# Miami Valley Land Development Suitability Assessment

## 2008

Miami Valley Regional Planning Commission

**mvrpc**
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REGIONAL PLANNING COMMISSION
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GOING PLACES
An Integrated Land Use Vision for the Miami Valley Region

land suitability

**For more information**

Please visit www.mvrpc.org for a copy of this report. Questions or comments should be directed to Grant Garstka, GIS Specialist / Planner at ggarstka@mvrpc.org.

MVRPC is a voluntary association of governmental and non-governmental organizations serving as a forum and resource where regional partners identify priorities, develop public policy, and implement strategies to improve the quality of life and economic vitality throughout the Miami Valley Region.

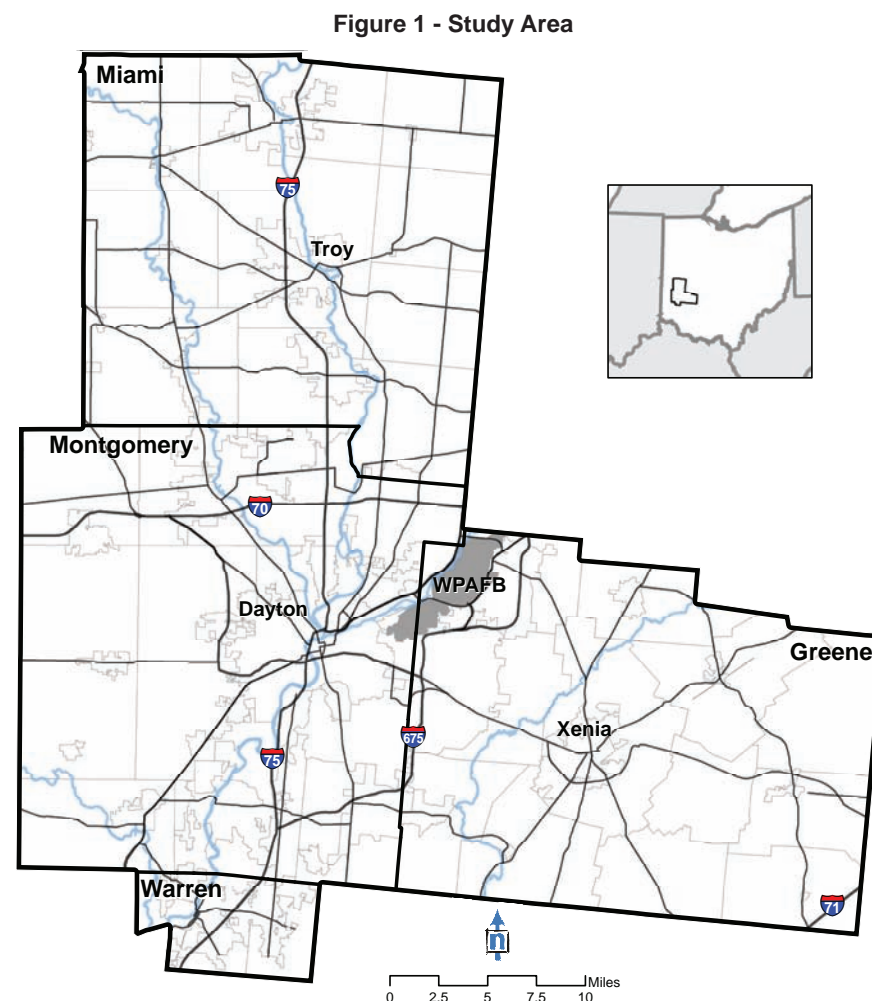## Miami Valley Land Development Suitability Assessment

### Purpose

The Miami Valley Regional Planning Commission (MVRPC) conducted the *Miami Valley Land Development Suitability Assessment* as the final portion of the physical existing conditions evaluation of "Going Places – An Integrated Land Use Vision for the Miami Valley Region." The main purpose of this assessment is to examine the regional landscape in a comprehensive manner and to identify developable land that is not currently fully developed and/or protected.

The entire Region will benefit if development is planned and executed in a manner that takes full advantage of existing infrastructure and does not threaten the quality of natural resources. Further, the Region would be best served when future land development plans take into account the development intensity of surrounding areas. Not all locations are equal in terms of their potential for physical development. Therefore, this assessment is an attempt to determine the Miami Valley Region's capacity to accomodate future development in order to facilitate desirable development patterns in appropriate areas. It is based on an evaluation of the various constraints and opportunities present in the Region and an examination of this capacity in relation to the geographic distribution of different types of development intensity.

This assessment was built from two previously published assessments: the *Miami Valley Land Suitability Assessment – Natural Environmental Factors* and the *Miami Valley Land Suitability Assessment – Built Environmental Factors*. Each assessment provided geographically referenced information regarding various features, such as sensitive natural resources and man-made infrastructure, to identify constraints and opportunities that the Region's land offers. This assessment includes a comprehensive land suitability measure – a combination of the results from the previous assessments – as well as an analysis of this measure to identify land that is suitable for development or re-development and an illustration of how the results of this analysis could be applied in local planning initiatives.

### Study Area

The study area covers a three county region in the Dayton Metropolitan area, along with three cities in northern Warren County, located in southwest Ohio (see figure 1). It includes Greene, Miami, and Montgomery counties along with the cities of Carlisle, Franklin, and Springboro in Warren County, covering approximately 1,313 square miles with three interstates: I-70, I-75, and I-675.

**Figure 1 - Study Area**



### Report Structure

This report is a summary of the land development suitability assessment. It is divided into seven sections:

1.  The Introduction section is an explanation of the overall purpose of the study, study area, and report structure.

2.  The Methodology section is an outline of the general process adopted for this assessment and explains the methods used to carry out this assessment.

3.  The Historical Development Trends section contains an overview of the historical urbanization processes of the Region to contextualize the present regional landscape.

4.  The Land Suitability Measure section presents the comprehensive land suitability measure, developed based on information from the two previously published assessments: the *Miami Valley Land Suitability Assessment – Natural Environmental Factors* and the *Miami Valley Land Suitability Assessment – Built Environmental Factors*.

5.  The Developability Analysis section compares the Land Suitability Measure to findings from an examination of existing land use to identify land in the Region most suitable for development or re-development.

6.  The Applications section illustrates how the findings from the land developability analysis can be used as a tool and guide for local planners and decision makers.

7.  The Conclusion section provides a summary of the findings from the study.

### Acknowledgements

This assessment is an examination of the Region through a four-phase analysis of development suitability. In the first phase, a review of historical development trends is presented in order to contextualize the discussion of the current state of regional land development. For the second phase, a regional Land Suitability Measure was created by combining the results of two previous suitability measures, one which focused on the natural environment and one which focused on the built environment. The third phase is an analysis of the Land Suitability Measure with respect to current land development conditions – including development intensity – in the Region with the purpose of identifying developable land. For the final phase of this assessment, developable land in the Region is compared to two common local land use policies – zoning maps and future land use plan maps – to demonstrate how the findings from the analyses may be used as a resource for local planners and decision makers.

A Geographic Information System (GIS) was used to conduct technical data analyses due to its unique capacity for spatial database management and analysis. Various databases developed and/or acquired for this assessment were all brought into the GIS environment and analyzed using a raster-based spatial overlay technique based on grid cells measuring 2,500 square feet (50 feet by 50 feet). The databases used in this assessment include:

- 1975 Regional Land Use/Land Cover Database, MVRPC, 2008
- 2000 Regional Land Use/Land Cover Database, MVRPC, 2008
- Regional Natural Environment Suitability Measure Database, MVRPC, 2007
- Regional Built Environment Residential Suitability Measure Database, MVRPC, 2008
- Regional Built Environment Non-Residential Suitability Measure Database, MVRPC, 2008
- Regional Parcel Database, MVRPC, 2007 (compiled from Greene, Miami, Montgomery, and Warren county parcel databases)
- 2008 Regional Vacant Property Database, MVRPC, 2008
- 2007 Impervious Surface Database developed from National Land Cover Database from the Multi-Resolution Land Characteristics (MRLC) Consortium, MVRPC, 2008
- Decennial Census, U.S. Census Bureau, 2000
- Regional Zoning Database, MVRPC, 2008 (compiled from the zoning databases from local jurisdictions)
- Regional Future Land Use Database, MVRPC, 2008 (compiled from the future land use databases from local jurisdictions)

### Historical Development Trends

The Region's historical development trends were examined in order to better understand the characteristics of the Region's urbanization process. The Region's Urbanized Areas from 1950 to 2000, defined by the U.S. Census Bureau, were mapped and analyzed in conjunction with population figures from each decennial Census. In addition, historical land use data were analyzed to identify land use changes between 1975 and 2000.

### Land Suitability Measure

A comprehensive Land Suitability Measure was developed using three datasets that were created in the two previous suitability assessments: the *Miami Valley Land Suitability Assessment – Natural Environment Factors* and the *Miami Valley Land Suitability Assessment – Built Environment Factors.* The three datasets, which were derived from 15 Natural Environment Factors and 15 Built Environment Factors, are:

- The Natural Environment Land Suitability Measure
- The Built Environment Land Suitability Measure: Residential
- The Built Environment Land Suitability Measure: Non-Residential

The three datasets were developed independently, making data standardization necessary in order to construct a single comprehensive land suitability measure. The original land suitability measure score included in each of the composite grid layers was first translated into a standardized score so that the three could be integrated. Next, the built environment residential suitability composite grid layer and the non-residential suitability composite grid layer were overlaid and the two standardized composite scores were averaged to create a single standardized built environment score representative of both residential and non-residential suitability. Finally, the standardized built environment land suitability score was averaged with the natural environment land suitability standardized composite score by spatially overlaying the two grid layers (see figure 2).

The data standardization and spatial overlay processes resulted in a dataset that quantifies a single, comprehensive land suitability measure. This dataset was then ranked into four suitability classes: Highly Suitable, Moderately Suitable, Suitable, and Not Suitable.

**Figure 2 - Development of the Land Suitability Measure**



Built Environment Suitabilty Measure: Residential

Built Environment Suitabilty Measure: Non-Residential

Built Environment Suitabilty Measure

Natural Environment Suitabilty Measure

Comprehensive Land Suitabilty Measure

**Developability Analysis**

The Developability Analysis was conducted by combining the Land Suitability Measure with a Land Development Condition Measure. The Land Suitability Measure defines whether the land is suited to accommodate development or not based on land characteristics and provides information regarding whether the land poses any developmental constraints or opportunities. The Land Development Condition Measure classifies land based on its current physical development status. The two measures, when combined, determine the developability of the Region's land. Table 1 shows the framework that was used in combining these two measures. In general, land that is classified as either partially developed or undeveloped in the Land Development Condition Measure and as suitable in the Land Suitability Measure was determined to be developable.

