Regional PEDESTRIAN PLAN
INDIANAPOLIS MPO

GIS Prioritization Methodology
A Step-by-Step Process

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The Indianapolis Metropolitan
Planning Organization

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Design Group

The Prioritization Process

Why Prioritization?

The Central Indiana regional pedestrian network is disrupted by gaps. Gaps are missing segments of the pedestrian network that create barriers separating neighborhoods, public facilities and people. Areas in the region lacking pedestrian facilities such as sidewalks and crossings make walking difficult and unsafe. However, limited funding means it's impossible to meet every pedestrian need in Central Indiana at once. In order to make the region more walkable, Central Indiana must dedicate its resources to improvement areas that bring the greatest amount of impact.

The prioritization process was designed to provide decision makers with general recommendations for improving upon and expanding the regional pedestrian network. Regional priorities may not be the same as local priorities. The Plan does not propose or recommend what pedestrian facilities should be built. Instead, it provides a data-driven analysis of the existing conditions in Central Indiana communities to be used as a resource for their own pedestrian planning efforts.

Measures of Prioritization

The priority investment area indices- derived from the Plan goals and objectives, community planning efforts, and vetted public survey- are measures used to rank areas of priority investment.

MEASURES OF PRIORITIZATION

Pedestrian Safety — Prioritize projects in high-crash locations to improve safety.

Equity — Prioritize projects in areas where people have lower incomes and less access to personal vehicles, where people are more likely to walk where they need to go.

Wellness — Prioritize investment in areas where the pedestrian environment can negatively impact the wellness of residents.

Pedestrian Demand — Prioritize facilities that take people where they want to go (i.e., restaurants, work, school, grocery stores and entertainment).

Walking Comfort — Prioritize facilities that can improve how comfortable a person feels while walking (with consideration for conditions on a street, such as traffic speed, number of cars and street width).

What are the Steps for Prioritization?

The prioritization process was built on quantitative data validated by feedback obtained through the public engagement process and steering committee meetings. The prioritization process involves a series of seven steps:

Determine Measures of Priority Investment

In order to determine pedestrian needs, each of the five priority investment area indices were mapped using measures indicating major areas or conditions of concern. These measures are drivers of influence for their corresponding indices and were selected based on their defining characteristics, as well as availability of data for the Central Indiana region.

Establish Quantitative Rank

Priority areas were classified from high to low quantitative rank to create a series of heat maps. "Hot spots" indicate high priority and help identify areas in the region that are in most need of pedestrian infrastructure improvements.

Apply Preliminary Ranking Strategies

The priority investment area indices of greatest importance were selected based on a series of preliminary ranking strategies. These ranking strategies were used to evaluate the priority investment areas and included public input driven, steering committee input, and the Marion County Walkways Plan priorities and best practices.

Assign Weights

Priority investment area indices were weighted based on a series of contributing factors to each ranking strategy. Some indices are weighted higher than others and have a greater impact on determining priority investment areas.

Produce the Tiers

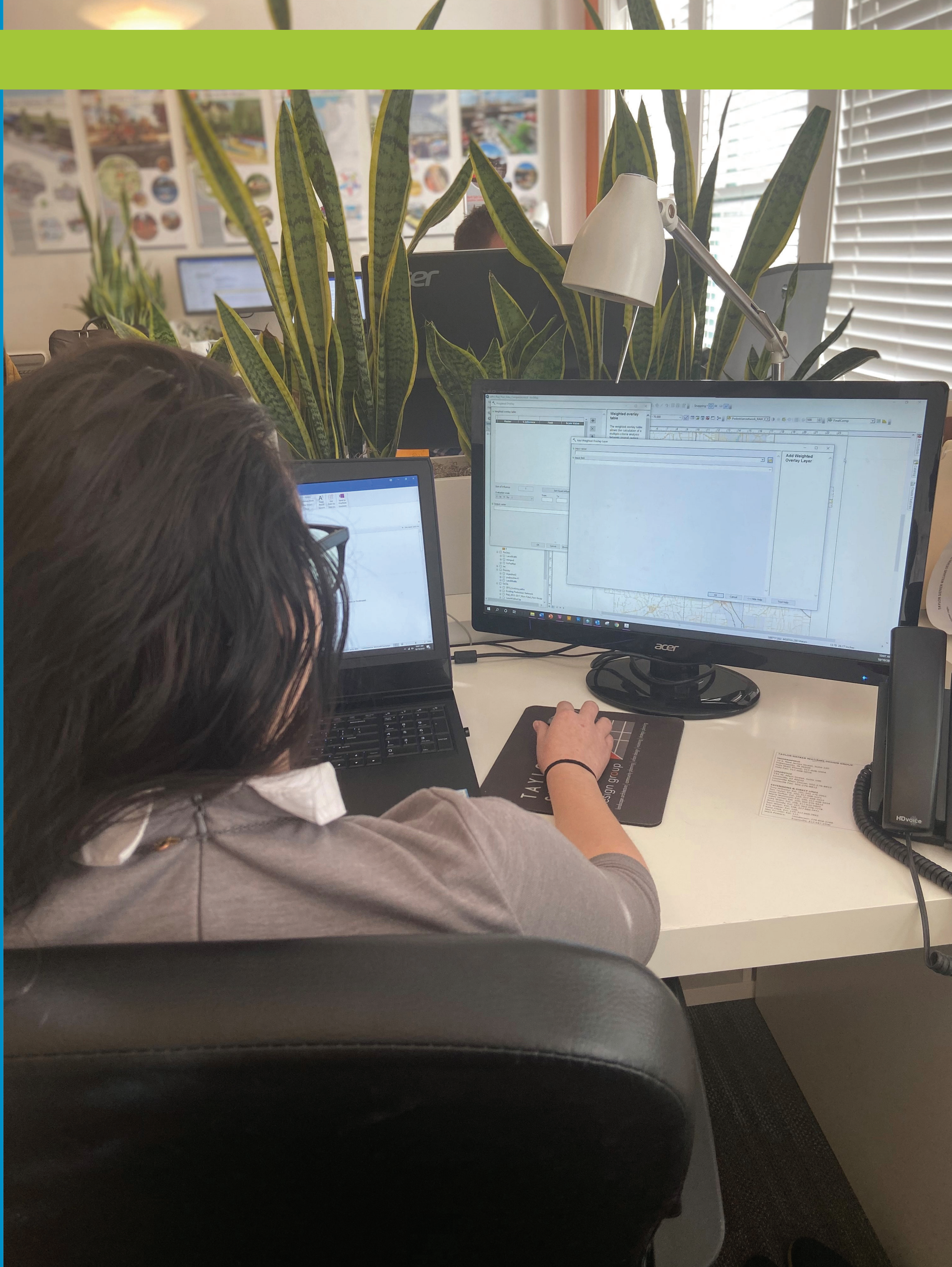
Once weights were assigned and each index was mapped, a hierarchy of colors indicate the level of priority of a particular area. Higher value tiers represent higher priority, while lower value tiers represent lower priorities.

Develop a Composite

In order to focus funds on high priority areas, a fifth composite ranking strategy was created to assist communities in prioritizing their pedestrian improvement projects. The final composite ranking strategy provides communities with a map of gaps in the pedestrian network weighted and categorized into tiers to indicate priority.

Map the Projects

Based on the composite ranking strategy that organized pedestrian projects into five tiers of priority, the existing pedestrian network was cross-referenced and categorized to determine where gaps fell in the tier system. Maps of potential pedestrian projects were created at the regional and county levels.


Weighted overlay table
Add Weighted Overlay Layer
acer
HDvoice

GIS Prioritization Methodology

Overview

ESRI ArcGIS and the Spatial Analyst Extension are required (double check your license) to identify areas of priority investment for pedestrian infrastructure in Central Indiana. The process was largely based on the prioritization approach used in the Marion County Walkways Plan, which used a series of GIS toolboxes to execute batch commands. Priority investment areas indices were mapped and weighted to establish quantitative rank. Where these factors came together were the "hot spots" that indicate high priority. The GIS prioritization methodology outlines the prioritization process used in the Regional Pedestrian Plan on a local scale.

Exercise

For the purpose of this exercise, Fishers, IN was selected to illustrate how Central Indiana communities and local organizations can run similar analyses. The study area includes additional areas outside of the jurisdictional limits of Fishers in order to eliminate holes and create a cohesive study zone. Fishers' existing pedestrian facilities and missing segments (i.e. gaps) in the functional classifications network are mapped in **Figure 1**. On the map, a green line represents an existing pedestrian facility and a red line represents a missing segment, or gap.

