.
2. Discourage the development of non-farm residential estates on prime farmland.
3. Encourage land owners to place farmland into conservation easements and establish a prime farmland district with incentives and stronger regulations.
4. Respect the boundaries of land placed in Land Trust and Conservation Easements with close scrutiny of any proposed development that would boarder these protected areas.
5. Where current farmland is being considered for development, the least productive land areas will be considered first.
6. Encourage proposed residential development to locate on land where wooded areas, topography and natural areas can serve as natural buffers to adjacent farming operations.
7. Discourage any development that would conflict with the productivity of current farming operations. Proposed developments will be evaluated based on the evidence for their necessity, availability of public sewer and water, their effect upon active farming operations in the area, and the potential effect of active farming operations on the proposed development.

8. Guide future residential development to land within or adjacent to existing high density areas where utility services are already in place.
9. Discourage the extension of public water and wastewater collection into prime farmland areas.

Conservation

Protecting land within Miami Township with attention to places containing nationally or state significant ecological qualities, important wildlife habitat, high water quality, cultural and economic significance, scenic value, and working farms within conservation easements are a priority. These sustainable land uses are important aspects of the community and should be managed and protected for the benefit of the residents of Miami Township and the region.



Conservation Goals

1. Wisely manage and protect the township's irreplaceable natural resources.
2. Protect existing prime farmland and environmentally sensitive land by encouraging land owners to apply for conservation easements.

Conservation Strategies

1. Encourage owners of prime farmland and environmentally sensitive land to enroll in permanent farming or conservation easements with organizations such as Tecumseh Land Trust, Little Miami Incorporated and the USDA Forest Legacy Program. Encourage the

Miami Township Trustees to continue supporting these easement programs with revenues received.



2. Include national, state and local parks in the conservation land use classification. All development in these areas would be excluded from permanent residential housing except for camping type infrastructure and buildings for various recreational and youth activities. Federal and state regulations would supersede. Primary examples would include Glen Helen, John Bryan State Park and Clifton Gorge Natural Areas, Camp Clifton, Camp Birch and Camp Greene, Clifton Narrows County Preserve.

3. Consider including environmentally sensitive areas in the conservation land use classification. Primary examples of such areas would include the Little Miami River Corridor, Well Head Protection Areas, wetlands recognized by the State, and the 100 year regulatory floodplains.

Conservation Land Use Policies

1. This land use classification will be characterized by environmentally sensitive areas of the township.
2. The conservation land use classification is also to be characterized by farmland that has been placed in a conservation easement.
3. Techniques to preserve stream corridors would include provisions for wide buffer strips of natural vegetation and prohibiting the introduction of sewage effluent and other toxic materials into the streams.
4. The protection of the 100 year regulatory floodplain for health and safety reasons should influence the potential land use activities that will not impede flood waters or increase erosion potential.
5. Promote the importance of groundwater protection.
6. Increase public awareness of sites of historic and/or archaeological significance.

Residential

Residential land uses are the third largest land use, in terms of area, in unincorporated Miami Township. The dominant housing type is a single family dwelling unit. These single family dwelling units occur on the land as rural lots scattered over the township along existing roads where public water and/or public wastewater collection is not available. These residential lots are considered rural and spacious in nature. It is the intent of this policy document to encourage the proper placement of residential home sites within Miami Township in order to insure the following:

- the protection of prime agricultural soils, farmland and other irreplaceable natural resources,

- to maintain a low-density/rural character,
- sufficient lot area for long term use of individual on-site leaching devices for wastewater disposal, and
- on-going adequacy of the groundwater supply.

The residential use of the land should only be encouraged in those areas of Miami Township which are within the Urban Service Area of the Village of Yellow Springs or in areas where similar residential lots have already occurred to such an extent that the principal use of the land for large scale farming activities is no longer feasible or maintain the rural character of the Township.

Residential Goals

1. Preserve the township's rural feel for future generations through the management of growth and development.
2. Provide areas of transition between the villages and rural areas of the township.
3. Provide for safe and adequate housing for present and future generations of residents of the township.