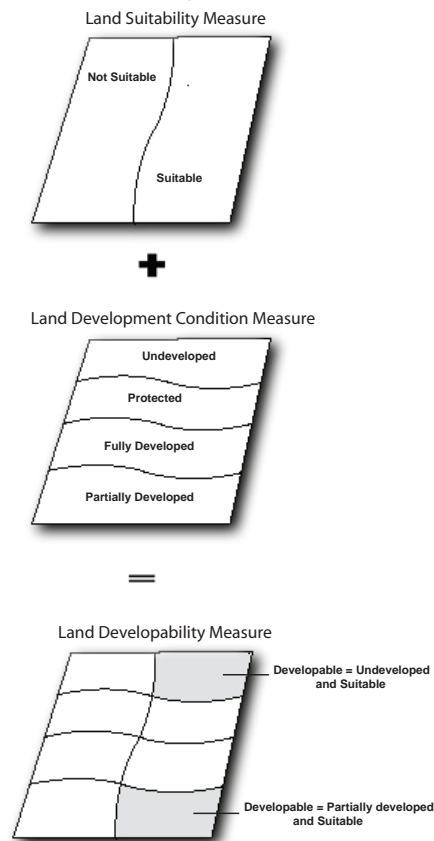**Figure 3 - Developability Analysis Overlay Process**



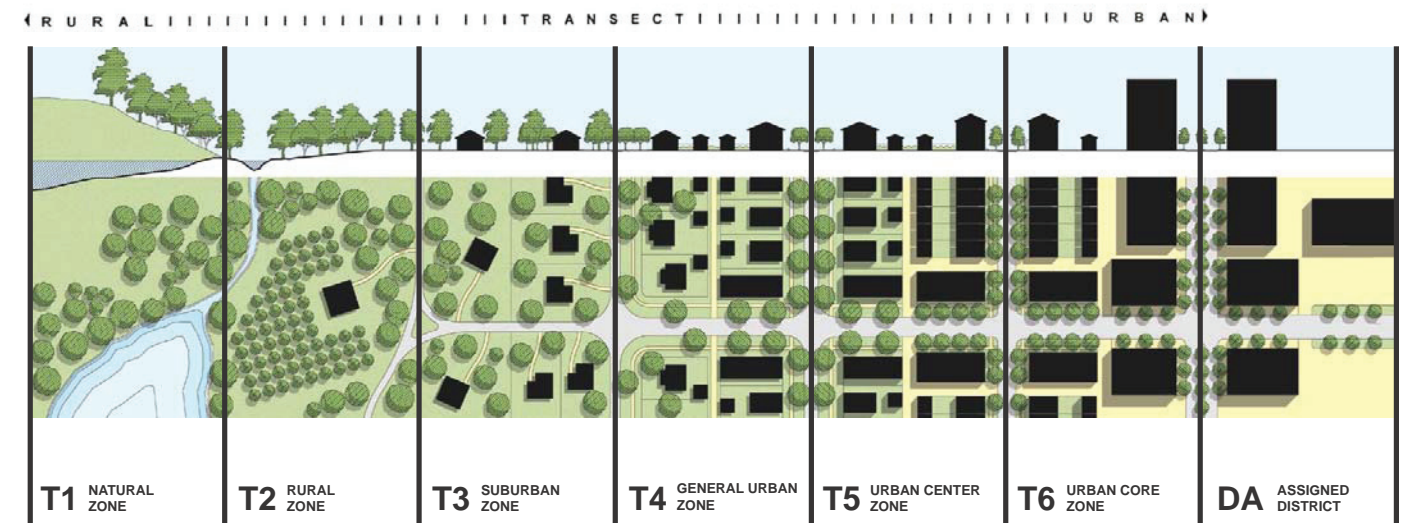**Table 1 - Developability Analysis Framework**

| | | | Land Suitability Measure | |
|---|---|---|---|---|
| | | | Suitable | Not Suitable |
| Land Development Condition Measure | Developed | Fully Developed | NA | NA |
| | | Partially Developed | Developable | Not Developable |
| | Undeveloped | | Developable | Not Developable |
| | Protected | | Not Developable | Not Developable |

Figure 3 depicts how the developability analysis framework was implemented using the spatial overlay technique in a GIS environment. First, for the Land Development Condition Measure, the regional landscape was divided into a grid with cells measuring 2,500 square feet (50 feet by 50 feet) and classified into 4 classes: undeveloped, fully developed, partially developed, and protected. Next, similar to the method used in developing the Land Suitability Measure, the Land Development Condition Measure grid was spatially overlaid onto the Land Suitability Measure grid. These two measures were then combined in order to determine the Land Developability Measure, which presents data on the amounts and geographic locations of developable land in the Region.

The second step in the Developability Analysis was to contextualize the Region's developable land by examining development intensity. Throughout the Region, there are areas that can be characterized as urban or rural. However, different development intensities can be found within both categories. Therefore, the purpose of this part of the analysis was to identify these various levels of existing physical development intensity and compare them to the results of the Land Developability Measure.

Land development intensity was examined using the concept of Transect, a planning theory developed by Andrés Duany and other members of the Congress for New Urbanism which emphasizes urban form and development intensity (see figure 4). Three indicators were used to determine the different levels of development intensity: impervious surface, residential density, and non-residential intensity. These indicators were used to classify the Region's land into Transect Zones (T-Zones), ranging from T-Zone 1 to T-Zone 5, where T-Zone 1 represents the lowest development intensity and T-Zone 5 represents the highest. For a more detailed description of the method used for evaluating development intensity, please see Appendix B.

**Figure 4 - Transect Concept**



Source: Duany, Andrés. 2002. Introduction to the Special Issue: The Transect. *Journal of Urban Design* 7(3): 251 - 260.

**Application of the Developability Analysis**

For the fourth, and last, phase of this assessment, the results of the Developability Analysis were compared to local zoning maps and future land use plan maps to demonstrate how the findings from this analysis could be used as a resource for local planners and decision makers in future land use planning efforts. The areas identified as zoned for development and planned for future development are based on the review of both zoning maps and future land use plan maps. They were compared to the Developability Analysis findings and highlight where the two conflict.

In order to understand the Region's current development condition, it is important to understand how development patterns in the Region have changed over time. Therefore, this section is an examination of historical land development at the regional level. This examination is intended to provide a better understanding of how physical development in the Miami Valley Region has evolved and to offer insight as to what the future land development pattern might hold for physical land development in the Miami Valley Region. More specifically, this section includes information on the changes in urbanization trends, the amounts, and geographical distributions of different types of land uses.

Between 1950 and 2000, the Miami Valley Region experienced three key urbanization trends (see table 2). First, based on the number of people in the Region living in Census designated Urbanized Areas, the Region became more urban. Urban residency in the Region increased from 66.9% in 1950 to 89.8% in 2000. Simultaneously, the amount of land classified as an Urbanized Area increased by almost 400% between 1950 and 2000. In 1950, there were only 66.2 square miles of Urbanized Area. In 2000, there were 327.6 square miles. However, due to the fact that the Urbanized Areas grew faster than the Urbanized Area population, Urbanized Area population density decreased – the third key urbanization trend. In 1950, 5,239.6 people per square mile lived in Urbanized Areas. However, in 2000, only 2,209.9 people per square mile lived in Urbanized Areas. This signifies that recent development can be characterized as consuming larger tracts of land per capita with relatively low land use intensity. This is a contrast to urban development in 1950, which was more compact and of a higher density.

Figure 5 illustrates the geographic expansion of Urbanized Areas in the Miami Valley Region between 1950 and 2000. In 1950, densely settled Urbanized Areas were mainly located in or immediately surrounding the City of Dayton and Wright Patterson Air Force Base. Meanwhile, over the last 50 years, Urbanized Areas in the Region expanded to the east, south, and north. For the most part, this expansion coincided with transportation improvements, such as the construction of I-75, I-70, and I-675.

While urbanization trends provide a good overview of land development characteristics in the Region, a comparison of land use data between 1975 and 2000 provides more in-depth information on land use change. This examination is informative because it reveals how much land has changed by land use type and location.

**Table 2 - Regional Urbanization Trends: 1950-2000**

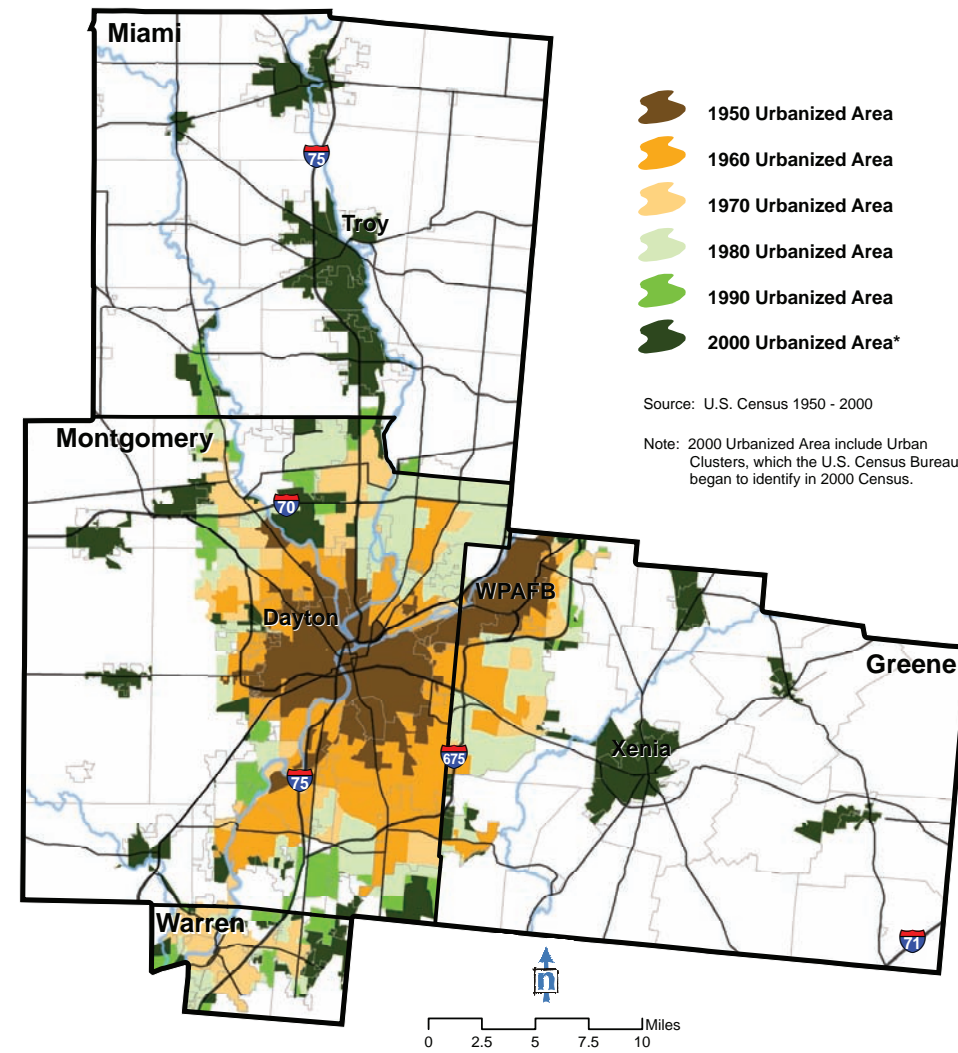|  | 1950 | 1960 | 1970 | 1980 | 1990 | 2000 | 1950 - 2000 % Change |
|---|---|---|---|---|---|---|---|
| Urbanized Areas (in Sq Mi) | 66.2 | 149.0 | 185.9 | 253.7 | 274.1 | 327.6 | 394.9% |
| Total Population | 518,642 | 694,623 | 815,547 | 791,847 | 803,722 | 805,816 | 55.4% |
| Population in Urbanized Areas | 346,864 | 501,694 | 606,549 | 596,134 | 613,147 | 723,955 | 108.7% |
| % of Total Population in Urbanized Areas | 66.9% | 72.2% | 74.4% | 75.3% | 76.3% | 89.8% | - |
| Urbanized Area Population Density (Pop per Sq Mi) | 5,239.6 | 3,367.1 | 3,262.8 | 2,349.8 | 2,236.9 | 2,209.9 | - |

Source: U.S. Census, 1950 to 2000
Note: The data in this table includes only Greene, Miami, and Montgomery counties

**Figure 5 - Regional Urbanization Trends: 1950-2000**



Legend:
- 1950 Urbanized Area
- 1960 Urbanized Area
- 1970 Urbanized Area
- 1980 Urbanized Area
- 1990 Urbanized Area
- 2000 Urbanized Area*

Source: U.S. Census 1950 - 2000

Note: 2000 Urbanized Area include Urban Clusters, which the U.S. Census Bureau began to identify in 2000 Census.