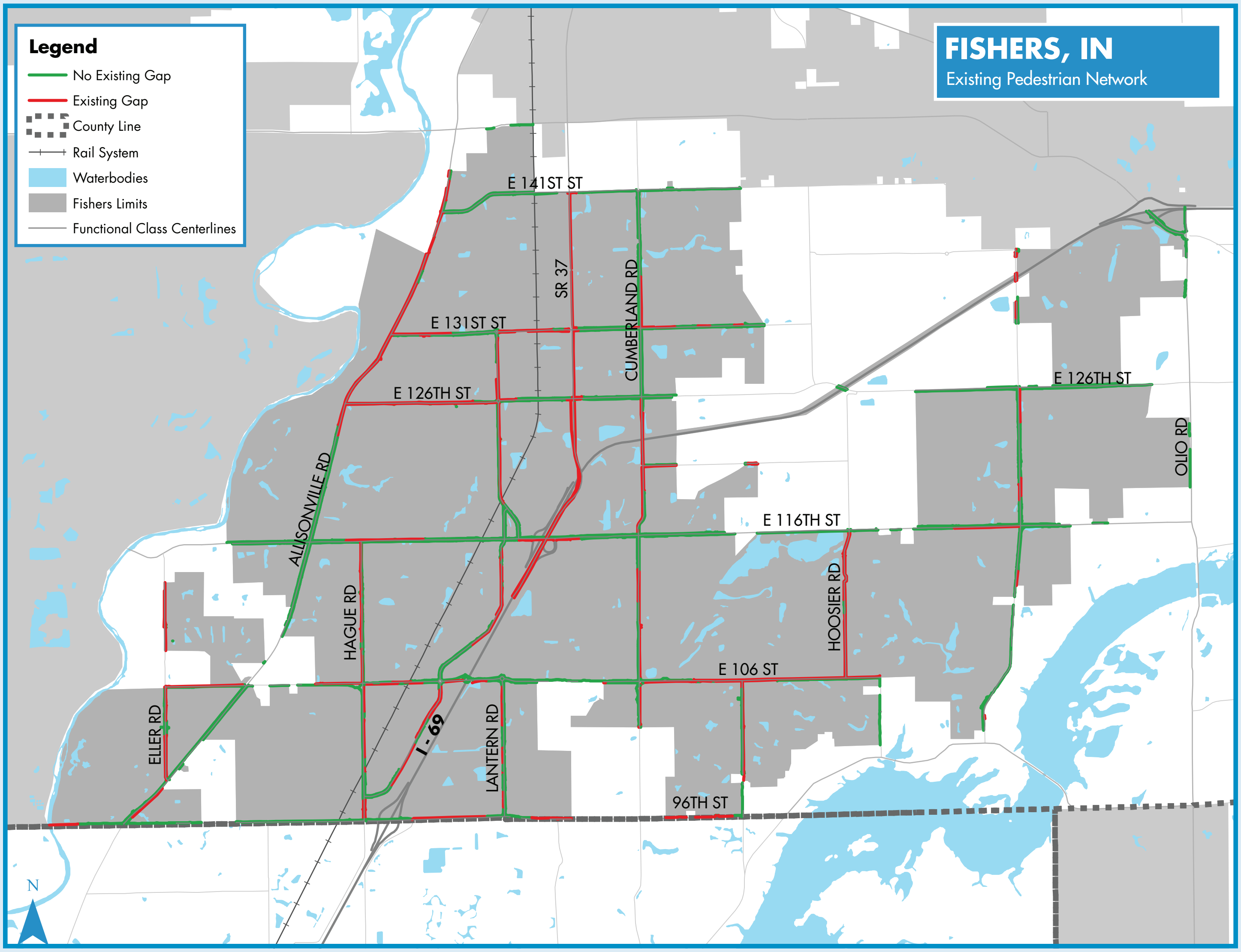


Figure 1. Existing Pedestrian Network & Gaps in Fishers, IN.

Data Limitations

Measures of priority investment were evaluated using data applicable to the entirety of the Metropolitan Planning Area (MPA). In order to limit bias towards any individual county, incomplete data sets where data is not present for one or more county was not included. Central Indiana communities and organizations are encouraged to explore data sets at the local level to adapt the prioritization process accordingly for local pedestrian planning efforts.

Raw Data

A list of the raw data layers used in this exercise is provided below **(Figure 2)**:

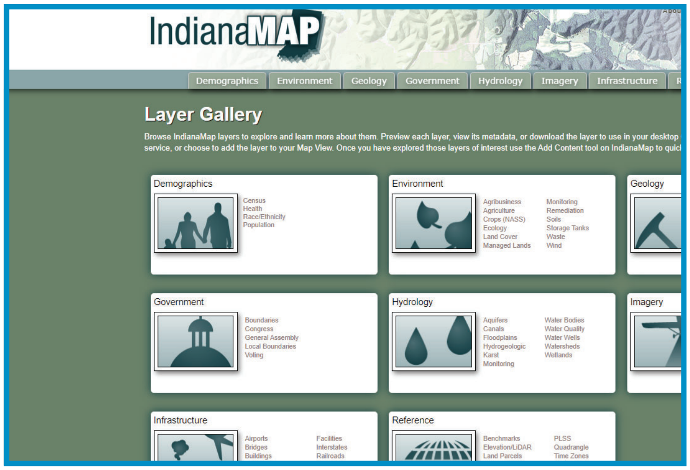


Figure 2. Indiana MAP is one source of the raw data layers used in the GIS prioritization methodology.

Pedestrian Safety

- Pedestrian Non-Fatal/ Non-Incapacitating Crashes 2012-2017 (Indianapolis MPO)
- Existing Pedestrian Infrastructure Network (Indianapolis MPO)
- Lane Widths (Indianapolis MPO)

Equity

- Youth Population (2017 American Community Survey)
- Senior Population (2017 American Community Survey)
- Minority Population (2017 American Community Survey)
- Household Poverty Levels (2017 American Community Survey)
- Zero-Car Households (2017 American Community Survey)

Wellness

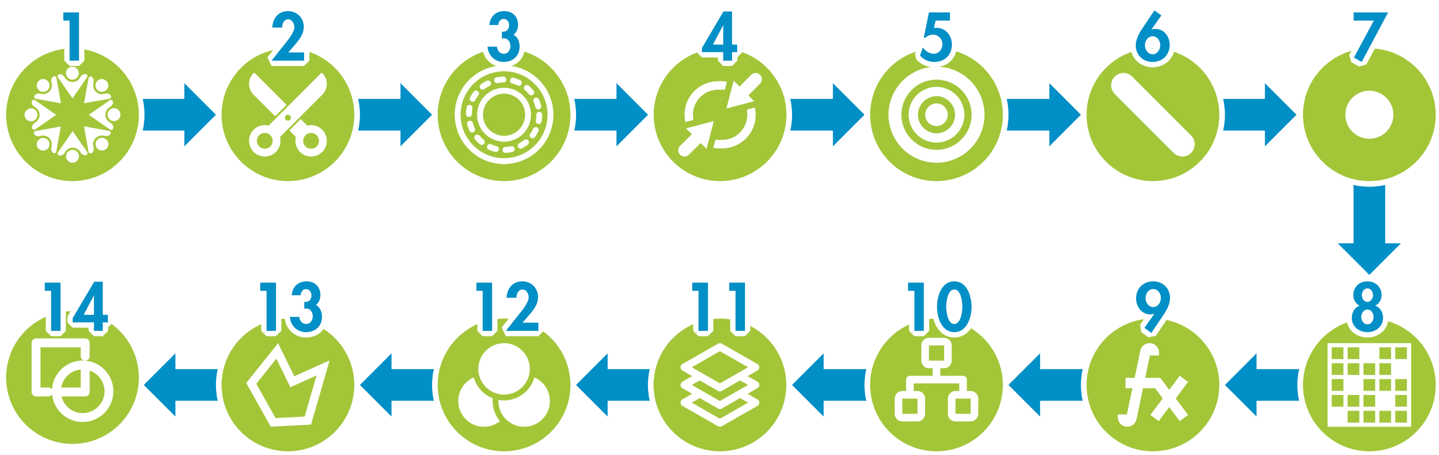
- Parks and Trails 2019 (IDNR)
- Hospitals (Indiana MAP)
- Pedestrian Fatal/ Incapacitating Crashes 2012-2017 (Indianapolis MPO)

Pedestrian Demand

- Population Density (2017 American Community Survey)
- Employment Density (Indianapolis MPO)
- Educational Facilities (Indiana MAP)

Walking Comfort

- County AADT (Annual Average Daily Traffic) 2018 (INDOT)
- Speed Limits (Indianapolis MPO)
- Functional Classifications 2018 (INDOT)
- Existing Pedestrian Infrastructure Network (Indianapolis MPO)



GIS Prioritization Methodology

This GIS prioritization methodology involves a series of fourteen steps **(Figure 3)**:

1. Select by Attributes: Community
2. Clip
3. Select by Attributes: Functional Classifications
4. Normalization
5. Density Analysis or Polygon to Raster: Kernel Density
6. Density Analysis or Polygon to Raster: Line Density
7. Density Analysis or Polygon to Raster: Point Density
8. Density Analysis or Polygon to Raster: Polygon to Raster
9. Integer Raster
10. Reclassification

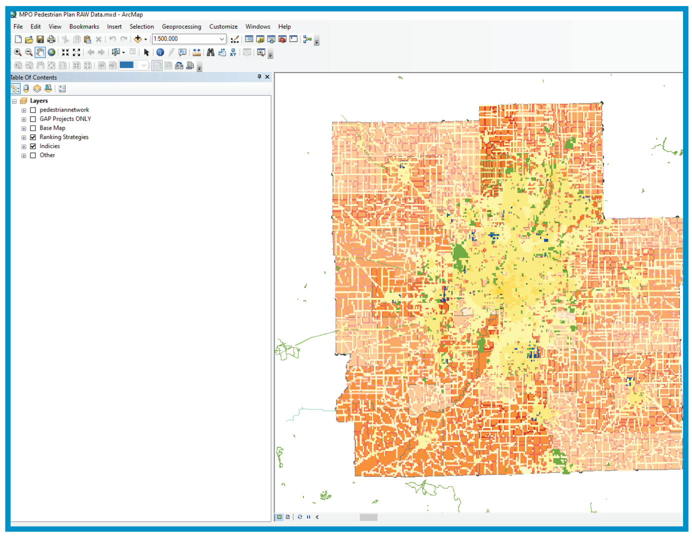


Figure 3. The GIS prioritization methodology involves a series of fourteen steps.

11. Weighted Overlay: Priority Investment Areas Indices
12. Weighted Overlay: Final Composite
13. Raster to Polygon
14. Intersect

Create a File Geodatabase

A file geodatabase must be created prior to proceeding with the prioritization process. A geodatabase, also known as a spatial database, is a collection of various types of geographic datasets held in a common file system folder **(Figure 4)**. There are three types of geodatabases ranging in size and number of users, include file geodatabases, personal geodatabases and enterprise geodatabases. A file geodatabase is stored as folders in the file system and can store up to 1 TB in data.

- Open ArcMap and click the Catalog window.
- Expand the file connections in the Catalog tree.
- Navigate to the folder where you want to create the file geodatabase. Right-click the folder, then click **New > File Geodatabase**.
- Once a file geodatabase has been created in the area you have selected, rename it by right-clicking on it and selecting **Rename**.