Residential Strategies

1. To keep the rural feel of Miami Township while providing for limited residential growth within the township.
2. Future growth needs of the Township should be encouraged to locate adjacent to Yellow Springs where utilities and services are available. Clifton's utility infrastructure will only support limited residential growth.
3. To protect active farming operations and natural resources within the Township, development should be encouraged to locate in areas characterized by an existing pattern of non-farm development.
4. Explore innovative residential zoning techniques that will enhance the preservation of the rural landscape and scenic views.

Residential Land Use Policies

1. Encourage new residential development to locate primarily near the Village of Yellow Springs.
2. Discourage the development of residential subdivisions and individual residential lots in productive farmland areas.
3. Encourage the use of open space residential, or "cluster" design concept when planning new development
4. The Township and County should give high priority to the addition of respective provisions within the Zoning Resolution and County Subdivision Regulations to accommodate the open space Residential or "cluster" design concept.
5. Residential development within rural areas of the Township should be screened from adjacent thoroughfares in order to maintain rural character.
6. Lot size should be determined by the site's ability to accommodate an on-site private sewage treatment system and a private well.

Chapter Four: Implementation Program

Introduction

The Comprehensive Plan provides the policy foundation for decisions about the Township's future. The purpose of this chapter is to establish a connection between the goals and objectives of the Comprehensive Plan and other actions that will enhance and improve the quality of life of the township residents.

The preparation of this Plan is a step toward creating a more sustainable, manageable, and desirable living environment for the residents of Miami Township. While the Plan document itself is necessary and basic to any planning program, it has no value unless its concepts, goals, objectives, and policies are systematically considered by all parties involved in the development process. A community can only expect to receive benefits from the planning process in direct proportion to efforts made in Plan implementation.

Being a Community Plan in scope, the Comprehensive Plan provides a general framework within which the township can engage in planning and zoning. Much of the development that occurs is local in scale and it is important that the local governments carry out their responsibilities to guide this development.

There is a great deal to be accomplished if Miami Township is to achieve this Plan's stated goals, and the many items of the Plan. The greatest challenge however is for private individuals and enterprise to have faith in the long range future of Miami Township and to make private investment in cooperation with public efforts. With continuing assistance and support of collaborating jurisdictions and other public agencies, the ingenuity and initiative of private investment will be able to meet the challenges and potentials which have been presented in this Plan.

Use of the Plan

The Comprehensive Plan is an element of Miami Township's development regulations and development strategies. It envisions land use twenty years or so into the future, and provides a policy framework to manage growth and development during that period. The Plan is meant as a guide to assist the township, developers, and citizens with decisions about the future. It establishes township wide goals and recommends objectives and policies to achieve those goals. It sets policy direction, which will help direct development, against which development proposals may be measured.

The Plan is intended as a guide for development decisions such as requests to change zoning classifications and how best to utilize community and man-made resources. Any rezoning request or development proposal should be evaluated for conformity with the goals and policies of the Plan. Should changes in zoning be proposed, the rezoning should be in accord with the goals, objectives and policies of the Comprehensive Plan. This may mean that amendments to the Plan may need to be considered. Any zoning change or land use proposal that is not consistent with the goals and policies of the Comprehensive Plan should trigger a mechanism to

set in motion a procedure to consider amending the Comprehensive Plan or provide reasons to deny a request. This will assure that any change to the land use provisions of the Plan are given due consideration prior to or at the same time as the review of the specific rezoning or development proposal. The Miami Township Zoning Commission should review and act upon the Comprehensive Plan amendment prior to or simultaneously as the specific rezoning or development proposal is being acted upon. How long does the amendment process take? There is no set time frame for processing a Plan change. It depends on the size and complexity of the amendment and the amount of research required of staff.

General Amendment Process

Minor modifications to the Comprehensive Plan would be changes that do not bring new land use classifications to the area; they are just an extension of an existing one. These modifications will generally be triggered by a rezoning request and are to be reviewed during the rezoning process. Approval shall be based on Miami Township's determination that the modification(s) are not in conflict with the intent, goals, objectives and policies of the Plan and are consistent with the townships vision. These modifications will be evaluated and acted upon during the rezoning process.

Major modifications, of the Comprehensive Plan would include but are not limited to: the addition of a new land use to an area, the provision of public utilities (water and wastewater collection) beyond the identified urban service boundary, a major increase to an existing land use that could impact adjoining areas, etc. A major modification requires the re-evaluation of the Plans intent, goals, objectives and policies.