Table 3 summarizes land development trends by land use types between 1975 and 2000. At the regional level, land for residential, commercial, and industrial uses all increased in acreage while agricultural land decreased in acreage. Commercial land experienced the largest growth rate. There was nearly a 150% increase in commercial land, while there was only a 36% increase in residential land and a 22% increase in industrial land.

Looking at the land use changes at the county level, the data reveals that the rate of development varied by type and location. For example, residential land in Miami county experienced large a increase, of 123.8%. In contrast, Montgomery County experienced only a 25.6% increase in residential land. Commercial land use in Montgomery County and Miami County grew by 161.1% and 183.3%, respectively. Table 3 shows that much of the growth occurred at the expense of agricultural/ open space land.

**Table 3 - Regional Land Development Trends by Land Use Type: 1975-2000**

|  | Residential | | | Commercial | | | Industrial | | | Agricultural/ Open Space | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  | 1975 | 2000 | % Change | 1975 | 2000 | % Change | 1975 | 2000 | % Change | 1975 | 2000 | % Change |
| Region | 92,923.1 | 126,648.3 | 36.3% | 9,310.6 | 23,099.3 | 148.1% | 8,551.6 | 10,429.0 | 22.0% | 696,833.7 | 632,058.7 | -9.3% |
| - Greene | 24,304.6 | 31,639.0 | 30.2% | 1,883.5 | 3,502.0 | 85.9% | 2,344.0 | 2,094.2 | -10.7% | 228,954.4 | 218,818.8 | -4.4% |
| - Miami | 8,962.9 | 20,057.1 | 123.8% | 930.5 | 2,636.4 | 183.3% | 1,411.6 | 2,565.4 | 81.7% | 249,008.5 | 234,266.2 | -5.9% |
| - Montgomery | 59,665.7 | 74,952.2 | 25.6% | 6,496.5 | 16,960.9 | 161.1% | 4,796.0 | 5,769.4 | 20.3% | 218,039.2 | 178,973.4 | -17.9% |

Source: MVRPC, 2008
Note: Warren County data are not shown because they are not available

Figure 6 depicts land use in 1975 while Figure 7 presents land use in 2000 classified by land use type.   A comparison of the two maps reveals that land developed for residential and commercial uses expanded substantially.  However, while new residential developments spread out fairly evenly to the east, north, and south in Montgomery County and in the western portion of Greene County, commercial land use became concentrated along major transportation corridors, with large commercial districts being located at major highway junctions.

**Figure 6 - Regional Land Use/Land Cover Map - 1975**



Agricultural/Open Space
Commercial
Industrial
Institutional
Mixed Urban
Residential

Source:  MVRPC

Note:  Warren County data are not shown
        because they are not available

**Figure 7 - Regional Land Use/Land Cover Map - 2000**



Agricultural/Open Space
Commercial
Industrial
Institutional
Mixed Urban
Residential

Source:  MVRPC

## Miami Valley Land Development Suitability Assessment

The purpose of the Land Suitability Measure is to determine where and how much of the Region's land is suitable to accomodate potential future development. This assessment combines the natural and built environment land suitability measures from two previous land suitability assessments into one comprehensive regional Land Suitability Measure. This section begins with a review of those two previous assessments and then describes the results of the Land Suitability Measure.

### Overview of Miami Valley Land Suitability Assessment – Natural Environment Factors

The *Miami Valley Land Suitability Assessment – Natural Environment Factors* provides a comprehensive overview of the Region's natural landscape. Fifteen natural environment factors were analyzed, both individually and in relation to one another, in order to identify locations within the Region that are better suited for further physical development.

The fifteen Natural Environment Suitability factors can be grouped into three categories as follows:

| Resources | Hazards | Physical Impediments |
|---|---|---|
| • Forested Areas | • Flood Plains | • Depth to Bedrock |
| • Ground Water Pollution Potential | • Inundation Areas | • Slope |
| • Ground Water Yield | | • Soil Drainage |
| • Mineral Resources | | • Surface Water |
| • Prime Farmland | | • Load Bearing Strength |
| • Sole Source Aquifer | | |
| • Well Field Protection Areas | | |
| • Wetlands | | |

This assessment revealed that the land in the Region generally exhibits the following characteristics:

   • Mostly flat, dry land with adequate depth to bedrock and load bearing strength;
   • Non-forested land with mineral resources not likely to be present;
   • Medium ground water pollution potential;
   • Not within floodplains or inundation areas;
   • Significant amount of prime farmland with relatively good soil drainage and ground water yield capacity;
   • Containing quality sole source aquifers with portions of the Region designated as well-field protection areas.

The Natural Environment Suitability Composite Map provides a comprehensive spatial overview of environmentally sensitive areas in the Region. In general, this assessment showed that over 80% of regional land is highly or moderately suited to accommodate future land development and that the areas that are least suited for future development are located adjacent to the major river corridors in the Region.

### Overview of Miami Valley Land Suitability Assessment – Built Environment Factors

The *Miami Valley Land Suitability Assessment – Built Environment Factors* provides a comprehensive overview of the Region's constructed landscape. Fifteen built environment factors were analyzed, both individually and in relation to one another, in order to identify locations within the Region that are better suited for further physical development.

The fifteen Built Environment factors can be grouped into four categories as follows:

| Public Infrastructure Provisions | Accessibility | Existing Land Use | Limitations |
|---|---|---|---|
| • Fire Protection Services | • Educational Amenities | • Industrial Clusters | • Airport Noise |
| • Transportation Network Connectivity | • Major Thoroughfare Access | • Job Clusters | • Restricted Development Lands |
| • Public Wastewater Services | • Public Transportation Services | | • Potential Environmental Hazards |
| • Public Water Services | • Other Amenities | | |
| | • Recreational Amenities | | |
| | • Retail Clusters | | |

This assessment revealed that land in the Region generally exhibits the following characteristics:

   • Is located outside airport noise affected areas, potentially hazardous areas, industrial clusters, and restricted development lands;
   • Has good access to the Region's educational, recreational, and other amenities;
   • Has adequate public wastewater, water, and fire protection services;
   • Has certain levels of transportation network connectivity and access to major thoroughfares, public transportation services, and job clusters.

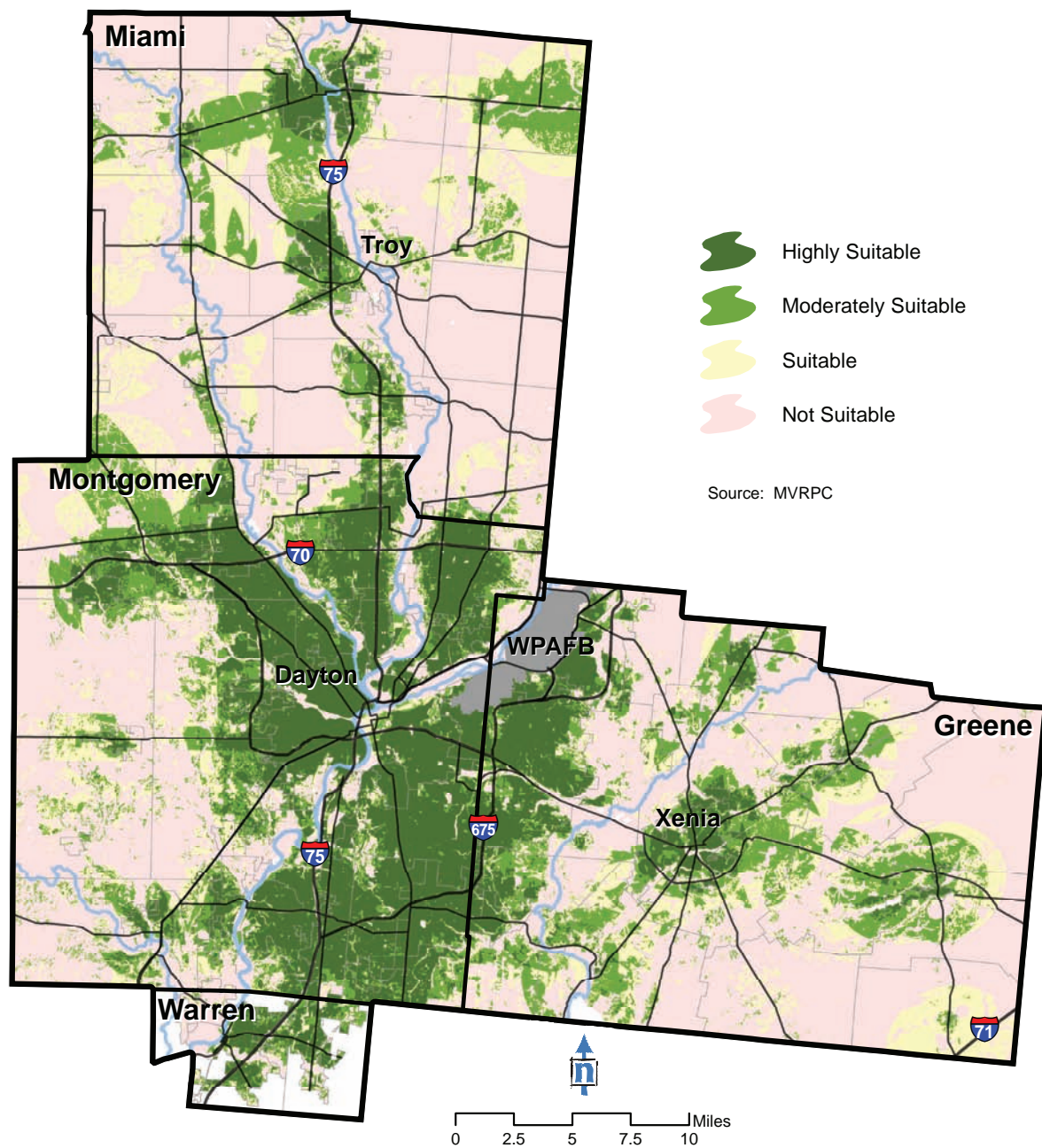Separate Suitability Composite Maps were created for residential and non-residential development considerations because of the differences in the way that the built environment suitability factors affect development potential for residential and non-residential development. In general, this assessment showed that over 55% of regional land is highly or moderately suited to accommodate residential or non-residential development.

### Miami Valley Land Development Suitability Assessment

**Figure 8 - Regional Land Suitability Map**



- Highly Suitable
- Moderately Suitable
- Suitable
- Not Suitable

Source: MVRPC

**Results of the Land Suitability Measure Analysis**

The comprehensive regional Land Suitability Measure reveals that not all locations are equally suitable in terms of their potential for future physical development. Figure 8 illustrates the spatial distribution of the Land Suitability Measure for the Region, presenting where suitable areas are located, and the level of suitability of those areas. In general, the areas identified as Highly Suitable, Moderately Suitable, and Suitable were found along major transportation corridors. Areas identified as Highly Suitable are found mainly in the eastern Montgomery County, western Greene County, and along I-75 in Miami County.

Figure 9 presents the share of regional land based on the Land Suitability Measure. It shows that 18.4% of the regional land is Highly Suitable, 15.3% is Moderately Suitable, 13.9% is Suitable, and 52.3% is Not Suitable for physical development.

Figure 10 illustrates the percent distribution of each county's land by the Land Suitability Measure. The analysis found that 11.5% of Greene County, 4.2% of Miami County, 36.4% of Montgomery County, and 35.3% of Warren County is Highly Suitable for physical development. In addition, 16.6% of Greene County, 13.2% of Miami County, 15.8% of Montgomery County, and 20.4% of Warren County is Moderately Suitable for physical development.