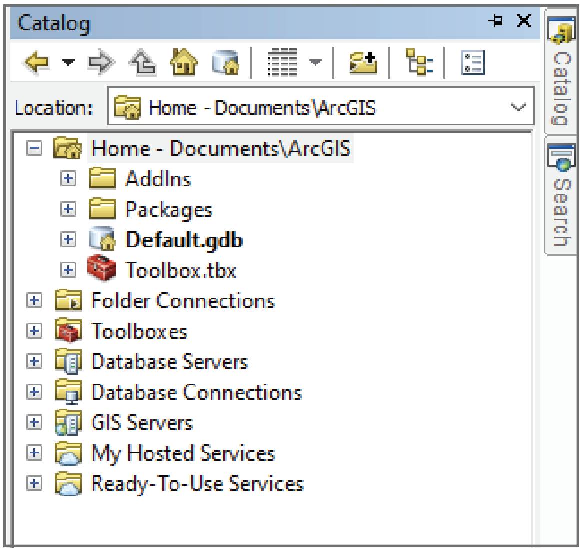
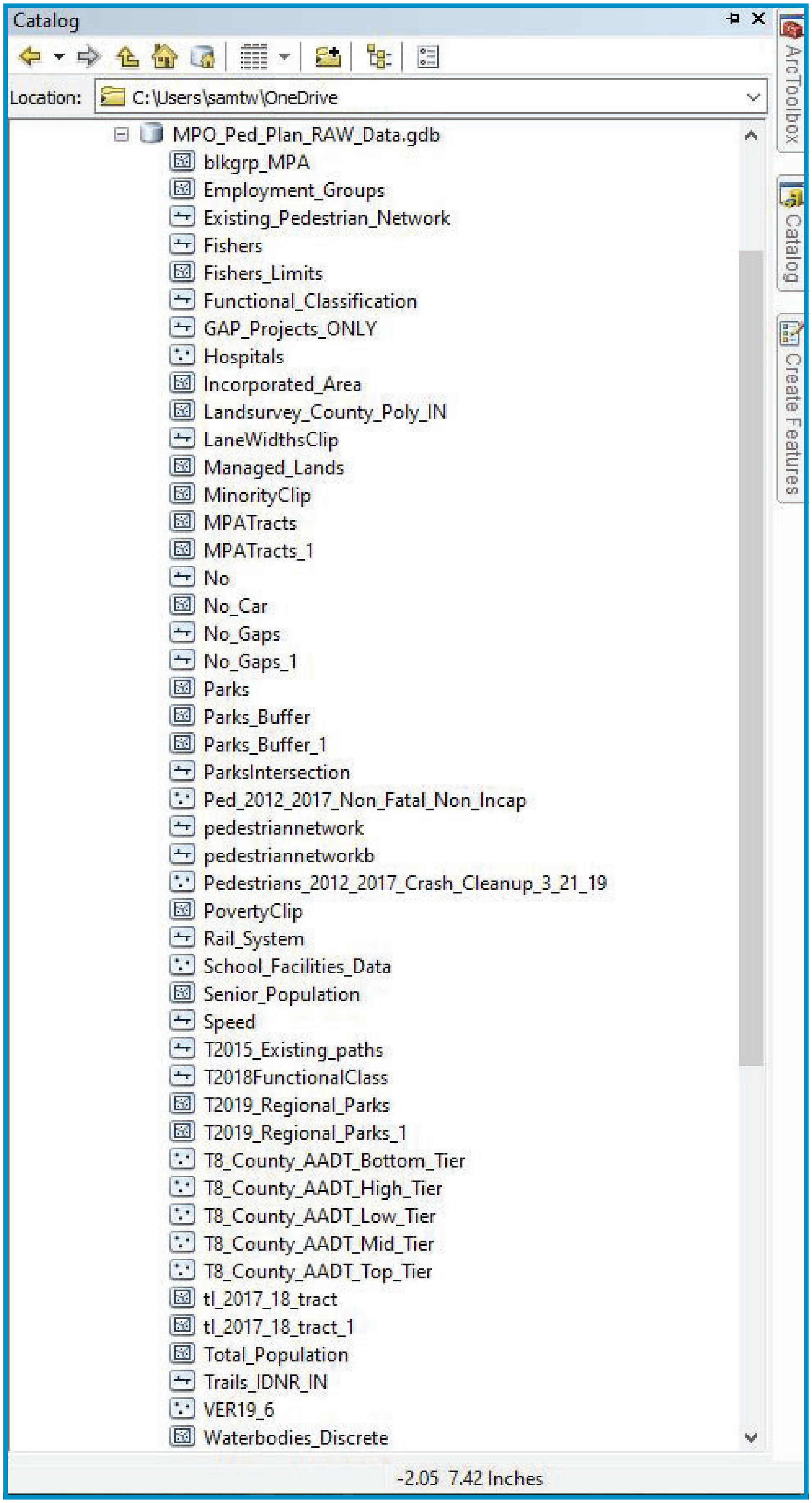


Figure 4. Create a File Geodatabase.


Catalog
ArcToolbox
Catalog
Create Features
Location: C:\Users\samtw\OneDrive
MPO_Ped_Plan_RAW_Data.gdb
blkgrp_MPA
Employment_Groups
Existing_Pedestrian_Network
Fishers
Fishers_Limits
Functional_Classification
GAP_Projects_ONLY
Hospitals
Incorporated_Area
Landsurvey_County_Poly_IN
LaneWidthsClip
Managed_Lands
MinorityClip
MPATracts
MPATracts_1
No
No_Car
No_Gaps
No_Gaps_1
Parks
Parks_Buffer
Parks_Buffer_1
ParksIntersection
Ped_2012_2017_Non_Fatal_Non_Incap
pedestriannetwork
pedestriannetworkb
Pedestrians_2012_2017_Crash_Cleanup_3_21_19
PovertyClip
Rail_System
School_Facilities_Data
Senior_Population
Speed
T2015_Existing_paths
T2018FunctionalClass
T2019_Regional_Parks
T2019_Regional_Parks_1
T8_County_AADT_Bottom_Tier
T8_County_AADT_High_Tier
T8_County_AADT_Low_Tier
T8_County_AADT_Mid_Tier
T8_County_AADT_Top_Tier
tl_2017_18_tract
tl_2017_18_tract_1
Total_Population
Trails_IDNR_IN
VER19_6
Waterbodies_Discrete
-2.05 7.42 Inches

Select by Attributes: Community

Separate your community from other incorporated areas in the MPA using the **Select by Attributes** tool, which uses an attribute query to select features that match the selection criteria (Figure 5). Expand the Other group, and select the Incorporated Areas layer.

- Click **Selection > Select by Attributes.**
    - In the Select by Attributes dialog box, choose the Incorporated Area layer.
    - Specify create a new selection as the selection **Method**.
    - Create a query using the expression building tools, selecting "CORPNAME" =
    - Click **Get Unique Values**. Select the name of your community from the list.
    - Click **Verify** to validate your query expression, then click **Okay**.
- Create a new layer for your community limits by right-clicking on the Incorporated Area layer in the Table of Contents. Click **Selection > Create Layer from Selected Features**.

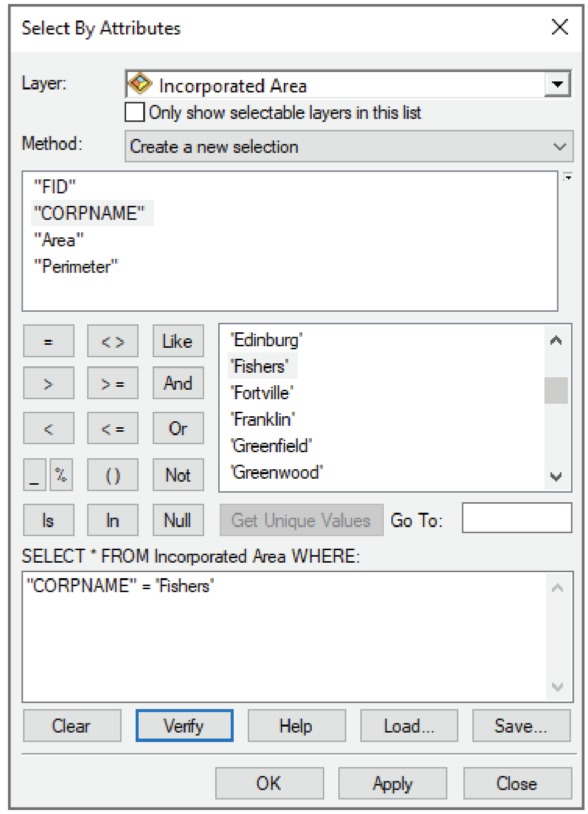
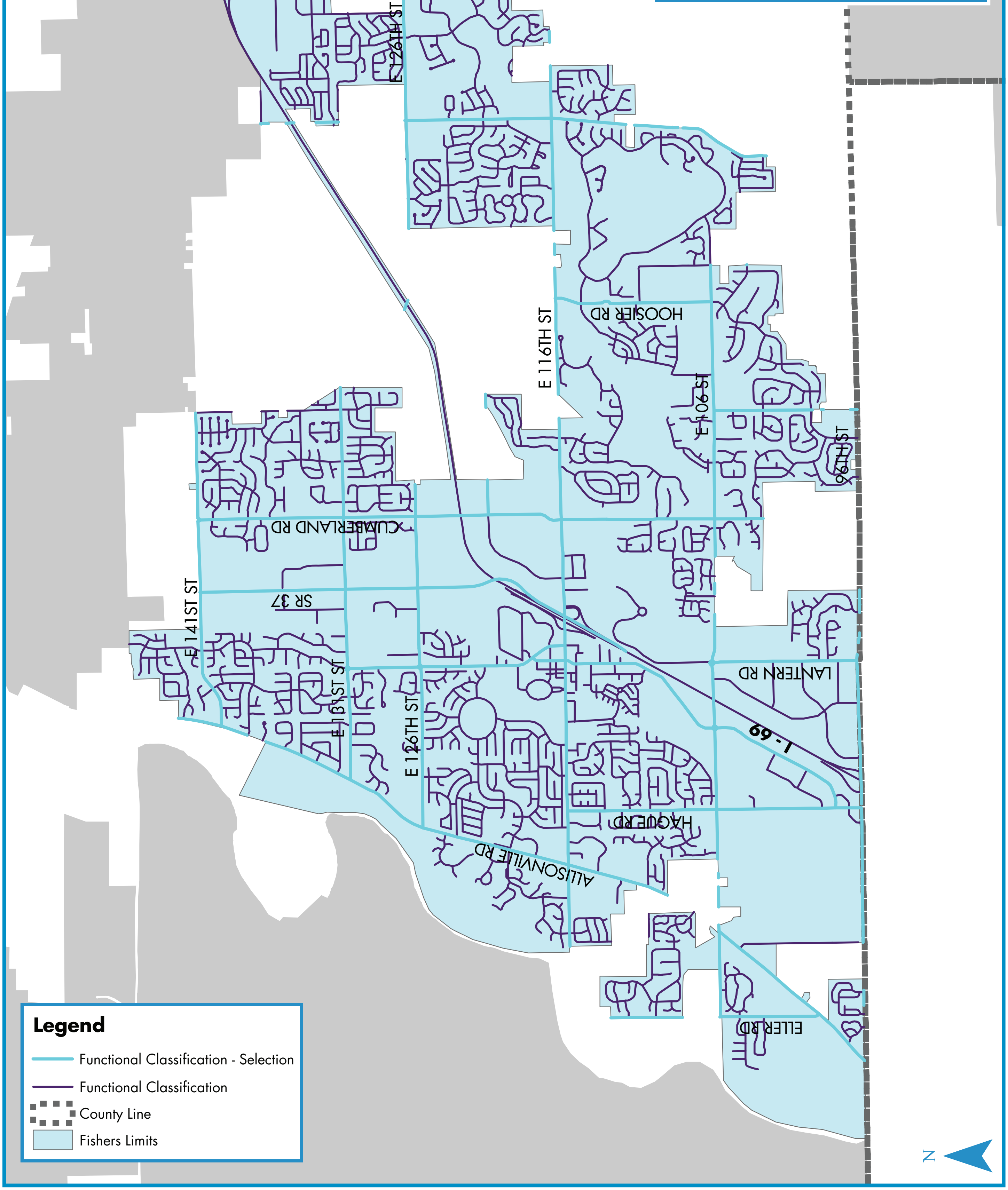


Figure 5. Select by Attributes: Community

FISHERS, IN

Sample Select by Attributes: Functional Classifications



Legend

- Functional Classification - Selection
- Functional Classification
- County Line
- Fishers Limits

Clip

Clip the Pedestrian Network, Gap Projects, Base Map and Index Measures layers to your community. The **Clip** tool extracts input features that overlay the clip features **(Figure 6)**. In this exercise, you will be using the **Clip** tool to cut out a piece of one feature using the community limits layer you created in the previous step, so that you are only analyzing the data within the boundaries of your community.