What Can Be Done?

- Develop a check list to be used during development reviews to ensure conformance with the Plan.
- Have annual joint meetings with the Board of Township Trustees, Zoning Commission and Board of Zoning Appeals to make sure development decisions that are being made in compliance with the intent, goals, objective and policies of the Plan.

Monitoring the Comprehensive Plan

The Comprehensive Plan provides principles for achieving a future that is perceived as being better than the future would be without planning - together with a set of goals, objectives, and policies that will hopefully move the Township towards the future.

The concept of monitoring progress towards the desired future and evaluating tools for implementation are integral to the planning process. A well-designed monitoring and evaluation program can help the township and citizens understand both progress and setbacks in achieving the Plan's goals. More importantly, the program can direct staff and decision makers, towards revisions of the Plan and more effective ways of obtaining desired goals and objectives. Most importantly, the monitoring program can provide citizens with the means to hold the government accountable for the actions it is taking.

Developing a meaningful monitoring and evaluation program is an important Plan implementation tool in itself and should have high priority among the many action items necessary to implement the Plan.

The monitoring and evaluation program should focus on the key indicators, the Plans – goals and objectives, these could expand over time if needed. Each indicator should be analyzed by the following characteristics:

- Use readily available data;
- Be measurable over time;
- Provide meaningful information;
- Be sensitive to change; and
- Be easily interpreted.

The results of monitoring and evaluation program should be presented annually to the Township Trustees for their information. The annual monitoring and evaluation report should include proposed changes to the Plans goals and objectives. Review of the report and consideration of proposed Plan amendments should include citizen input also. These changes to Plan policy and revisions to the Plan should be considered annually as part of an annual Plan review process, to promote the viability of the Comprehensive Plan.

Periodically, the township should conduct a major review of the Plans themes, principles and strategies. The timing of this major review effort is dependent upon the rapidity of changes in the township.

What Can Be Done?

- Track all development proposals and the outcome of their review.
- Provide an annual report that states the effectiveness or the ineffectiveness of the development decisions made compared to the Plans goals, guiding principles and policies.
- Annually identify any area of the Plan that should be considered for revision.
- Have annual joint meetings with the Board of Township Trustees, Zoning Commission and Board of Zoning Appeals to make sure development decisions that are being made in compliance with the intent, goals, objective and policies of the Plan.

Transforming the Plan into Public Policy

The first step to insure the effectiveness of this Plan is to transform it into public policy through adoption by the township. The concepts, goals, objectives and policies of the Plan are transformed into official stated public policy through public hearings and subsequent adoption.

What Can Be Done?

- Submit a copy of the Plan to the Regional Planning and Coordinating Commission of Greene County for review and comments
- Through a public meeting process have the Zoning Commission adopt the Plan and recommend that the Township Trustees formally adopt the Plan.
- Have the Township Trustees formally adopt the Plan as policy during public hearings.

- Submit the adopted Plan to the Regional Planning and Coordinating Commission of Greene County for adoption and incorporation into the County Plan.

Zoning Amendments

The Comprehensive Plan is not self-enforcing. Once the Comprehensive Plan is officially adopted, steps must be taken to carry it out. There is a wide range of implementation mechanisms, to achieve the Plan goals and objectives. Most of these mechanisms are already in place. The implementation mechanisms include the zoning resolutions, subdivision regulations, urban service boundaries, and other land development regulations, building codes, capital improvement programs, land acquisition, use and conservation easements, Land Use Plans and maps, eminent domain, and nuisance laws. The potential complementary role of private investment actions (e.g. easements, deed restrictions and plat covenant and restrictions) in furthering Plan objectives is essential if the Plan is to be realized. The role of the Miami Township Zoning Commission is to provide sound administration, coordination and communication on a continuing basis cannot be over-emphasized. Once the Comprehensive Plan is adopted some zoning amendments may need to be modified to help carry out some of the stated goals and objectives.

What Can Be Done?