Table 4 presents the data showing each county's acreage and share of regional land by the Land Suitability Measure. Montgomery County contains the largest percentage of land classified as Highly Suitable (69.8%), followed by Greene (19.8%) and Miami (7.1%) counties. On the other hand, for the land identified as either Moderately Suitable or Suitable, the analysis revealed that Greene, Miami and Montgomery counties all share similar percentages of the regional total, ranging from 26.9% to 36.4% for Moderately Suitable land and from 25.1% to 39.8% for Suitable land.

**Figure 9 - Regional Land by Land Suitability Measure**



- Highly Suitable
- Moderately Suitable
- Suitable
- Not Suitable

**Figure 10 - County Land by Land Suitability Measure**



| | Gre | Mia | Mot | War |
|---|---|---|---|---|
| Highly Suitable | 11.5% | 4.2% | 36.4% | 35.3% |
| Moderately Suitable | 16.6% | 13.2% | 15.8% | 20.4% |
| Suitable | 15.0% | 17.7% | 9.9% | 8.0% |
| Not Suitable | 56.9% | 64.9% | 38.0% | 36.3% |

Note: Warren County includes only the cities of Carlisle, Franklin, and Springboro

**Table 4 - County Share of Land by Land Suitability Measure**

| County | Highly Suitable | | Moderately Suitable | | Suitable | | Not Suitable | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | Acreage | County Share of Regional Total | Acreage | County Share of Regional Total | Acreage | County Share of Regional Total | Acreage | County Share of Regional Total | |
| Greene | 30,724.0 | 19.8% | 44,242.3 | 34.4% | 39,948.7 | 34.2% | 151,675.5 | 34.5% | 266,590.5 |
| Miami | 11,014.3 | 7.1% | 34,641.3 | 26.9% | 46,471.6 | 39.8% | 170,348.1 | 38.7% | 262,475.3 |
| Montgomery | 108,324.6 | 69.8% | 46,905.3 | 36.4% | 29,321.3 | 25.1% | 112,877.9 | 25.7% | 297,429.2 |
| Warren | 5,030.0 | 3.2% | 2,899.6 | 2.3% | 1,139.4 | 1.0% | 5,164.4 | 1.2% | 14,233.4 |
| Regional Total | 155,092.9 | 100.0% | 128,688.5 | 100.0% | 116,881.1 | 100.0% | 440,065.9 | 100.0% | 840,728.4 |

Note: Warren County includes only the cities of Carlisle, Franklin, and Springboro

## Miami Valley Land Development Suitability Assessment

The results of the Land Suitability Measure presented on the previous page only identify whether land is suitable or not suitable for physical development. In order to identify the quantity and location of developable land, the current development condition of the Region's land needs to be examined as well.

This section begins by providing an overview of regional land use in 2007, which was used as a base for developing the Land Development Condition Measure and offers insights in terms of where and how much land was designated for which use.

### Results of the 2007 Land Use Anlaysis

Figure 11 shows the spatial distribution of land by various land use types. Throughout the Region, commercial land is decentralized and scattered while industrial land is mostly situated along the I-75 corridor. Residential land, while located throughout the Region, is concentrated in the eastern portion of Montgomery County and western portion of Greene County. For Miami County, most residential, commercial, and industrial land uses are centered around I-75.

Approximately 60% of the Region's land (65.3%) is identified as agricultural or open space (see figure 12). Residential land (24.2%) makes up the next largest percentage, followed by institutional (3.7%) and commercial (3.3%) land.

Figure 13 presents the composition of county land by land use type. Agricultural and open space land and residential land make up the majority of both Greene and Miami counties. Miami County is mostly agricultural and open space (74.1%), with residential land (20.7%) being the second most prevalent use. This is similar to Greene County, in which 72.4% is agricultural and open space land and 17.7% is residential land. Meanwhile, the composition of land in Montgomery County is substantially different than that of Greene and Miami counties. In Montgomery County, only 51.7% of the land is classified as agricultural and open space, followed by residential (33.2%), institutional (6.1%), commercial (6.1%), and industrial (3.6%) uses.

Montgomery County leads the Region in all residential (46.2%), commercial (62.4%), industrial (53.3%), and institutional (47.3%) land (see table 5). Miami County has the second largest shares of land for residential (27.6%) and industrial (19.5%) uses, while Greene County contains the second largest shares for commercial (18.3%) and institutional (40.7%) uses.



**Figure 11 - Regional Land Use/Land Cover Map - 2007**

Legend:
- Agricultural/Open Space
- Commercial
- Industrial
- Institutional
- Residential
- Other

Source: MVRPC



**Figure 12 - Regional Land by Land Use Type**

65.3% - 24.2% - 3.3% - 2.3% - 3.7% - 1.3%

Residential, Commercial, Industrial, Institutional, Agricultural/Open Space, Other



**Figure 13 - County Land by Land Use Type**

| | Gre | Mia | Mot | War |
|---|---|---|---|---|
| Residential | 17.7% | 20.7% | 33.2% | 37.1% |
| Commercial | 1.8% | 1.5% | 6.1% | 9.0% |
| Industrial | 1.3% | 1.4% | 3.6% | 11.6% |
| Institutional | 4.7% | 1.1% | 5.2% | 4.9% |
| Agricultural/Open Space | 72.4% | 74.1% | 51.7% | 29.7% |
| Other | 2.1% | 1.3% | 0.2% | 7.6% |

Note: Warren County includes only the cities of Carlisle, Franklin, and Springboro

**Table 5 - County Share of Land by Land Use Type**

| | Residential | | Commercial | | Industrial | | Institutional | | Agricultural/Open Space | | Other | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Acreage | County Share of Regional Total | Acreage | County Share of Regional Total | Acreage | County Share of Regional Total | Acreage | County Share of Regional Total | Acreage | County Share of Regional Total | Acreage | County Share of Regional Total | |
| Greene | 46,666.6 | 23.8% | 4,862.6 | 18.3% | 3,480.8 | 19.1% | 12,293.5 | 40.7% | 191,102.5 | 36.0% | 5,471.8 | 52.7% | 263,877.7 |
| Miami | 54,154.8 | 27.6% | 3,996.4 | 15.0% | 3,561.5 | 19.5% | 2,964.2 | 9.8% | 194,192.7 | 36.6% | 3,344.2 | 32.2% | 262,213.9 |
| Montgomery | 90,511.9 | 46.2% | 16,600.8 | 62.4% | 9,732.3 | 53.3% | 14,283.5 | 47.3% | 141,047.8 | 26.6% | 585.0 | 5.6% | 272,761.2 |
| Warren | 4,767.8 | 2.4% | 1,156.9 | 4.3% | 1,495.7 | 8.2% | 630.4 | 2.1% | 3,816.8 | 0.7% | 978.6 | 9.4% | 12,846.2 |
| Regional Total | 196,101.1 | 100.0% | 26,616.8 | 100.0% | 18,270.2 | 100.0% | 30,171.6 | 100.0% | 530,159.7 | 100.0% | 10,379.6 | 100.0% | 811,699.0 |

Note: Warren County includes only the cities of Carlisle, Franklin, and Springboro

## Miami Valley Land Development Suitability Assessment

The Land Development Condition Measure was developed using 2007 land use information from various parcel-based land use databases. Regional land was coded into 4 classes: Undeveloped, Fully Developed, Partially Developed, and Protected.

- **Undeveloped land** is generally comprised of parcels that are classified as agricultural, open space, or parcels that do not contain a structure.

- **Developed land** is generally comprised of parcels that do contain a structure and are classified as residential, commercial, industrial, right-of-way, or tax exempt. Developed land is further narrowed into the sub-classifications Fully Developed or Partially Developed.

  *Fully developed* land consists of parcels with occupied structures.

  *Partially developed* land consists of parcels that are classified as developed but contain vacant structures.

- **Protected land** mostly includes park land, active recreation areas, and land protected under conservation easements.

### Results of the Land Development Condition Measure Analysis

Figure 14 shows the regional distribution of undeveloped, fully developed, partially developed, and protected land. Most of the Region's fully developed land is located in the eastern portion of Montgomery County and the western portion of Greene County. Fully developed land in Miami County is centered along I-75. In Warren County, most of the land is fully developed since the study area includes only the cities of Carlisle, Franklin, and Springboro.

Figure 15 shows the regional breakdown of the Land Development Condition Measure data. An estimated 28.8% of regional land is classified as fully developed and 0.3% is classified as partially developed. In addition, almost 4.9% the Region's land is identified as protected. The remaining 66.0% of the land is undeveloped.

**Figure 14 - Regional Land Development Condition Map**



Fully Developed
Partially Developed
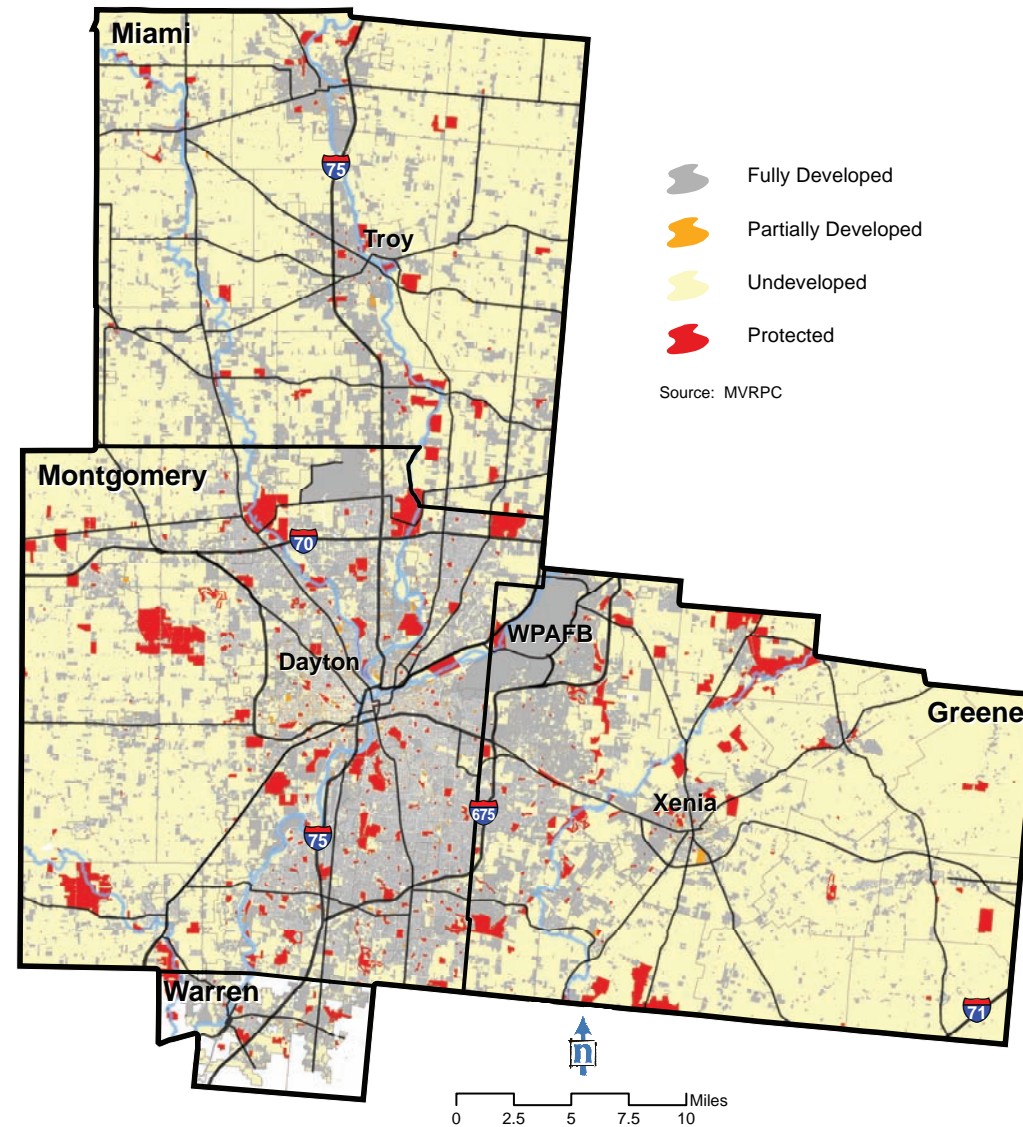Undeveloped
Protected

Source: MVRPC

Figure 16 shows the percent breakdown of each county's land by the Land Development Condition Measure. It shows that both Montgomery County (39.5%) and the portions of Warren County (56.3%) included in this assessment are mostly fully developed, while only about a quarter of Greene (23.1%) and Miami (22.0%) counties are identified as fully developed. In Greene and Miami counties, undeveloped land makes up 72.0% and 75.7% of total county land, respectively.