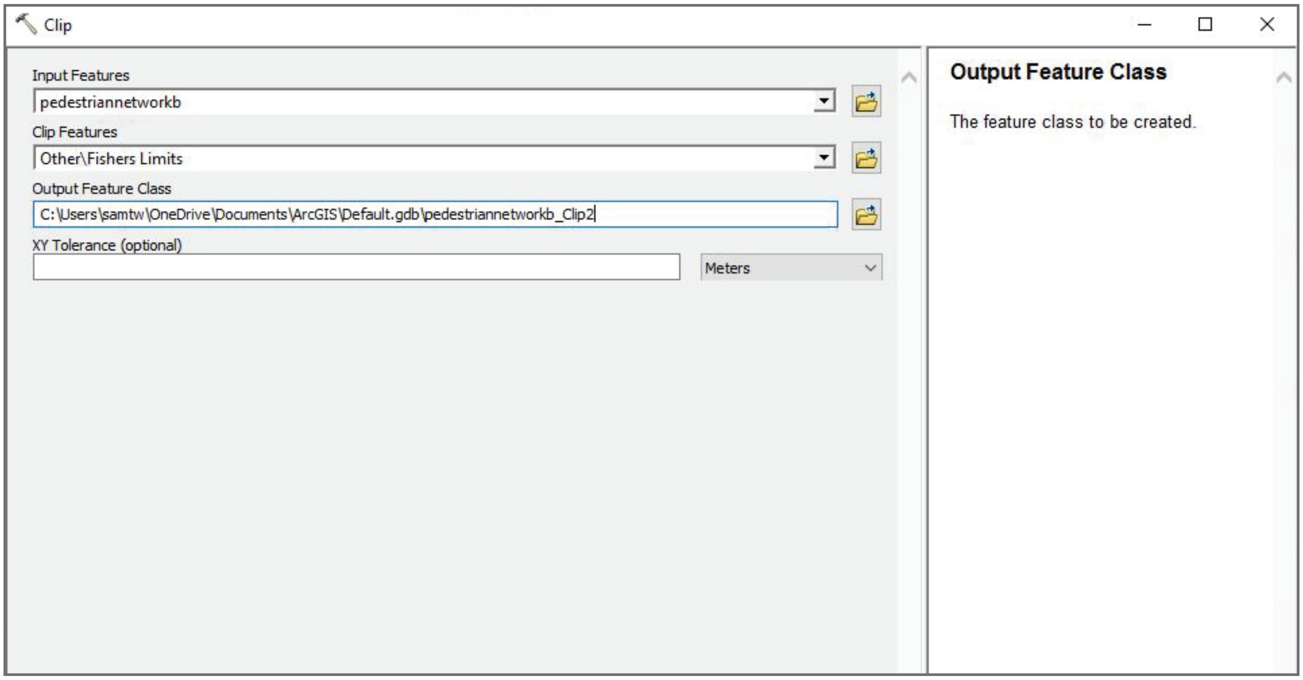
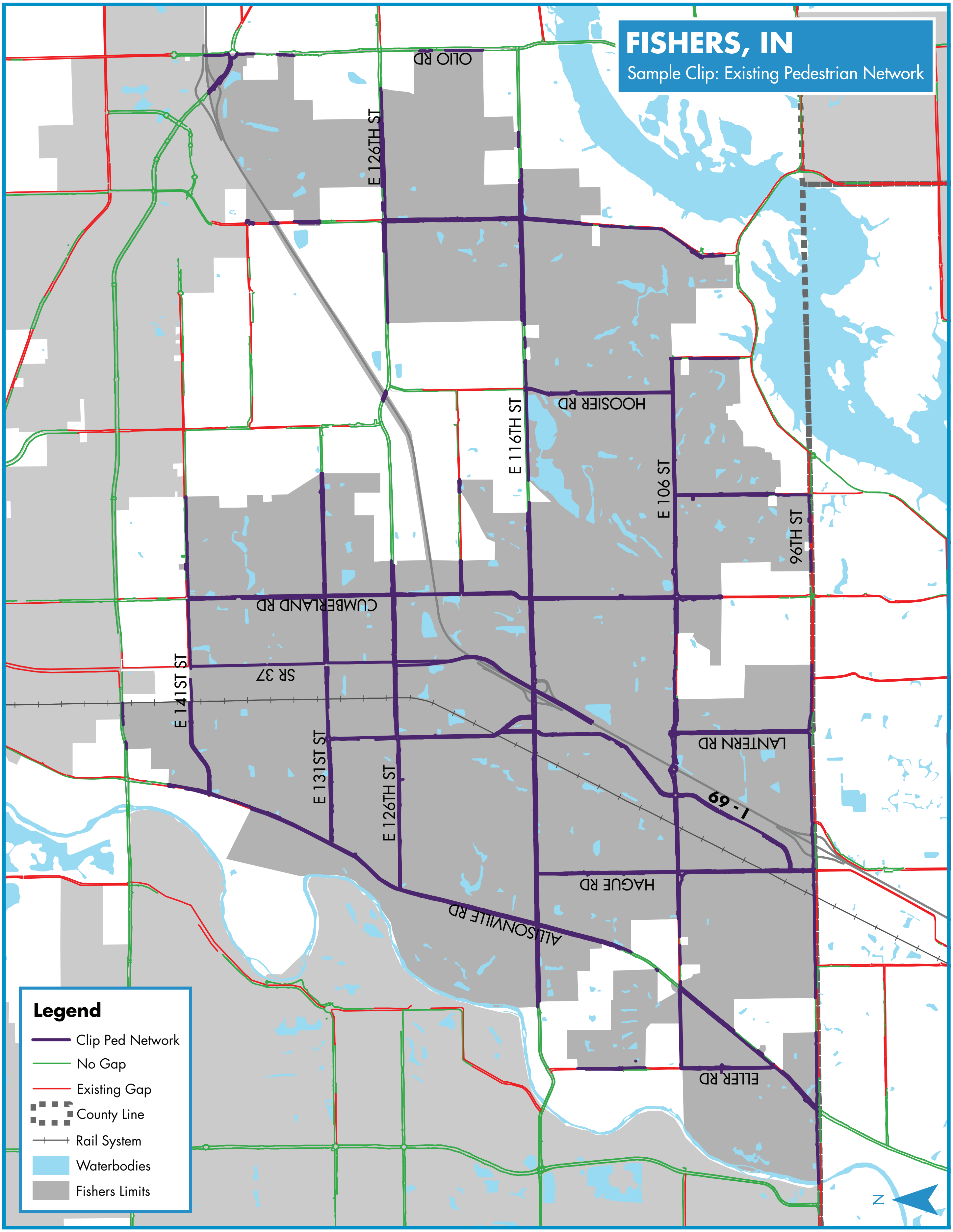


Figure 6. Clip.

- Beginning with Wellness, expand the Measures Layer Group. Select the first layer in this group (No Gaps). Click **Geoprocessing > Clip**.
  - In the Clip dialog box, click the ***Input Features*** drop-down, and select the feature to be clipped.
  - Click the ***Clip Features*** drop-down, and select the feature used to clip the input features.
  - Set a name for the ***Output Feature Class***.
  - Click **Environments > Raster Analysis**. The environment settings are values that will be used by tools that honor the environment (our community). ***Cell Size*** stays as default, and ***Mask*** should use the community limits.
  - Click **Okay**.


FISHERS, IN
Sample Clip: Existing Pedestrian Network
OLIO RD
E 126TH ST
HOOSIER RD
E 116TH ST
E 106 ST
96TH ST
CUMBERLAND RD
SR 37
E 141ST ST
E 131ST ST
E 126TH ST
LANTERN RD
I - 69
HAGUE RD
ALLISONVILLE RD
ELLER RD
N
Legend
Clip Ped Network
No Gap
Existing Gap
County Line
Rail System
Waterbodies
Fishers Limits

Select by Attributes: Functional Classifications

Select only the road functional classifications you will be using for this analysis **(Figure 7)**. Functional classifications used for the purpose of this exercise include major and minor arterial and collector roads. Local roads and interstates were not included as part of this exercise as pedestrians are prohibited on interstates and local roads are inherently low-volume, narrow roads with less chance of pedestrian/ vehicular conflicts occurring.

- Click **Selection > Select by Attributes.**
  - In the Select by Attributes dialog box, choose the Incorporated Area layer.
  - Specify create a new selection as the selection **Method**.
  - Create a query using the expression building tools, selecting "FUNCTIONAL" =
  - Click **Get Unique Values**. Select major and minor arterial and collector roads from the list.
  - Click **Verify** to validate your query expression, then click **Okay**.
- Create a new layer for your community limits by right-clicking on the Incorporated Area layer in the Table of Contents. Click **Selection > Create Layer from Selected Features**.