The Miami Township Zoning Resolutions should be amended and modified to:

- Make sure the relationship between the district's purpose and/or intent statement reflects the function and uses permitted in the district.
- Provide for an exclusive agricultural zoning district, one that preserves the best farmland for future agricultural uses.
- Create a Planned Unit Development Overlay District that allows for the preservation of farmland and conservation areas.
- Protect existing rural residential homes from the conversion of single-family homes into multi-family units or businesses.
- Concentrate intense land uses such as higher density residential, businesses and commercial uses in and around the Village of Yellow Springs.
- Provide a specialized zoning district to protect the public well fields.
- Provide a specialized zoning district to protect the aquifer recharge areas.

Collaboration and Partnerships

We encourage and nurture the community spirit when ordinary citizens, civic and business groups, institutions and local governments come together to identify the shared values and common vision of what we want our community to be. We strengthen our community even further when we work cooperatively to realize or shared vision. Community spirit, built on the pride of association and the sense of civic responsibility, creates strong, cohesive places.

An essential element to any Plan is the component of people involved. This partnership between the citizens of Miami Township and the Comprehensive Plan is an integral part of planning. Looking at the planning process and understanding that planning is not just a compilation of policies and rules helps everyone understand how we got to where we are and where we are

planning to go. Planning is, at its base, a community of individuals finding common goals and working on strategies to achieve them that are fair both to the individuals and to the community as a whole. Citizen input – is and will continue to be a part of the planning process for Miami Township. This is evident throughout the Plan with issues such as quality of life and stewardship of our land resources. Quality of life is determined by the citizens of the community and stewardship is about citizens and their ability to contribute to the future of Miami Township. Residents can be helpful to the process of implementing and monitoring this Comprehensive Plan by talking with one another about matters of concern and interest within the township. Township leaders are committed to an open and inclusive process. Anybody that cares about the future of Miami Township is encouraged to attend public meeting and contribute their ideas.

What Can Be Done?

- Use strong public participation models for planning processes.
- Encourage outreach before applications for development are finalized.
- Use mediation processes on controversial developments.
- Identify benchmarks on the performance in the areas of economic, environmental, and social factors.

Chapter Five: Alternate Improvement Concepts

Introduction

The Miami Township Comprehensive Plan represents a continuation and expansion of the implementation efforts of previous planning initiatives, including building upon *Perspectives 2020: A Future Land Use Plan for Greene County Ohio* and the *Greene County Farmland Preservation Plan* which provide tools for local communities to make the best possible decisions about their future land uses. The success of Miami Township's future vision will depend on the ability of the township to effectively communicate the long term benefits of managing our common land and water resources.

Citizens, elected officials and zoning commission members can take the initiative and move in a proactive way by forging ahead to support cooperation, coordination, and the establishment of the appropriate tools needed to achieve the successful implementation of the Miami Township Comprehensive Plan. This Plan endorses the following alternate improvement concepts.

Low Impact Development

Traditionally, storm water management has involved the rapid conveyance of water to an engineered pond or surface water body. Low Impact Development (LID) is an innovative storm water management approach that manages rainfall where it lands by modifying developments to try to maintain some natural hydrologic function. The goal is to mimic a site's pre-development landscape by using site design techniques that infiltrate, filter, store, evaporate, and detain runoff close to its source. Low impact development encourages the use of small, cost-effective management practices located on individual lots.

Almost all components of an environment have the potential to serve as a management tools. This includes open space, rooftops, parking areas, sidewalks and driveways. LID is a versatile approach that can be applied equally well to new development or retrofit an existing structure. Some management practices associated with LID include:

- Infiltration of rainwater through vegetated trenches and basins with some filtration devices;
- Landscaping methods that include rain gardens, bio swales, and native vegetation;
- On-site capture and storage of rainwater;
- Minimization of impervious area by using narrower streets and/or porous pavement;
- Protect and restore soil quality by minimizing land disturbing activities and avoid compaction, increase organic matter content through the use of compost application and strategic use of native vegetation.

Specific Low Impact Development Techniques:

Rain Barrels are designed to hold rainwater collected from residential rooftops. Water is retained in the barrel and can be used for yard watering of vegetation. The barrels are designed with overflow options to allow water to infiltrate beneath the barrel or be redirected to such features as a rain garden.