Table 6 shows each county's acreage and share of regional land by the Land Development Condition Measure. Over half of all fully developed land (56.2%) is located in Montgomery County, followed by Greene (26.1%) and Miami (24.7%) counties. Montgomery County also has the largest shares of partially developed (77.5%) and protected (52.7%) land.

**Figure 15 - Regional Land by Land Development Condition Measure**



- Fully Developed
- Partially Developed
- Undeveloped
- Protected

**Figure 16 - County Land by Land Development Condition Measure**



|  | Gre | Mia | Mot | War |
|---|---|---|---|---|
| Fully Developed | 23.1% | 22.0% | 39.5% | 56.3% |
| Partially Developed | 0.1% | 0.1% | 0.7% | 0.5% |
| Undeveloped | 72.0% | 75.7% | 52.2% | 38.6% |
| Protected | 4.7% | 2.2% | 7.6% | 4.6% |

Note: Warren County includes only the cities of Carlisle, Franklin, and Springboro

**Table 6 - County Share of Land by Land Development Condition Measure**

| County | Fully Developed | | Partially Developed | | Undeveloped | | Protected | | Total |
|---|---|---|---|---|---|---|---|---|---|
|  | Acreage | County Share of Regional Total | Acreage | County Share of Regional Total | Acreage | County Share of Regional Total | Acreage | County Share of Regional Total | |
| Greene | 61,008.7 | 26.1% | 283.3 | 11.8% | 189,916.2 | 35.4% | 12,404.2 | 31.4% | 266,612.4 |
| Miami | 57,637.0 | 24.7% | 192.7 | 8.0% | 198,257.6 | 37.0% | 5,682.0 | 14.4% | 261,769.4 |
| Montgomery | 108,028.0 | 56.2% | 1,836.0 | 77.5% | 142,963.3 | 26.7% | 20,823.6 | 52.7% | 273,677.9 |
| Warren | 7,139.9 | 3.1% | 64.8 | 2.7% | 4,891.9 | 0.9% | 581.2 | 1.5% | 12,677.8 |
| Regional Total | 233,813.7 | 100.0% | 2,403.9 | 100.0% | 536,029.0 | 100.0% | 39,491.1 | 100.0% | 811,737.6 |

Note: Warren County includes only the cities of Carlisle, Franklin, and Springboro

## Miami Valley Land Development Suitability Assessment

The Land Developability Measure, which provides information regarding the location and amount of developable land that exists throughout the Region, was determined based on the data pertaining to the Land Suitability Measure and the Land Development Condition Measure. For this analysis, only undeveloped land and partially developed land, identified in the Land Development Condition Measure, were examined against the Land Suitability Measure in order to determine whether a particular tract of land is developable or not. In addition, the developable land was further classified into three classes based on the three levels of land suitability: Developable and Highly Suitable; Developable and Moderately Suitable; and Developable and Suitable.

**Figure 17 - Regional Land Developability Measure Map**



Developable (Highly Suitable)

Developable (Moderately Suitable)

Developable (Suitable)

Not Developable

Fully Developed

Protected

Source: MVRPC

**Figure 18 - Regional Land by Developability Measure**



- Developable
- Not Developable
- Fully Developed
- Protected

### Results of the Land Developability Measure Analysis

Figure 17 shows the spatial distribution of land classified by the Land Developability Measure. The areas in grey represent fully developed areas, while the areas in red represent protected land. The areas outside fully developed or protected land are color coded to illustrate the Land Developability Measure results.

Most of the developable land is located along the edges of fully developed land or along major transportation corridors.

Figure 18 shows regional shares of land broken down by the Land Developability Measure. Fully developed land and protected land make up 28.8% and 4.9% of the Region, respectively. Of the remaining land, 26.9% is identified as developable and 39.4% as not developable.

Roughly 20% to 25% of each county is found to be developable (see figure 19). The developable land in Greene, Miami, and Montgomery counties make up 28.2%, 26.3%, and 26.5% of each county's land, respectively. On the other hand, 49.5% of Miami County, 44.0% of Greene County and 26.4% of Montgomery County are identified as not developable. For Warren County, since the study area covers only three cities of Carlisle, Franklin, and Springboro, a smaller portion of land (22.6%) is identified as developable.

The examination of each county's share of land by the Land Developability Measure is presented in Table 7. Greene County has the largest share of developable land, with 34.0%, followed by Montgomery (33.2%) and Miami (31.5%) counties.

**Figure 19 - County Land by Developability Measure**



|  | Gre | Mia | Mot | War |
|---|---|---|---|---|
| Developable | 28.2% | 26.3% | 26.5% | 22.6% |
| Not Developable | 44.0% | 49.5% | 26.4% | 16.5% |
| Fully Developed | 23.1% | 22.0% | 39.5% | 56.3% |
| Protected | 4.7% | 2.2% | 7.6% | 4.6% |

Note: Warren County includes only the citeis of Carlisle, Franklin, and Springboro

**Table 7 - County Share of Land by Developability Measure**

| | Developable | | Not Developable | | Fully Developed | | Protected | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | Acreage | County Share of Regional Total | Acreage | County Share of Regional Total | Acreage | County Share of Regional Total | Acreage | County Share of Regional Total | |
| Greene | 74,337.0 | 34.0% | 115,862.5 | 36.2% | 61,008.7 | 26.1% | 12,404.2 | 31.4% | 263,612.4 |
| Miami | 68,746.1 | 31.5% | 129,704.2 | 40.5% | 57,637.0 | 24.7% | 5,682.0 | 14.4% | 261,769.4 |
| Montgomery | 72,562.3 | 33.2% | 72,264.0 | 22.6% | 108,028.0 | 46.2% | 20,823.6 | 52.7% | 273,677.9 |
| Warren | 2,864.0 | 1.3% | 2,092.7 | 0.7% | 7,139.9 | 3.1% | 581.2 | 1.5% | 12,677.8 |
| Regional Total | 218,509.4 | 100.0% | 319,923.4 | 100.0% | 233,813.7 | 100.0% | 39,491.1 | 100.0% | 811,737.6 |

Note: Warren County includes only the citeis of Carlisle, Franklin, and Springboro

## Miami Valley Land Development Suitability Assessment

Regional development intensity was examined using the concept of Transect that was introduced in the methodolgy. The advantage of this review is that it provides an alternative regional perspective with an emphasis on development intensity rather than the types of land use (i.e.: residential, commercial or industrial). Further, this alternative perspective can inform local decision makers about the scale of development intensity that best suits their respective communities or specific locations within their communities.

The Regional Land Development Intensity Map was developed by overlaying spatial data representing impervious surfaces, residential density, and non-residential intensity. In general, T-Zone 1 represents the lowest degree of development intensity while T-Zone 5 represents the highest. A detailed methodology and a presentation of the data used for the Regional Land Development Intensity analysis can be found in Appendix B of this report.

The T-Zones for the Development Intensity Map are defined as follows:

- **T-Zone 1 (T1)**: Lowest land use intensity, 0-20% impervious surface and mostly open land or agricultural land with a residential density of 0.70 Housing Units per Acre (HUA) or less
- **T-Zone 2 (T2)**: Lower land use intensity, 20-40% impervious surface and a residential density of 0.70 - 1.40 HUA
- **T-Zone 3 (T3)**: Medium land use intensity typical of suburban areas, 40-60% impervious surface, and mixed land use
- **T-Zone 4 (T4)**: Higher land use intensity, urbanized area with 60-80% impervious surface, and greater mixed land use
- **T-Zone 5 (T5)**: Urban core with very high land use intensity, 80-100% impervious surface and with a residential density of 4.18 HUA or greater

### Results of the Land Development Measure Analysis by Development Intensity

Figure 20 shows the Region according to land development intensity. Most of the Region (72.4%) is classified as T1, or very low intensity. Meanwhile, T5, the highest intensity, makes up the smallest portion of the Region (3.3%). High levels of development intensity were found in the City of Dayton and east of I-75 in Montgomery County. Wright Patterson Air Force Base and the City of Xenia in Greene County, along with the municipalities located along I-75 in Miami County, show a high level of development intensity as well.



**Figure 20 - Regional Land Development Intensity Map**

T5 (3.3%)
T4 (7.4%)
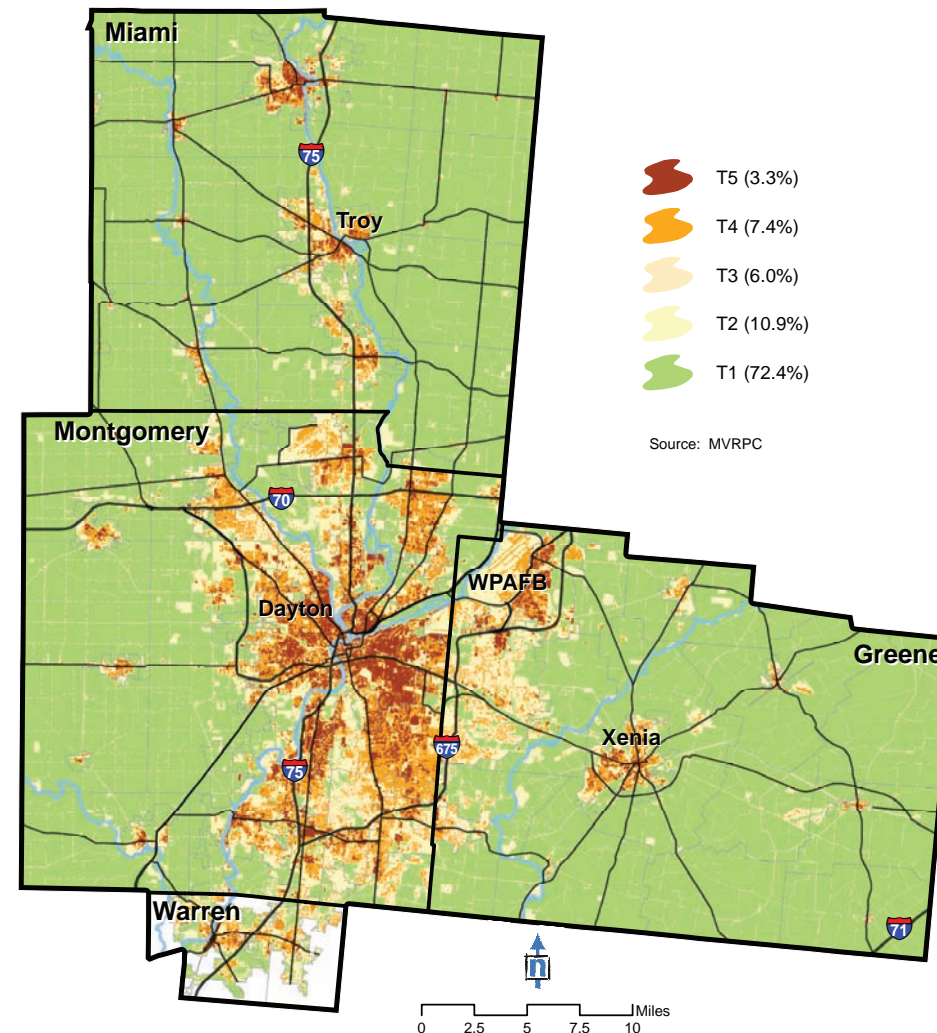T3 (6.0%)
T2 (10.9%)
T1 (72.4%)

Source: MVRPC

Table 8 presents the cross tabulation of data from the Regional Land Developabiilty Measure with the data from the Regional Land Development Intensity Measure. Within the category of fully developed land, various levels of land development intensity are identified. However, the data suggest that lower development intensity is more prevalent than higher development intensity throughout the Region. As presented in the table, 8.8% of fully developed land has a very high level of intensity (T5) while 37.7% has the lowest level of development intensity (T1).