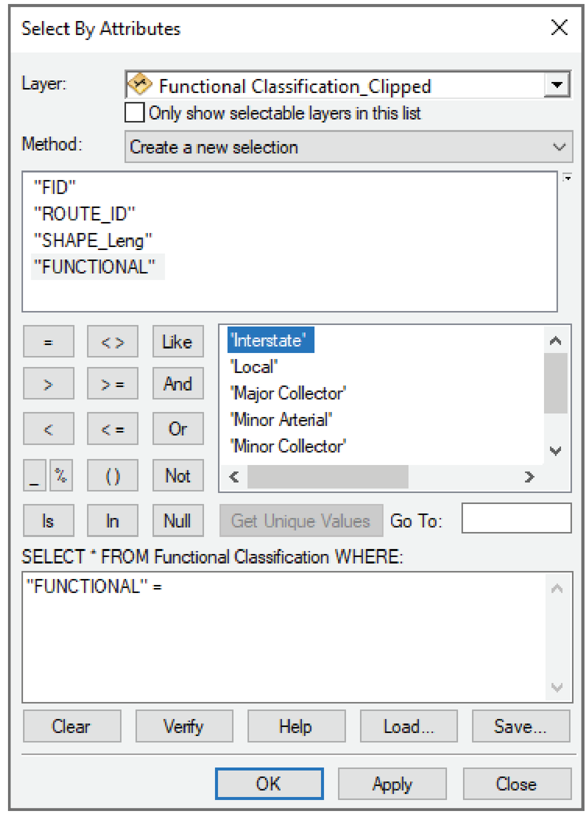
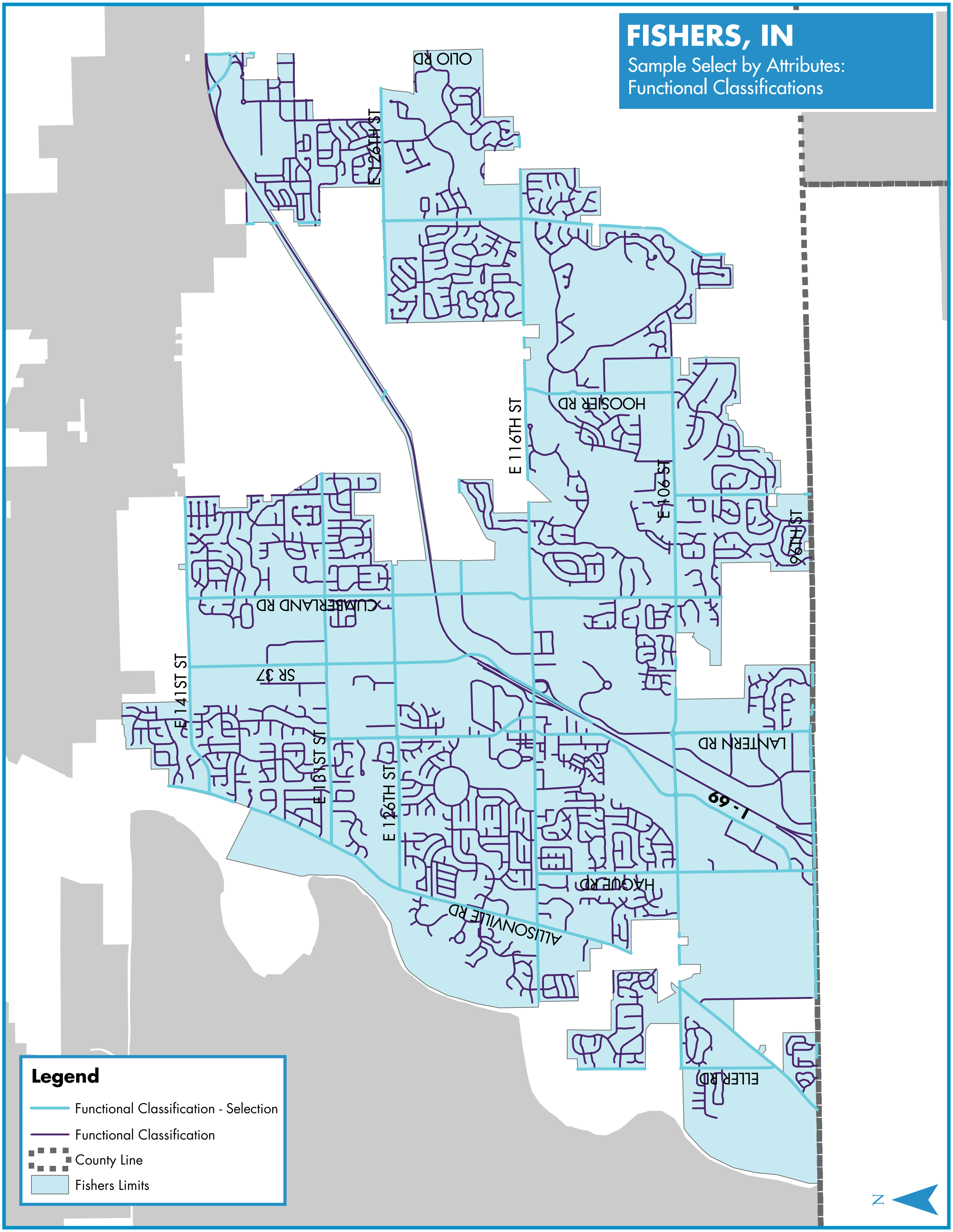


Figure 7. Select by Attributes: Functional Classifications.

FISHERS, IN

Sample Select by Attributes: Functional Classifications



Normalization

Normalize each of the clipped Index Measures layers **(Figure 8)**. Since areas usually differ in size, comparing areas based on count isn't very meaningful. **Normalization** restructures input data by standardizing a field of measure (numerator) against a selected value (denominator) to minimize differences, thereby transforming counts (measures of magnitude) into ratios (measures of intensity). When normalizing data, it is necessary to consider the universes and units, where a universe is the value or population that forms the base from which the units are a subset.

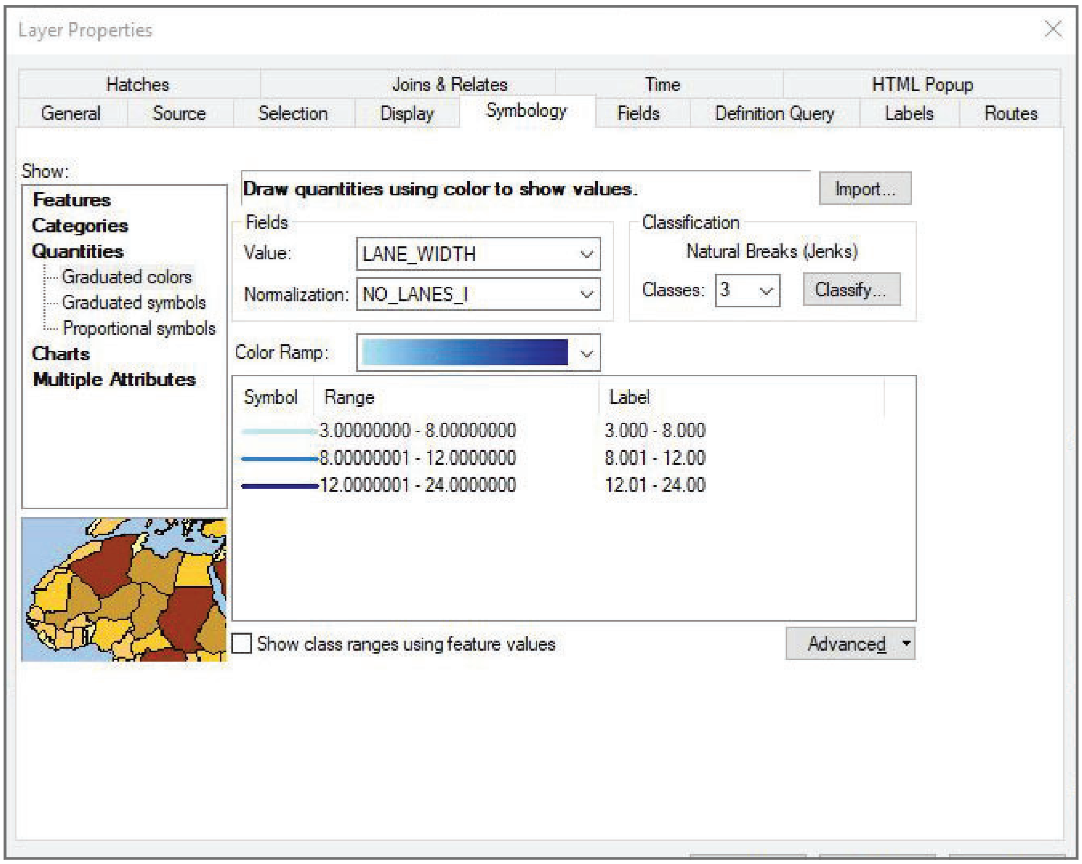
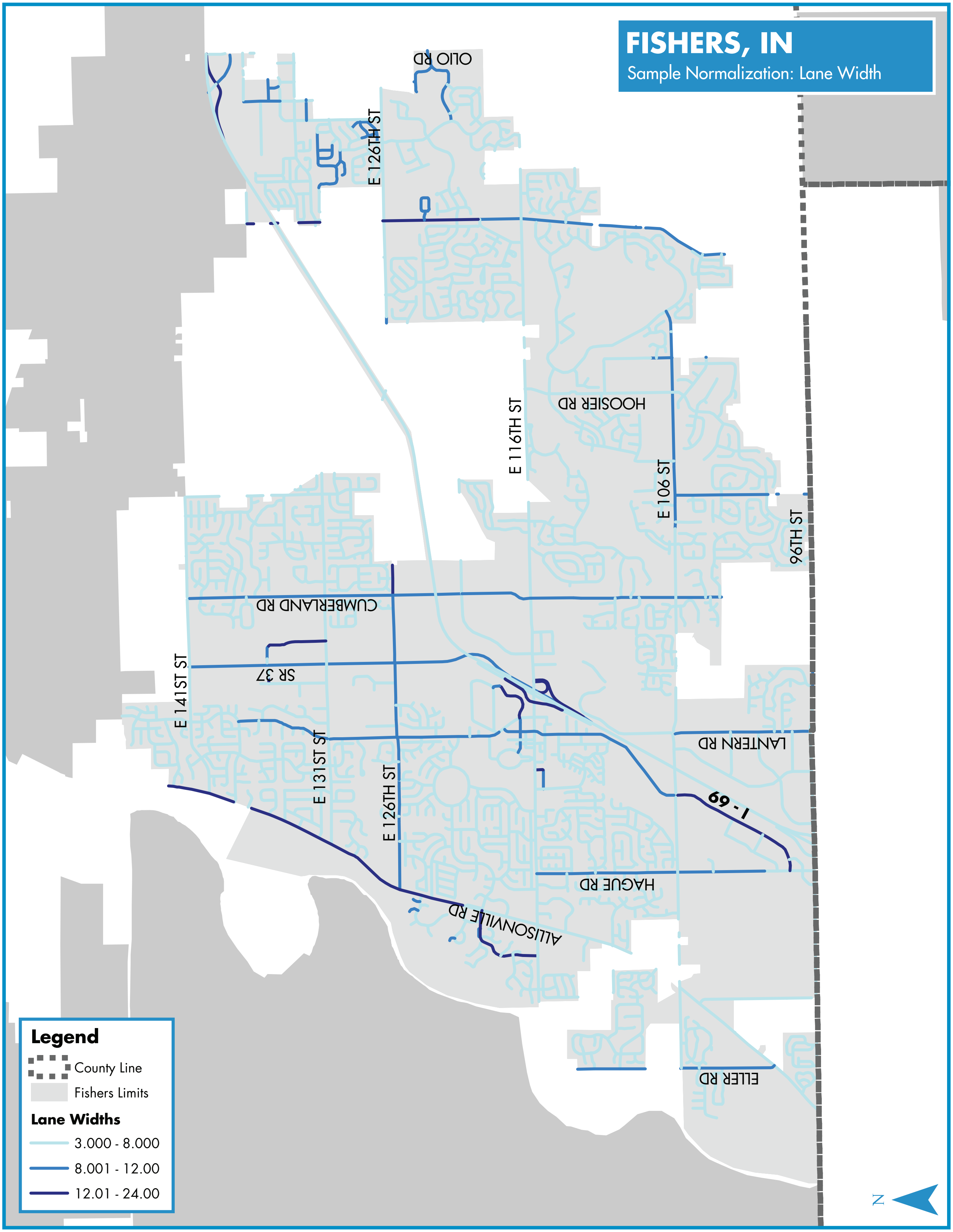


Figure 8. Normalization.