Rain Gardens are shallow depression areas planted with native vegetation that absorb and infiltrated runoff from impervious surfaces and may discharge to the groundwater, a storm drain, or surface outlet. Depending on site conditions a sub-grade tile system may be recommended to enhance infiltration, especially where a high water table exists. Rain gardens reduce the volume of storm water runoff pollutant loads delivered to surface water. Rain gardens can be used on individual lots no matter what the use is to mitigate impervious surface runoff.

Bio swales are vegetated swales which are an alternative to standard below ground storm water sewers. They intercept or receive impervious surface runoff and blend infiltration and slow conveyance of storm water. The soil matrix of the swale can be amended to enhance infiltration and percolation. These systems can be engineered to absorb the high frequency low intensity storms but can convey the large storm events while providing vegetative filtering. Bio swales can discharge to groundwater, storm sewer intakes, or directly to surface water.

Permeable Paving Alternatives are surfaces that provide reduced site runoff by increasing infiltration into the soil. There are a number of permeable paving surfaces available from paver blocks to geoweb reinforced glass surfaces.

Low Impact Grading Among the most harmful development practices is site grading. Grading is the process of clearing the site of vegetation and redefining the lands topography. Grading is harmful because it reduces species habitat by clearing vegetation and reduces water quality by introducing sediment into local bodies of water, compacts soil (increasing imperviousness) and damages root systems. Techniques such as minimizing disturbance and minimizing the grading footprint can reduce the impacts of the site by grading.

Benefits to using Low Impact Development techniques in your community

Low Impact Development principals have many benefits and advantages over conventional development, including:

- Enhancing the local environment and protecting public health while saving developers and local governments' time and money.
- Addressing nonpoint source pollution and storm water management regulatory challenges in a simple and economical manner.
- Protecting surface water and groundwater from the impacts of runoff and groundwater contamination that can come from urban neighborhoods.
- Helping local governments to better balance conservation, growth, and economic development objectives by having more effective and flexible technology choices.
- Reducing storm water conveyance and storm water management infrastructure and their associated construction, maintenance and enforcement costs.
- Reducing water pollution and improving wildlife habitat more effectively than conventional best management practices (BMPs) because LID uses multiple systems.
- Using technologies that universally apply to green fields, brownfields, and urban redevelopment in any climatic or geological region.
- Enjoying increased quality of life, fiscal health, reduced air pollution, water conservation, better habitat protection and increased property values.

What can be done?

- Communities should take a close look at their local zoning ordinances and resolutions and how they address water resources to identify areas that can be changed.
- Land Use Plans and subdivision regulations can be altered to allow innovative Low Impact Development site design techniques.
- Encourage homeowners and developers to use Low Impact Development techniques.

Alternative Energy

Opportunities for energy conservation are increasingly available in almost every application in any setting. Any structure and land use can benefit from cost-saving and energy-saving innovations.

Solar Energy Solar is the Latin word for sun—a powerful source of energy that can be used to heat, cool, and light our homes and businesses. That's because more energy from the sun falls on the earth in one hour than is used by everyone in the world in one year. A variety of technologies convert sunlight to usable energy for buildings. The most commonly used solar technologies for homes are solar water heating, passive solar design for space heating and cooling, and solar photovoltaic for electricity.

Passive Solar Step outside on a hot and sunny summer day, and you'll feel the power of solar heat and light. Today, many buildings are designed to take advantage of this natural resource through the use of passive solar heating and day lighting.

The south side of a building always receives the most sunlight. Therefore, buildings designed for passive solar heating usually have large, south-facing windows. Materials that absorb and store the sun's heat can be built into the sunlit floors and walls. The floors and walls will then heat up during the day and slowly release heat at night, when the heat is needed most.

Solar Photovoltaic Technology Solar cells, also called photovoltaic (PV) cells by scientists, convert sunlight directly into electricity. PV gets its name from the process of converting light (photons) to electricity (voltage), which is called the *PV effect*. The PV effect was discovered in 1954, when scientists at Bell Telephone discovered that silicon (an element found in sand) created an electric charge when exposed to sunlight. Soon solar cells were being used to power space satellites and smaller items like calculators and watches. Today, thousands of people power their homes and businesses with individual solar PV systems. Utility companies are also using PV technology for large power stations.