Of those areas identified as Developable, two different findings are observed between undeveloped-developable land and partially developed-developable land. For undeveloped-developable land, lower levels of development intensity are found to be more prevalent than the higher levels of development intensity. In contrast, higher levels of development intensity are observed for the partially developed-developable land. These data findings are not surprising because undeveloped-developable land is currently not yet developed, therefore, showing lower levels of development intensity. Conversely, partially developed-developable land is showing higher levels of development intensity because it is already developed to a specific intensity.

**Table 8 - Regional Land Developability by Transect Zone**

| | Fully Developed | | Developable | | | | | | Undeveloped | | Moderately Suitable | | Suitable | | Partially Developed | | | | | | Undevelopable | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Undeveloped | | | | | | | | | | | | Partially Developed | | | | | | Undevelopable | | |
| | | | Highly Suitable | | Moderately Suitable | | Suitable | | | | | | | | Highly Suitable | | Moderately Suitable | | Suitable | | | | |
| | Acreage | % Share | Acreage | % Share | Acreage | % Share | Acreage | % Share | | | | | | | Acreage | % Share | Acreage | % Share | Acreage | % Share | Acreage | % Share | |
| T1 | 110,689.7 | 37.7% | 19,390.9 | 68.3% | 74,269.9 | 92.5% | 84,328.3 | 95.2% | 45.8 | 2.9% | 65.3 | 18.1% | 31.0 | 30.9% | 319,095.7 | 92.0% | 607,916.7 |
| T2 | 56,167.7 | 19.1% | 5,057.6 | 17.8% | 4,922.0 | 6.1% | 3,743.8 | 4.2% | 156.3 | 10.0% | 52.9 | 14.7% | 14.3 | 14.3% | 21,733.1 | 6.3% | 91,847.7 |
| T3 | 42,966.4 | 14.6% | 2,037.4 | 7.2% | 835.5 | 1.0% | 410.5 | 0.5% | 172.9 | 11.1% | 53.1 | 14.7% | 10.2 | 10.2% | 3,935.5 | 1.1% | 50,421.7 |
| T4 | 58,182.3 | 19.8% | 1,546.2 | 5.4% | 274.1 | 0.3% | 98.3 | 0.1% | 503.5 | 32.3% | 85.5 | 23.7% | 16.9 | 16.8% | 1,700.1 | 0.5% | 62,406.9 |
| T5 | 25,960.6 | 8.8% | 358.8 | 1.3% | 24.2 | 0.0% | 6.7 | 0.0% | 680.4 | 43.6% | 104.2 | 28.8% | 28.0 | 27.9% | 419.6 | 0.1% | 27,582.4 |
| Regional Total | 293,966.7 | 100.0% | 28,390.9 | 100.0% | 80,325.7 | 100.0% | 88,587.7 | 100.0% | 1,558.9 | 100.0% | 361.1 | 100.0% | 100.5 | 100.0% | 346,883.9 | 100.0% | 840,175.4 |

## Miami Valley Land Development Suitability Assessment

The Application of Developability Analysis section provides two specific examples of how the Developability Analysis can be used as a tool in making land use policy decisions. More specifically, the land developability measure is compared to a map of local zoning and a map of future land use plans, each compiled from jurisdicitons throughout the Region, to showcase how the results from this assessment can be applied in local planning efforts.

### Applications for Zoning

This example compares local zoning maps with the Land Developability Measure Map. First, zoning status was reviewed to determine areas zoned for development and not zoned for development. Areas that are zoned for development include areas zoned for residential, commercial, industrial, or institutional uses but are not yet developed. Second, areas that are zoned for development were compared with the Land Developability Measure to identify areas that are zoned for development but are not developable. Finally, areas that are not zoned for development were compared with the Land Developability Measure to identify areas that are not zoned for development but that are determined to be developable to highlight areas where future development could be directed.

### Zoned For Development

Figure 21 highlights areas that are zoned for development but are not yet developed or protected. Approximately 9.8% of the Region is zoned for development, while 55.9% is not zoned for development.

### Zoned For Development Vs. Land Developability Measure

Figure 22 is a comparison of the land zoned for development with the Land Developability Measure. The purpose of this comparison is to emphasize areas that are zoned for development, but are NOT developable. For red-highlighted areas, local zoning plans are encouraged to be revisited due to their lack of developability.
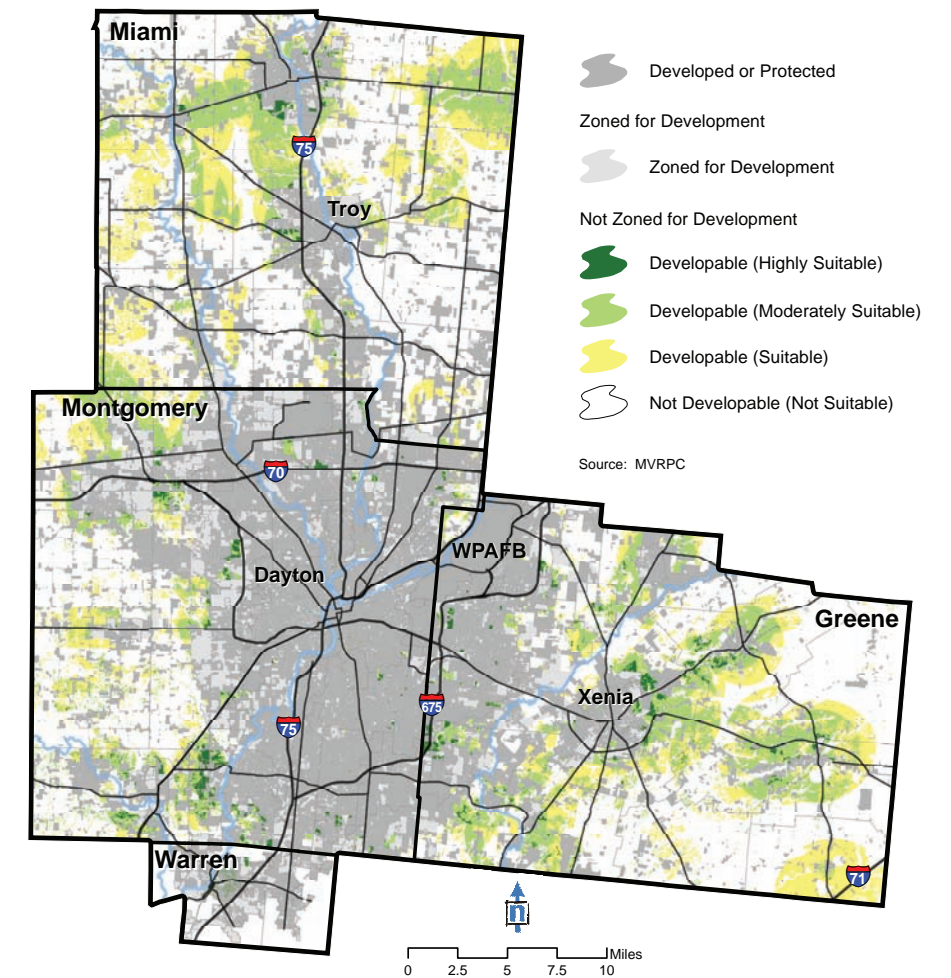
### Not Zoned For Development Vs. Land Developability Measure

Figure 23 is a comparison of land not zoned for development with the Land Developability Measure. The purpose of this comparison is to emphasize areas that are NOT zoned for development, but that are developable. When making local zoning plans in the future, these areas could be prioritized and brought into future zoning regulations.

Figure 21 - Zoning Status Vs. Land Development Condition Map



Zoned for Development (9.8%)
Not Zoned for Development (55.9%)
Developed (29.4%)
Protected (4.8%)

Source: MVRPC

Figure 22 - Zoned For Development Vs. Land Developability Measure Map



Developed or Protected
Zoned for Development
Developable (Highly Suitable)
Developable (Moderately Suitable)
Developable (Suitable)
Not Developable (Not Suitable)
Not Zoned for Development
Not Zoned for Development

Source: MVRPC

Figure 23 - Not Zoned for Development Vs. Land Developabilty Measure Map



Developed or Protected
Zoned for Development
Zoned for Development
Not Zoned for Development
Developable (Highly Suitable)
Developable (Moderately Suitable)
Developable (Suitable)
Not Developable (Not Suitable)

Source: MVRPC

**Miami Valley Land Development Suitability Assessment**

**Applications for Future Land Use**

This example compares future land use plan maps with the Land Developability Measure Map. First, future land use status was reviewed to locate areas planned for development. Areas planned for development include areas planned for residential, commercial, industrial, or institutional uses. Second, areas planned for future development were compared with the Land Developability Measure to identify areas that are planned for development but are not developable. Finally, areas that are not planned for future development were compared with the Land Developability Measure to identify areas not planned for development but that are developable to highlight where future development could be directed.

**Planned For Development**

Figure 24 highlights areas that are planned for future development but are not yet developed or protected. Approximately 13.2% of the Region is planned for development, while 52.6% is not planned for development.

**Planned for Development Vs. Land Developability Measure**

Figure 25 is a comparison of land planned for development with the Land Developability Measure. The purpose of this comparison is to emphasize areas that are planned for development, but are NOT developable. For red-highlighted areas, future land use plans are encouraged to be revisited due to their lack of developability.

**Not Planned for Development Vs. Land Developability Measure**

Figure 26 is a comparison of land not planned for development with the Land Developability Measure. The purpose of this comparison is to emphasize areas that are NOT planned for development, but are developable. When updating future land use plans, these areas could be prioritized and brought into future land use plans.