- Open the Layer Properties dialog box by right-clicking the layer in the table of contents and selecting **Properties**, or by double-clicking the layer name.
- Click **Symbology > Quantities > Graduated Colors** to display the quantitative values for a field in groups ordered into classes. All features within a class are drawn in the same color, and each class is assigned a graduated color from smallest to largest.
- In ***Fields***, select a measure to be used as the numerator from the ***Value*** drop down menu. Select a measure to be used as the denominator from the ***Normalization*** drop down menu.
- Classify numerical fields for graduated symbology under ***Classification***. Since this analysis uses a 3-tiered process, choose 3 classes, and click **Classify**. The Classification dialog box opens, where the ***Method*** should be selected as Natural Breaks.


FISHERS, IN
Sample Normalization: Lane Width
OLIO RD
E 126TH ST
E 116TH ST
HOOSIER RD
E 106 ST
96TH ST
CUMBERLAND RD
SR 37
E 141ST ST
E 131ST ST
E 126TH ST
LANTERN RD
I - 69
HAGUE RD
ALLISONVILLE RD
ELLER RD
N
Legend
County Line
Fishers Limits
Lane Widths
3.000 - 8.000
8.001 - 12.00
12.01 - 24.00

Density Analysis or Polygon to Raster

Once each of the clipped Index Measures layers have been normalized, they will need to be converted into rasters. Depending on the data type, this conversion will happen through a Density Analysis (points or lines) or Polygon to Raster (for polygons) process. See "Analysis by Data Layer" on page 36 for additional information.

- Click **ArcToolbox > Spatial Analyst Tools > Density**. Select the density based on data type. For example, select **Point** or **Kernel Density** for point data, or **Line** or **Kernel Density** for line data.

Density Analysis

Density Analysis uses point or line features to produce a heat map with a continuous surface that shows where features are concentrated by taking the quantities of an entity and spreading them across the landscape based on the measured quantities at each location and the geographic locations of the measured quantities (Figure 9). Density can be calculated using kernel, line or point calculations.

- **Kernel Density.** Calculates a magnitude-per-defined unit area from point or polyline features using a kernel function to fit a smoothly tapered surface to each point or polyline (Figure 10).
- **Line Density.** Calculates a magnitude-per-defined unit area from polyline features that fall within a defined radius around each cell (Figure 11).
- **Point Density.** Calculates a magnitude-per-defined unit area from point features that fall within a neighborhood around each cell (Figure 12).

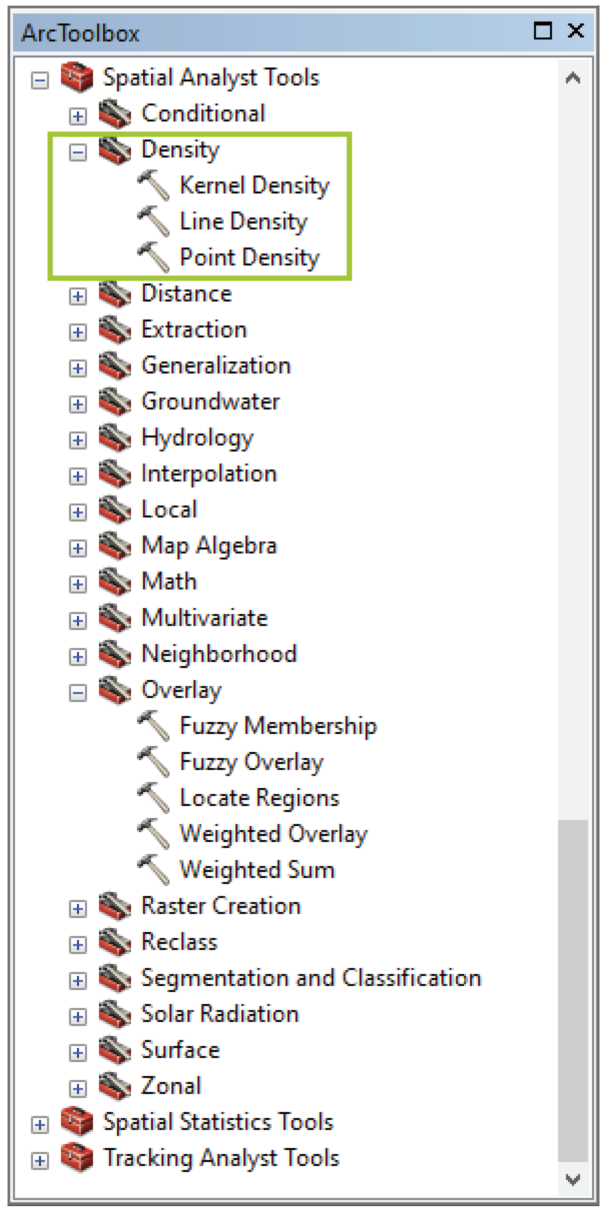


Figure 9. Density Analysis.

Kernel Density

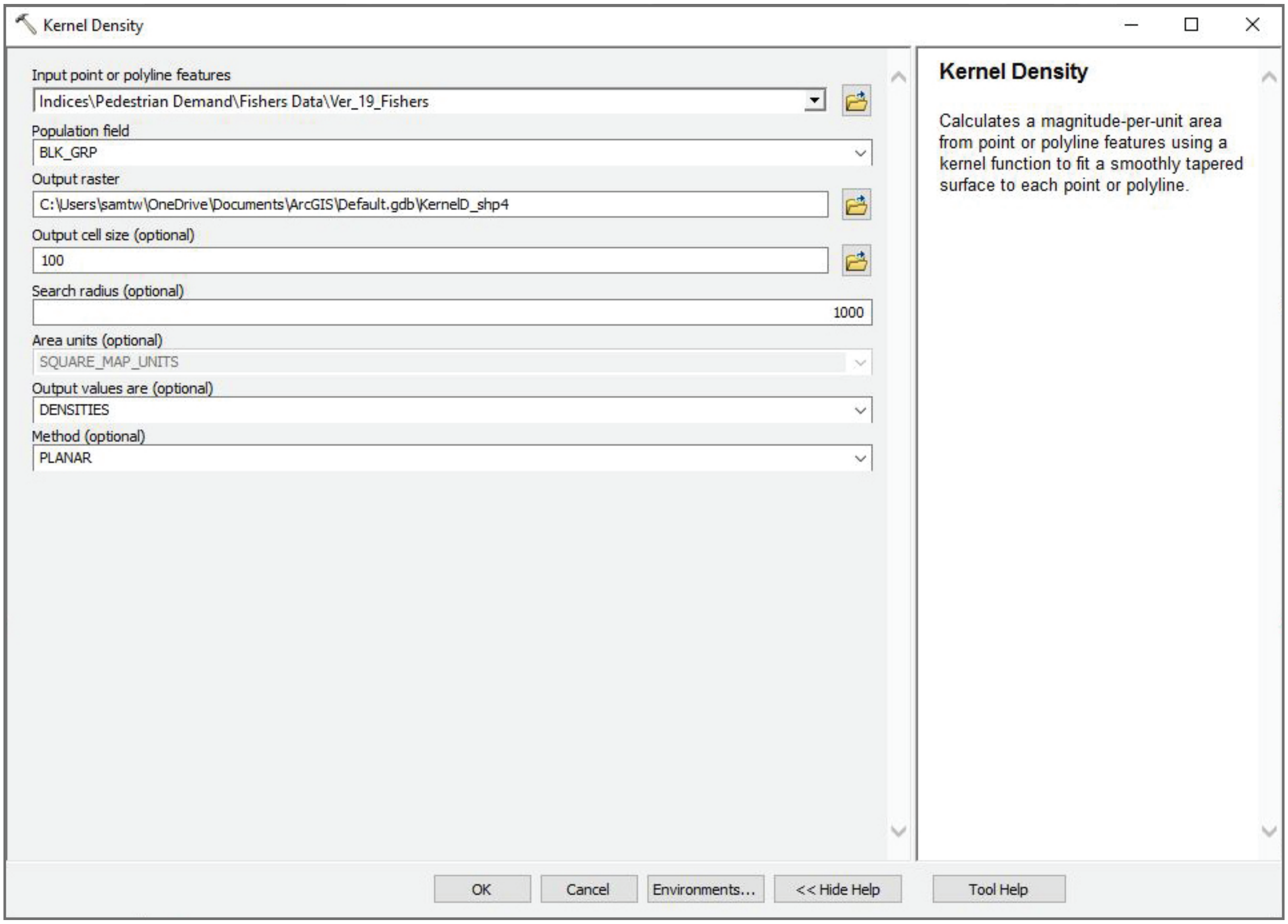


Figure 10. Kernel Density.

- For **Kernel Density**:
  - In the Kernel Density dialog box, click the ***Input Point or Polyline Features*** drop-down, and select the point or polyline feature for which to calculate density.
  - Set a name for the ***Output Raster***.
  - Set the ***Output Cell Size*** for the output raster dataset as 100.
  - Set the ***Search Radius*** within which to calculate density as 1,000.
  - Set the ***Area Units*** for output density values as Square_Map_Units.
  - Click **Environments > Raster Analysis**. ***Cell Size*** stays as default, and ***Mask*** should use the clipped functional classification.
  - Click **Okay**.