Solar panels used to power homes are typically made from solar cells combined into modules that hold about 40 cells. A typical home will use about 10 to 20 solar panels to power the home. The panels are mounted at a fixed angle facing south, or they can be mounted on a tracking device that follows the sun, allowing them to capture the most sunlight. Many solar panels combined together to create one system is called a solar array. For large electric utility or industrial applications, hundreds of solar arrays are interconnected to form a large utility-scale PV system.

Solar Hot Water The shallow water of a lake is usually warmer than the deep water. That's because the sunlight can heat the lake bottom in the shallow areas, which in turn, heats the water. It's nature's way of solar water heating. The sun can be used in basically the same way to heat water used in buildings and swimming pools.

Most solar water heating systems for buildings have two main parts: a solar collector and a storage tank. The most common collector is called a *flat-plate collector*. Mounted on the roof, it consists of a thin, flat, rectangular box with a transparent cover that faces the sun. Small tubes run through the box and carry the fluid — either water or other fluid, such as an antifreeze solution — to be heated. The tubes are attached to an absorber plate, which is painted black to absorb the heat. As heat builds up in the collector, it heats the fluid passing through the tubes.

Biomass Energy We have used biomass energy, or "bioenergy"—the energy from plants and plant-derived materials since people began burning wood to cook food and keep warm. Wood is still the largest biomass energy resource today, but other sources of biomass can also be used. These include food crops, grassy and woody plants, residues from agriculture or forestry, oil-rich algae, and the organic component of municipal and industrial wastes. Even the fumes from landfills (which are methane, a natural gas) can be used as a biomass energy source.

Geothermal Energy Many technologies have been developed to take advantage of geothermal energy—the heat from the earth. This heat can be drawn from several sources: hot water or steam reservoirs deep in the earth that are accessed by drilling; geothermal reservoirs located near the earth's surface, mostly located in western states, Alaska, and Hawaii; and the shallow ground near the Earth's surface that maintains a relatively constant temperature of 50°-60° F. This variety of geothermal resources allows them to be used on both large and small scales. A utility can use the hot water and steam from reservoirs to drive generators and produce electricity for its customers. Other applications apply the heat produced from geothermal directly to various uses in buildings, roads, and agriculture. Still others use the heat directly from the ground to provide heating and cooling in homes and other buildings.

Geothermal Heat Pumps The shallow ground, the upper 10 feet of the Earth, maintains a nearly constant temperature between 50° and 60°F (10°-16°C). Like a cave, this ground temperature is warmer than the air above it in the winter and cooler than the air in the summer. Geothermal heat pumps take advantage of this resource to heat and cool buildings.

Geothermal heat pump systems consist of basically three parts: the ground heat exchanger, the heat pump unit, and the air delivery system (ductwork). The heat exchanger is basically a system of pipes called a loop, which is buried in the shallow ground near the building. A fluid (usually water or a mixture of water and antifreeze) circulates through the pipes to absorb or relinquish heat within the ground. In the winter, the heat pump removes heat from the heat exchanger and pumps it into the indoor air delivery system. In the summer, the process is reversed, and the heat pump moves heat from the indoor air into the heat exchanger. The heat removed from the indoor air during the summer can also be used to heat water, providing a free source of hot water.

Geothermal heat pumps use much less energy than conventional heating systems, since they draw heat from the ground. They are also more efficient when cooling your home. Not only does this save energy and money, it reduces air pollution.

All areas of the United States have nearly constant shallow-ground temperatures, which are suitable for geothermal heat pumps.

Wind Energy We have been harnessing the wind's energy for hundreds of years. From old Holland to farms in the United States, windmills have been used for pumping water or grinding grain. Today, the windmill's modern equivalent, a wind turbine, can use the wind's energy to generate electricity.

Wind turbines, like windmills, are mounted on a tower to capture the most energy. Turbines catch the wind's energy with their propeller-like blades. Usually, two or three blades are mounted on a shaft to form a rotor.

A blade acts much like an airplane wing. When the wind blows, a pocket of low-pressure air forms on the downwind side of the blade. The low-pressure air pocket then pulls the blade toward it, causing the rotor to turn. This is called lift. The force of the lift is actually much stronger than the wind's force against the front side of the blade, which is called drag. The combination of lift and drag causes the rotor to spin like a propeller, and the turning shaft spins a generator to make electricity.