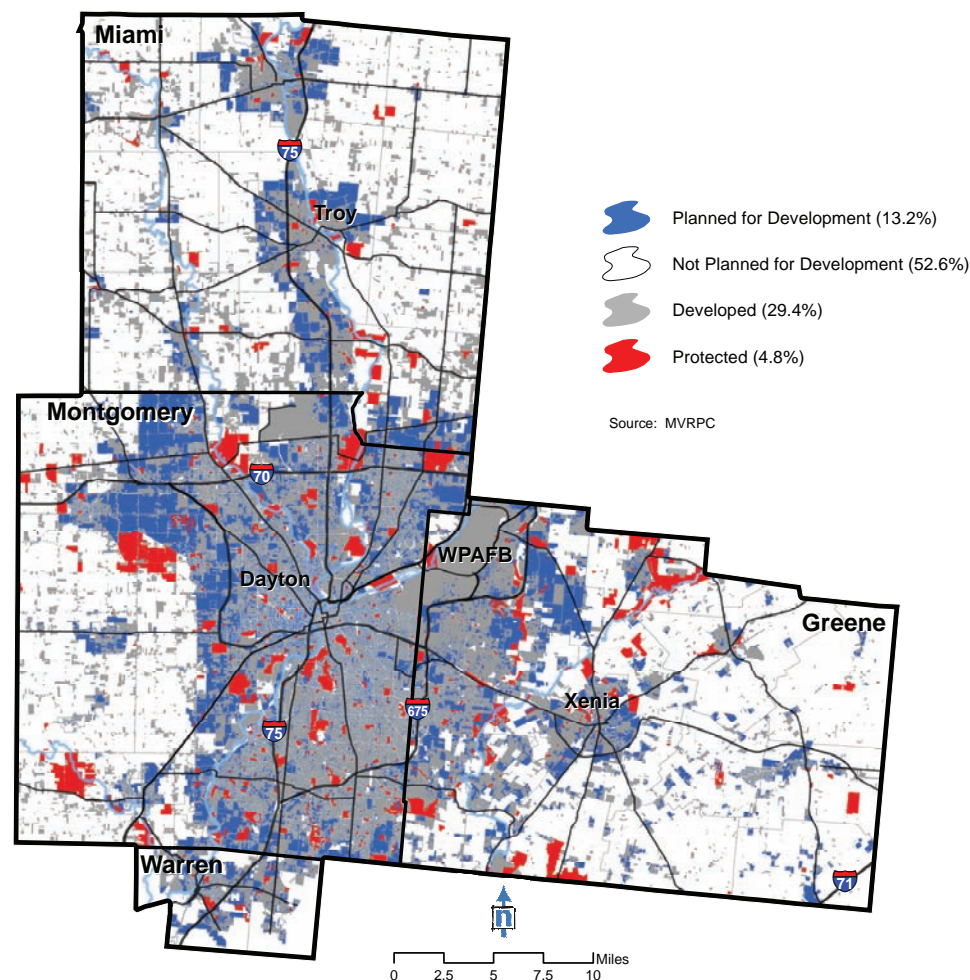**Figure 24 - Future Land Use Status Map**



Planned for Development (13.2%)
Not Planned for Development (52.6%)
Developed (29.4%)
Protected (4.8%)

Source: MVRPC

**Figure 25 - Planned for Future Development Vs. Land Developability Measure Map**



Developed or Protected
Planned for Development
Developable (Highly Suitable)
Developable (Moderately Suitable)
Developable (Suitable)
Not Developable (Not Suitable)
Not Planned for Development
Not Planned for Development

Source: MVRPC

**Figure 26 - Not Planned for Future Development Vs. Land Developability Measure Map**



Developed or Protected
Planned for Development
Planned for Development
Not Planned for Development
Developable (Highly Suitable)
Developable (Moderately Suitable)
Developable (Suitable)
Not Developable (Not Suitable)

Source: MVRPC

## Miami Valley Land Development Suitability Assessment

### Conclusion

As the final portion of the physical existing conditions evaluation of "Going Places – An Integrated Land Use Vision for the Miami Valley Region," the *Miami Valley Land Development Suitability Assessment* provides a comprehensive overview of the Region's existing land development condition. This assessment offers insights regarding how the Region has evolved over the years, outlines a dynamic regional landscape where some areas are better suited for physical development than others, and details the quantity and location of developable lands in the Region.

Highlights of the data findings from the assessment include:

- The Urbanized Areas in the Region expanded at a much faster pace than population growth, resulting in an Urbanized Area population density decline from 5,239.6 persons per square mile in 1950 to 2,209.9 in 2000. In addition, the growth in commercial land was the largest (148.1%) between 1975 and 2000 in comparison to residential (36.3%), industrial (22.0%), and agricultural/open space (-9.3%) land.
- According to the comprehensive Land Suitability Measure, 18.4% of the Region's land is Highly Suitable, while 15.3% is Moderately Suitable, 13.9% is Suitable, and 52.3% is Not Suitable
- In 2007, 28.8% of regional land was fully developed while 0.3% was partially developed. Of the developed land, 24.2% is residential, 3.3% is commercial, 2.3% is industrial, 3.7% is institutional, 65.3% is agricultural/open space, and 1.3% is classified as other
- The regional land developability analysis was conducted by identifying undeveloped or partially developed land in the Region, excluding protected and already developed land, and evaluating the development suitability of the remaining land. The analysis revealed that 26.9% of regional land is developable, while 39.4% is undevelopable.

Local planning efforts have impacts on regional development, just as regional planning efforts have impacts on local development. This assessment is intended to provide a snapshot of existing land development suitability in a comprehensive manner at a regional level that could assist local planning practitioners and decision makers. To this end, this assessment provides two examples of how the Land Developability Analysis could be applied as a tool for local planning efforts. However, it is important to note that this assessment only advises on where future development is either suitable or not suitable. It does not advise what specific land use types (i.e. residential, commercial, industrial, etc.) or land development types are most appropriate. Likewise, the development intensity approach used as part of this assessment is not intended to suggest certain types of zoning codes, but rather to provide information on what scale of development intensity is most appropriate for various locations throughout the Region.

The entire Region will benefit if development is planned and executed in a manner that takes advantage of existing infrastructure before paying for new construction and if development takes advantage of our natural resources without threatening their quality. Also, while this assessment has presented the amount of land that could be developed in the future, the message is not that all of that land should be developed. A determination of how much land will be needed for future development will only be appropriate when the future land use demand is considered.

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**Developability Analysis** – A spatial analysis to determine the amount and geographic location of developable land based on the Land Suitability Measure and the Land Development Condition Measure.

**Developable** – Land that is currently identified as undeveloped or partially developed from the Land Development Suitability Measure and identified as suitable from Land Suitability Measure.

**Developed** – Land identified as residential, commercial, industrial, right-of-way, or tax exempt properties and has a structure present. Developed land is further classified into Fully Developed and Partially Developed.

**Fully Developed** – Land identified as residential, commercial, industrial, right-of-way, or tax exempt properties with occupied structures.

**Highly Suitable** – Highest rank of the Land Suitability Measure.

**Land Development Intensity** – The extent to which land is used in terms of the concentration of activity measured by impervious surface, residential density, and non-residential intensity data.

**Land Developability Measure** – A measure that defines the land developability to accommodate potential future physical development based on the Land Suitability Measure and the Land Development Condition Measure.

**Land Suitability Measure** – A composite suitability score that defines whether land is suited for physical development or not based on land characteristics. Land characteristics are based on fifteen Natural Environment factors and fifteen Built Environment factors.

**Land Development Condition Measure** – A measure that defines the current condition of land development status. Conditions are classified as fully developed, partially developed, undeveloped, or protected.

**Moderately Suitable** – Middle rank of the Land Suitability Measure.

**Not Developable** – Land that is currently identified as undeveloped or partially developed from the Land Development Condition Measure and identified as not suitable from the Land Suitability Measure; Land that is currently identified as fully developed; or Land that is currently identified as protected.

**Not Planned for Development** – Areas not identified as residential, commercial, industrial, or institutional according to the future land use plan map.

**Not Zoned for Development** – Areas not zoned as residential, commercial, industrial, or institutional according the latest zoning map.

**Partially Developed** – Land identified as residential, commercial, industrial, right-of-way, or tax exempt properties with vacant structures.

**Planned for Development** – Areas identified as residential, commercial, industrial, or institutional according to the land use plan map.

**Protected** – Land identified as park land, active recreation land, or land protected by conservation easements.

**Suitable** – Lowest rank of the Land Suitability Measure.

**Transect** – A planning theory developed by Andrés Duany and other members of the Congress for New Urbanism, which emphasizes urban form.

**Transect Zone (T-Zone)** – Classification of land based on varying degrees of development intensity.

**Undeveloped** – Land identified as agricultural, open space, or land that does not have a structure present.

**Zoned for Development** – Areas zoned as residential, commercial, industrial, or institutional according to the zoning map.
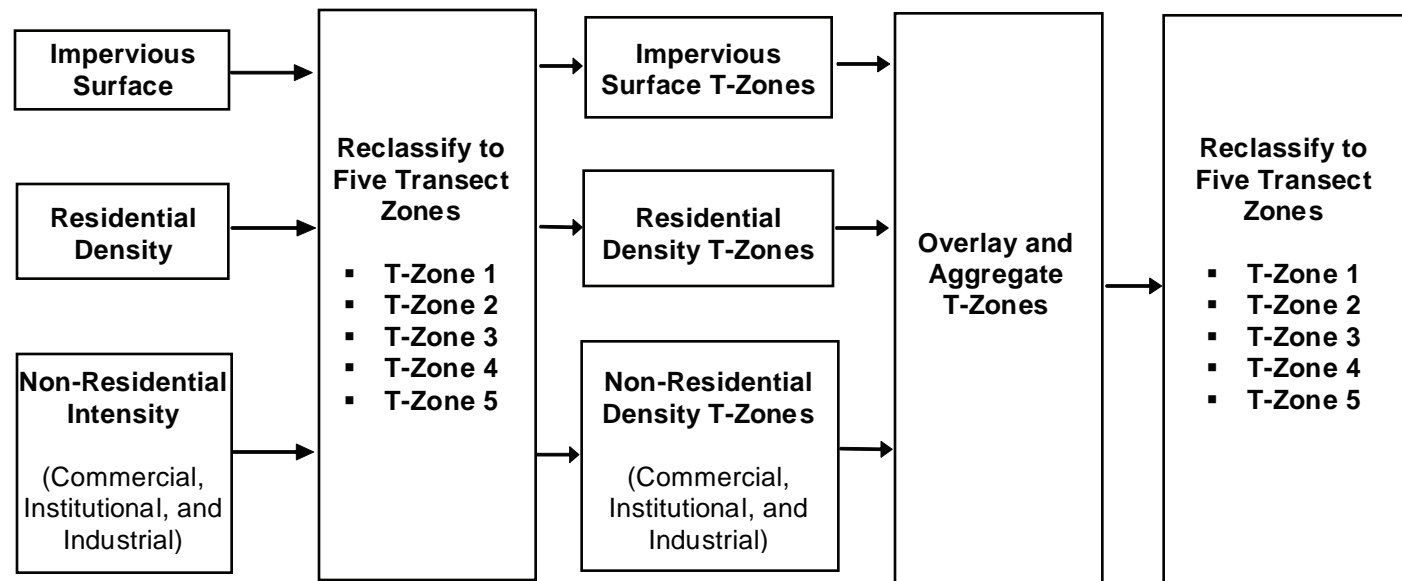
### Land Development Intensity

The landscape of the Miami Valley Region ranges from agricultural lands to dense urban core. Land development intensity was examined to identify the various levels of physical development concentration patterns that exist throughout the Region. The concept of development intensity used in this assessment draws from the idea of Transect, a planning theory developed by Andrés Duany and other members of the Congress for New Urbanism, which emphasizes urban form and development intensity. This appendix outlines the methodology used to mesure the Region's development intensity, discusses the indicators used, and presents the findings.

### Methodology

Three indicators were used to create the development intensity measure: impervious surface, residential density, and non-residential intensity. Impervious surface and residential density indicators are each made up of a single dataset; however, the non-residential intensity indicator is based on two data subsets: commercial and institutional development intensity data and industrial development intensity data.

In a GIS environment, the spatial data for each indicator was translated into a grid layer by dividing the data into grid cells measuring 2,500 square feet (50 feet by 50 feet). Based on the values of the grid cells, the regional land was classified into five Transect Zones, from T-Zone 1 (the lowest degree of development intensity) to T-Zone 5 (the highest degree of development intensity), to represent the relative level of land development intensity. Next, the T-Zone grids for each indicator were spatially overlaid and aggregated to produce a final grid layer. The aggregated values from this final grid layer were again re-classified into five T-Zones, which resulted in the Regional Land Development Intensity Map (see figure 20) and dataset. Figure B.1 illustrates this process.