Line Density

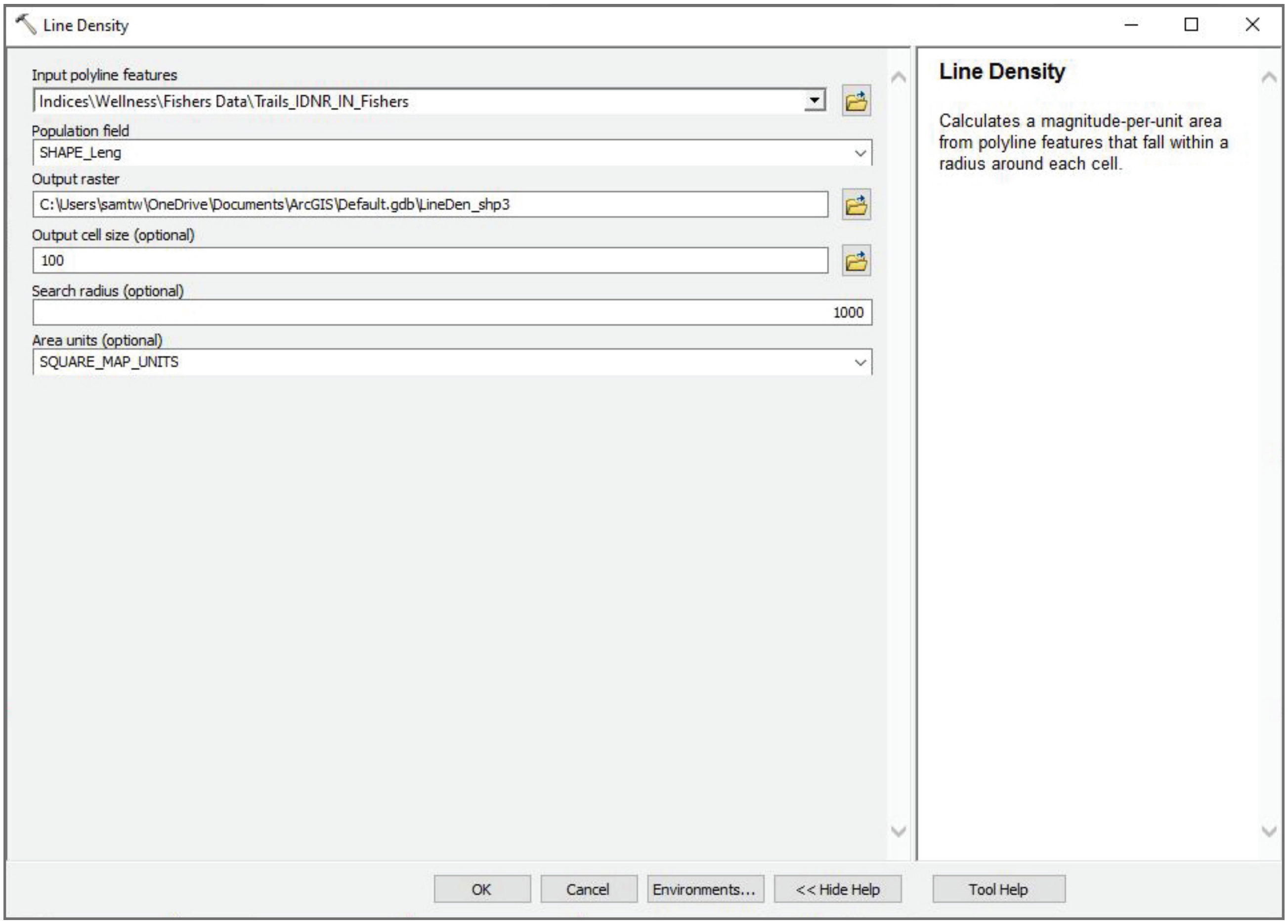


Figure 11. Line Density.

- For **Line Density**:
  - In the Line Density dialog box, click the ***Input Polyline Features*** drop-down, and select the polyline feature for which to calculate density.
  - Set a name for the ***Output Raster***.
  - Set the ***Output Cell Size*** for the output raster dataset as 100.
  - Set the ***Search Radius*** within which to calculate density as 1,000.
  - Set the ***Area Units*** for output density values as Square_Map_Units.
  - Click **Environments > Raster Analysis**. ***Cell Size*** stays as default, and ***Mask*** should use the clipped functional classification.
  - Click **Okay**.

Point Density

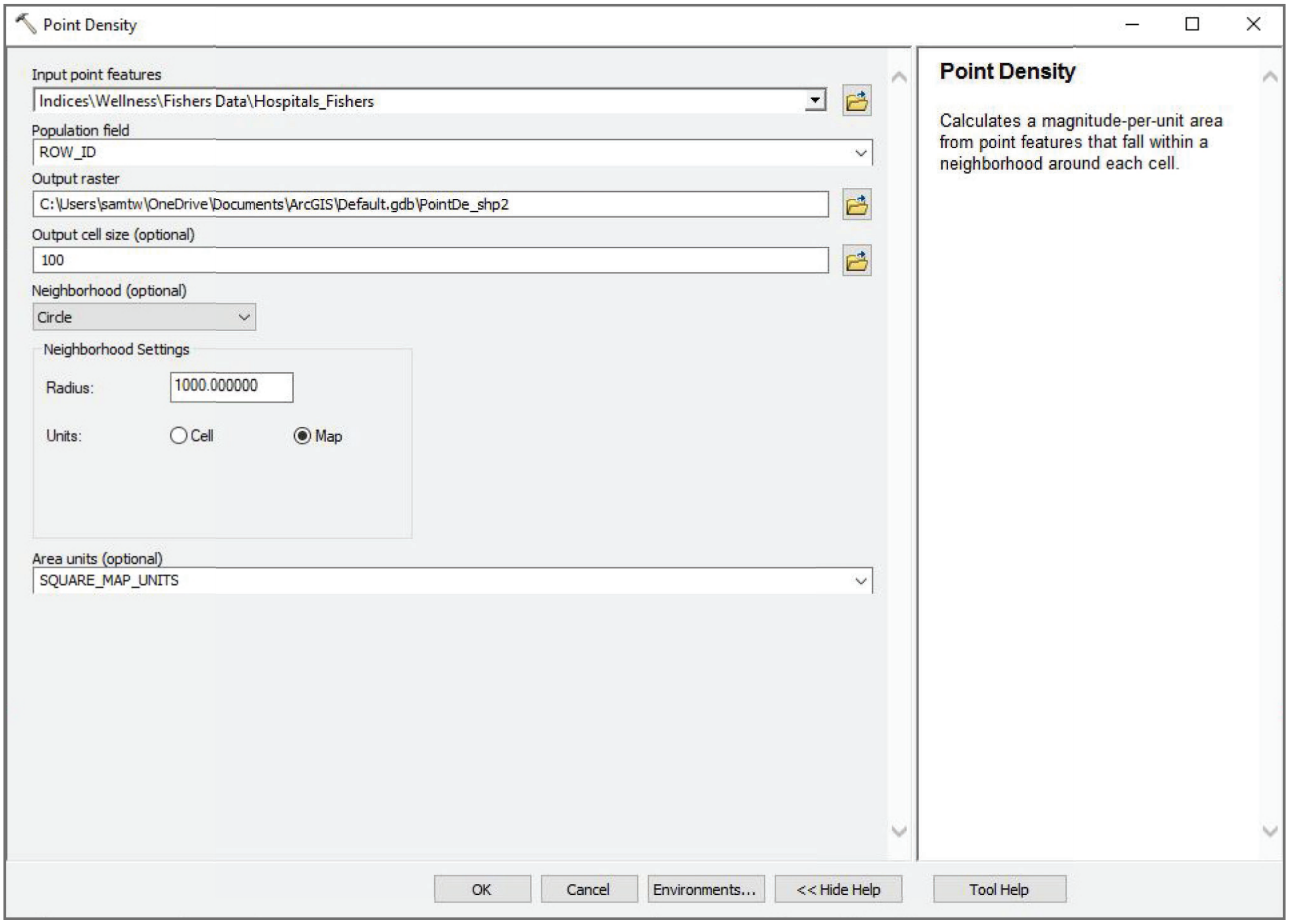


Figure 12. Point Density.

- For **Point Density**:
  - In the Point Density dialog box, click the ***Input Point Features*** drop-down, and select the point feature for which to calculate density.
  - Set a name for the ***Output Raster***.
  - Set the ***Output Cell Size*** for the output raster dataset as 100.
  - Set the Neighborhood to dictate the shape of the area around each cell to calculate the density value. Set the ***Neighborhood Class*** as Circle, with a ***Radius*** of 1,000 and ***Map Units***.
  - Set the ***Area Units*** for output density values as Square_Map_Units.
  - Click **Environments > Raster Analysis**. ***Cell Size*** stays as default, and ***Mask*** should use the clipped functional classification.
  - Click **Okay**.

Polygon to Raster

Polygon to Raster converts polygon features to a raster dataset (Figure 13). It may be used on any feature class containing polygon features, with the input field determining the type of raster.