**Figure B.1 - Process for Measuring Land Development Intensity**



### Impervious Surface

According to The United States Geological Survey (USGS), "Impervious surfaces can be generally defined as any material of natural or anthropogenic source that prevents the infiltration of water into soil… The growth of impervious surfaces is directly related to human activity and habitation through the construction of buildings, roads, parking lots, sidewalks, and so on."

Impervious surface is a valuable indicator for identifying various degrees of development concentrations in the urban landscape. Therefore, this assessment examined impervious surface data as one of three indicators to measure the land development intensity across the Region.
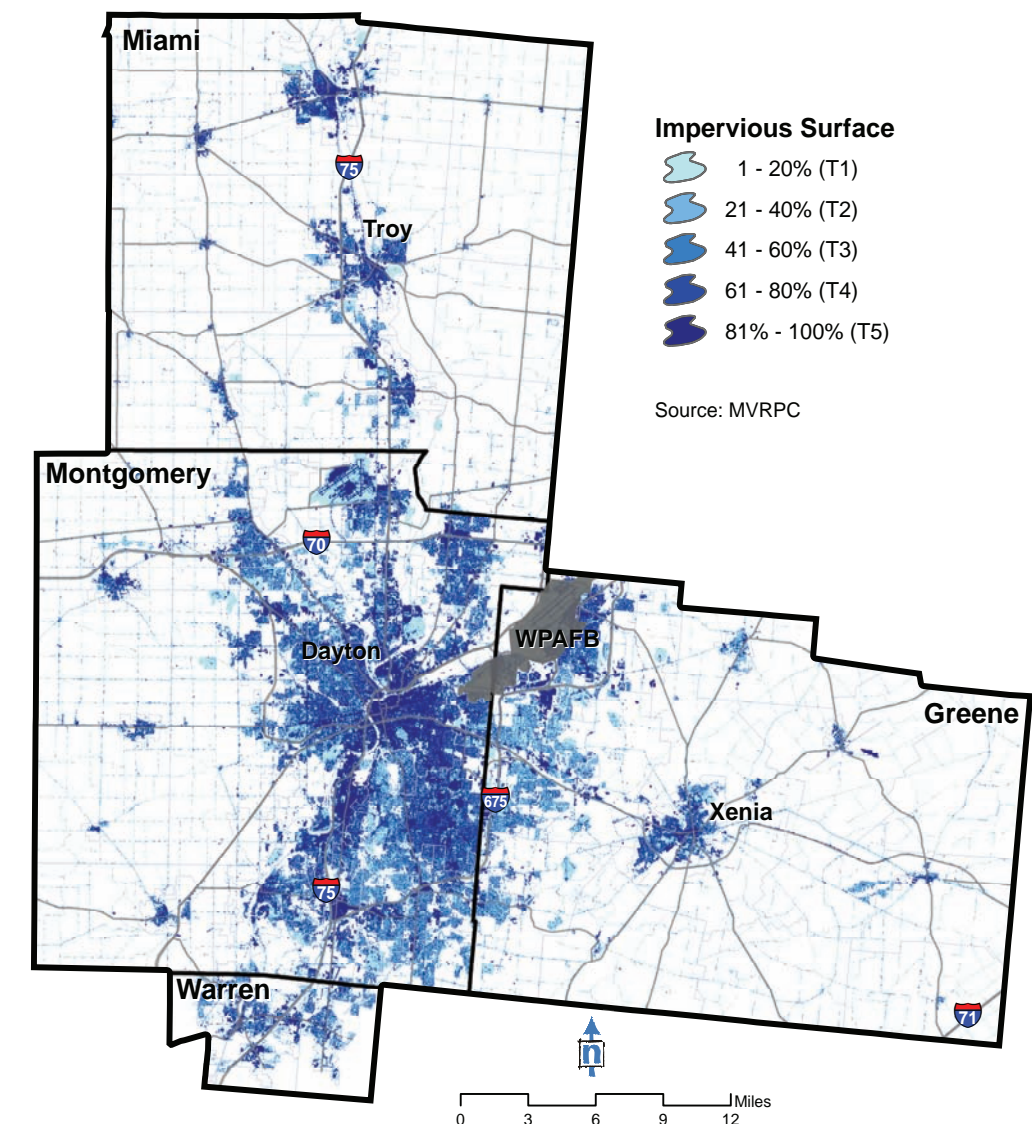
Impervious surface data were developed based on the 2001 National Land Cover Database from the Multi-Resolution Land Characteristics (MRLC) Consortium. However, this data was only accurate to 2001. Therefore, MVRPC updated the impervious surface data to account for key areas that experienced land development between 2001 and 2007 using 2007 orthophotographs. Using the impervious surface data, the regional land is classified into five T-Zone categories as follows:

Impervious Surface
T-Zone 1:   1 – 20%
T-Zone 2:  21 – 40%
T-Zone 3:  40 – 60%
T-Zone 4:  61 – 80%
T-Zone 5:  81 –100%

### Data Source

Impervious Surface Database developed from the National Land Cover Database from the the Multi-Resolution Land Characteristics (MRLC) Consortium, MVRPC, 2008

**Figure B.2 - Regional Distribution of Land by Impervious Surface**



Impervious Surface
- 1 - 20% (T1)
- 21 - 40% (T2)
- 41 - 60% (T3)
- 61 - 80% (T4)
- 81% - 100% (T5)

Source: MVRPC

### Residential Density

Residential density is often measured using housing unit density in land use analysis. The residential density indicator complement the impervious surface indicator not only because it is another good indicator for measuring land development intensity, but also because it has the added value of identifying areas of high population concentration. Therefore, this study uses Housing Unit per Acre (HUA) as the unit of analysis to measure the density of residential areas.
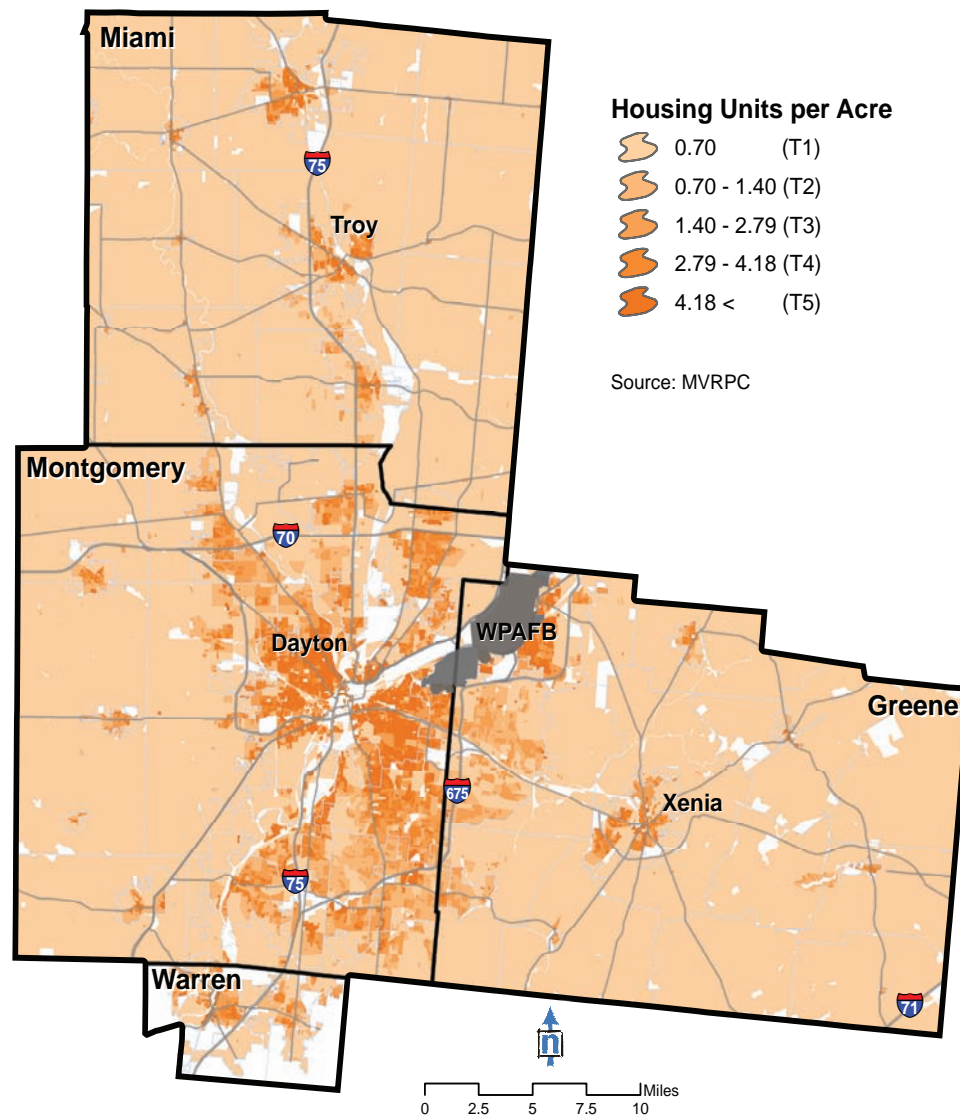
The HUA was calculated using block-level data from the 2000 U.S. Census. Using the HUA data, the regional land is classified into five T-Zone categories as follows:

Housing Units per Acre
T-Zone 1: 0.70
T-Zone 2: 0.70 - 1.40
T-Zone 3: 1.40 - 2.79
T-Zone 4: 2.79 - 4.18
T-Zone 5: 4.18 <

#### Data Source

Census 2000 SF1, U.S. Census Bureau, 2000

**Figure B.3 - Regional Distribution of Land by Housing Unit Density**



Housing Units per Acre
0.70        (T1)
0.70 - 1.40 (T2)
1.40 - 2.79 (T3)
2.79 - 4.18 (T4)
4.18 <      (T5)

Source: MVRPC

### Non-Residential Intensity

Non-residential intensity is commonly measured by using the Floor Area Ratio (FAR), which is calculated by dividing the total floor area of a building on a lot by the area of the lot it occupies, to determine the scale of development concentration. The non-residential intensity indicator complements the impervious surface and the residential density indicators by highlighting the varying development intensities of the Region's non-residential land. Therefore, the study uses FAR as the unit of analysis to measure the non-residential intensity.

Non-residential data is divided into two groups: commercial/institutional and industrial. Due to data availability and type, it was necessary to separate the two for accurate data classification. However, the data for both groups were created through the same process. The two datasets are mutually exclusive, meaning they do not overlap or contradict one another. Therefore, elsewhere this data is treated as a single non-residential variable. Based on the FAR data developed from the 2007 regional parcel database, regional land was classified into five T-Zone categories as follows:

Commercial/Institutional FAR
T-Zone 1: < .0769
T-Zone 2: 0.769 - 0.154
T-Zone 3: 0.154 - 0.231
T-Zone 4: 0.231 - 0.462
T-Zone 5: 0.462 <

Industrial FAR
T-Zone 1: < 0.029
T-Zone 2: 0.029 - 0.174
T-Zone 3: 0.174 - 0.346
T-Zone 4: 0.346 - 0.950
T-Zone 5: 0.950 <

#### Data Source

Regional Parcel Database, MVRPC 2007 (compiled from Greene, Miami, Montgomery, and Warren county parcel databases)

**Figure B.4 - Regional Distribution of Land by Non-Residential Intensity**



Commercial/Institutional FAR
< 0.769        (T1)
0.769 - 0.154  (T2)
0.154 - 0.231  (T3)
0.231 - 0.462  (T4)
0.462 <        (T5)

Industrial FAR
< 0.029        (T1)
0.029 - 0.174  (T2)
0.174 - 0.346  (T3)
0.346 - 0.950  (T4)
0.950 <        (T5)

Source: MVRPC