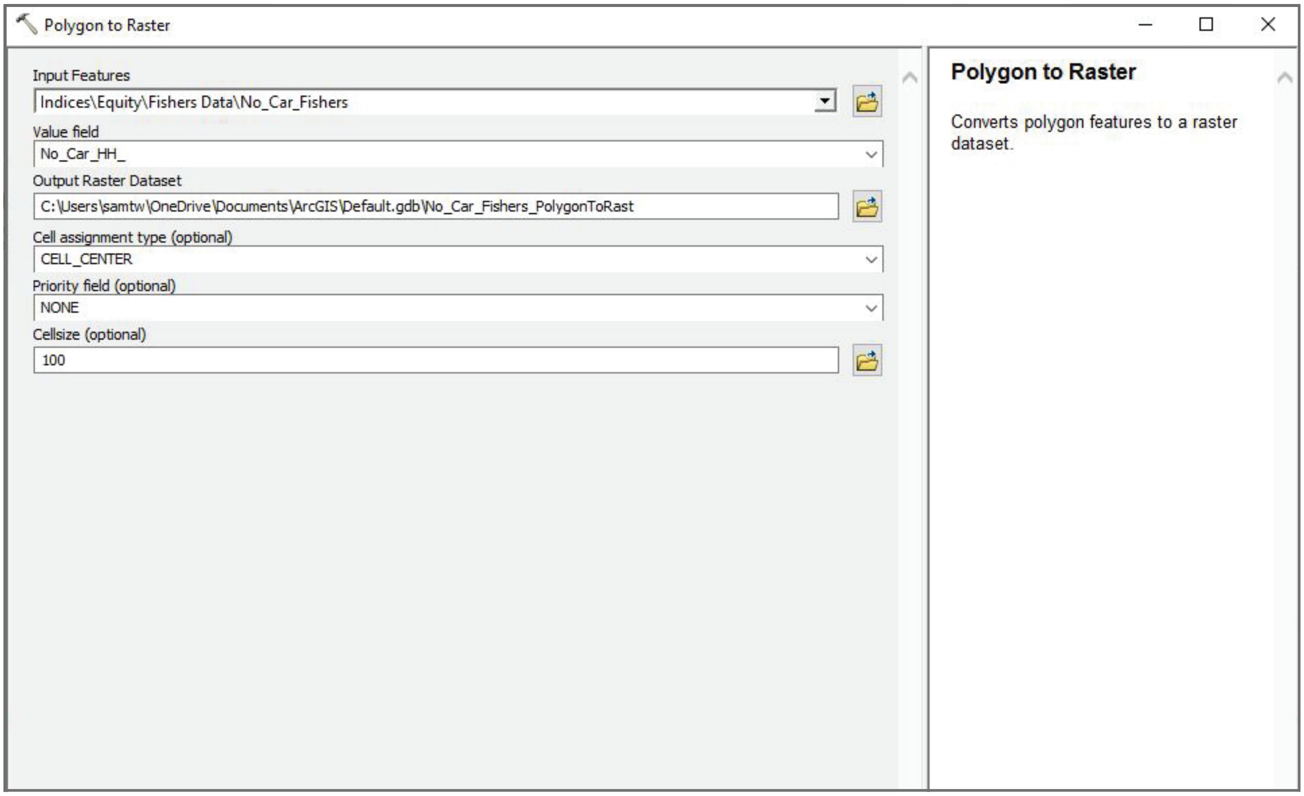
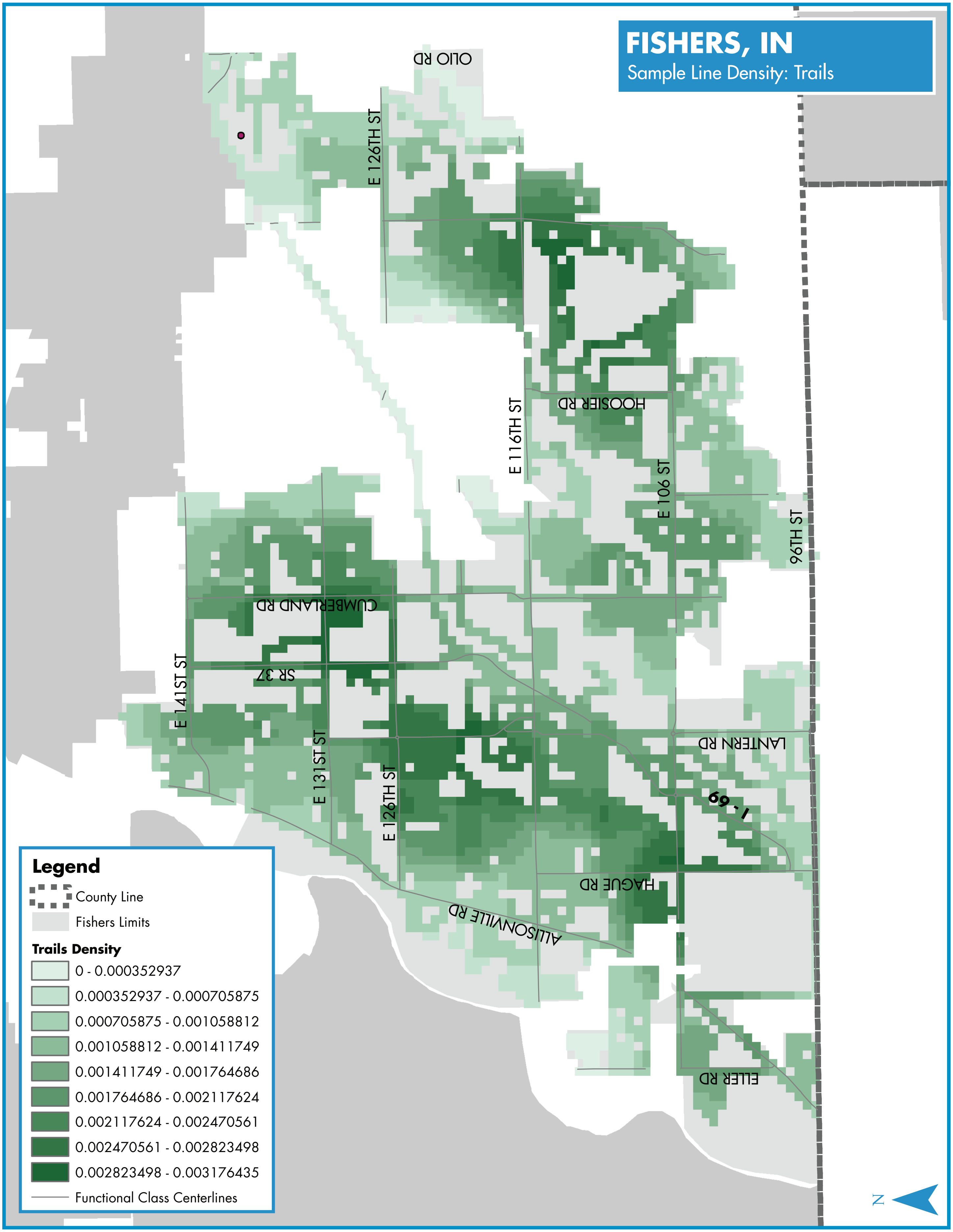


Figure 13. Polygon to Raster.

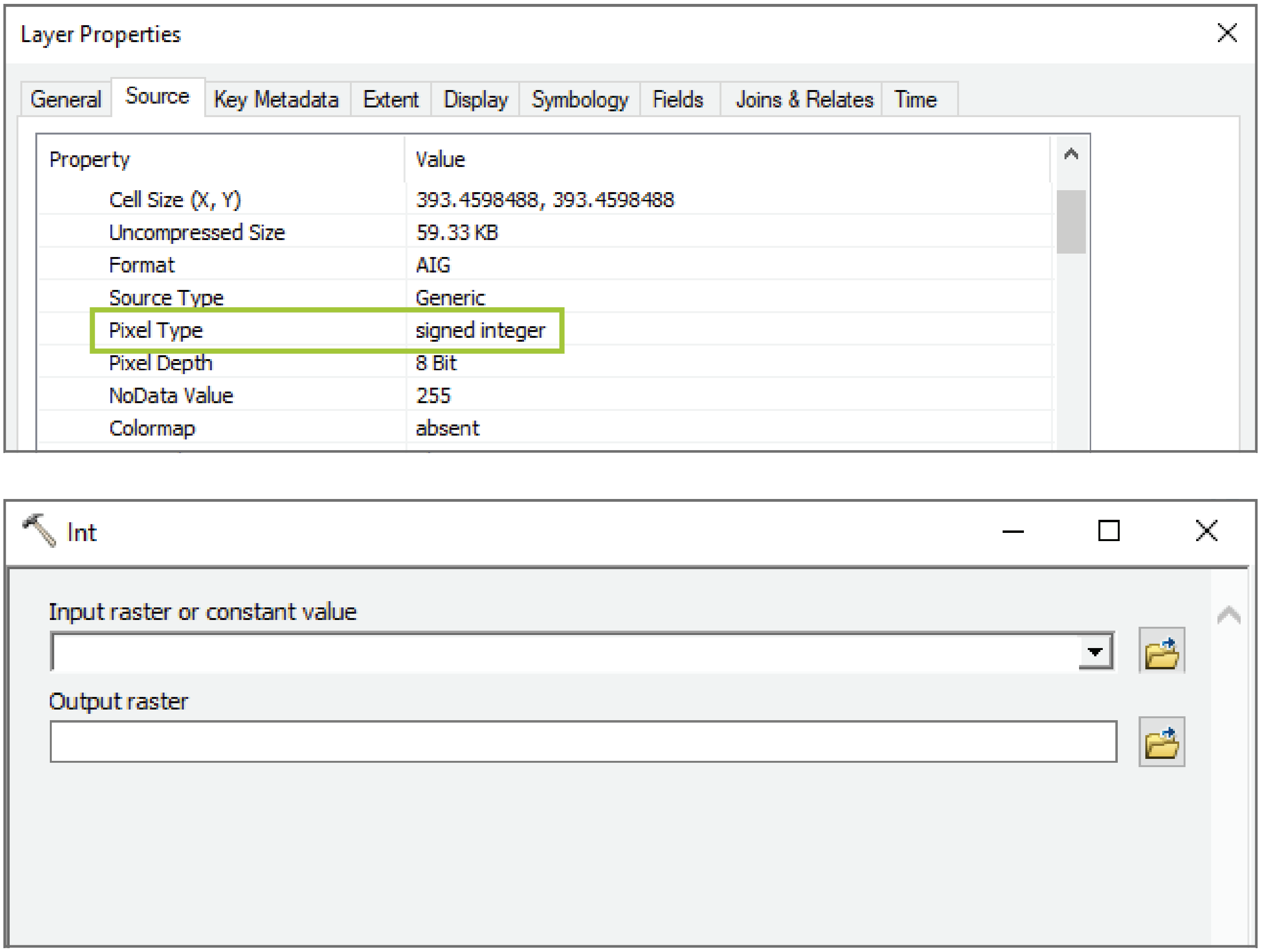
- Click **ArcToolbox > Conversion Tools > To Raster > Polygon to Raster**.
  - In the Polygon to Raster dialog box, click the ***Input Features*** drop-down and select the polygon input features dataset to be converted to a raster.
  - Set the ***Value Field*** to assign values to the output raster from the input feature's attribute table.
  - Set a name for the ***Output Raster***.
  - Set the ***Output Cell Size*** for the output raster dataset as 100.
  - Click **Environments > Raster Analysis**. ***Cell Size*** stays as default, and ***Mask*** should use the clipped functional classification.
  - Click **Okay**.



FISHERS, IN
Sample Line Density: Trails
OLIO RD
E 126TH ST
HOOSIER RD
E 116TH ST
E 106 ST
96TH ST
CUMBERLAND RD
SR 37
E 141ST ST
E 131ST ST
E 126TH ST
LANTERN RD
I - 69
HAGUE RD
ALLISONVILLE RD
ELLER RD
Legend
County Line
Fishers Limits
Trails Density
0 - 0.000352937
0.000352937 - 0.000705875
0.000705875 - 0.001058812
0.001058812 - 0.001411749
0.001411749 - 0.001764686
0.001764686 - 0.002117624
0.002117624 - 0.002470561
0.002470561 - 0.002823498
0.002823498 - 0.003176435
Functional Class Centerlines
N

Integer Raster

Before proceeding to **Reclassification**, the rasterized Index Measures layers must be in signed integer format. Open the Layer Properties dialog box of each rasterized layer by right-clicking the layer in the table of contents and selecting **Properties**, or by double-clicking the layer name. Click **Source > Data Source > Pixel Type**. If the pixel type is signed integer, proceed to **Reclassification** (Figures 14-15). If the pixel type is floating point, continue with Integer Conversion.

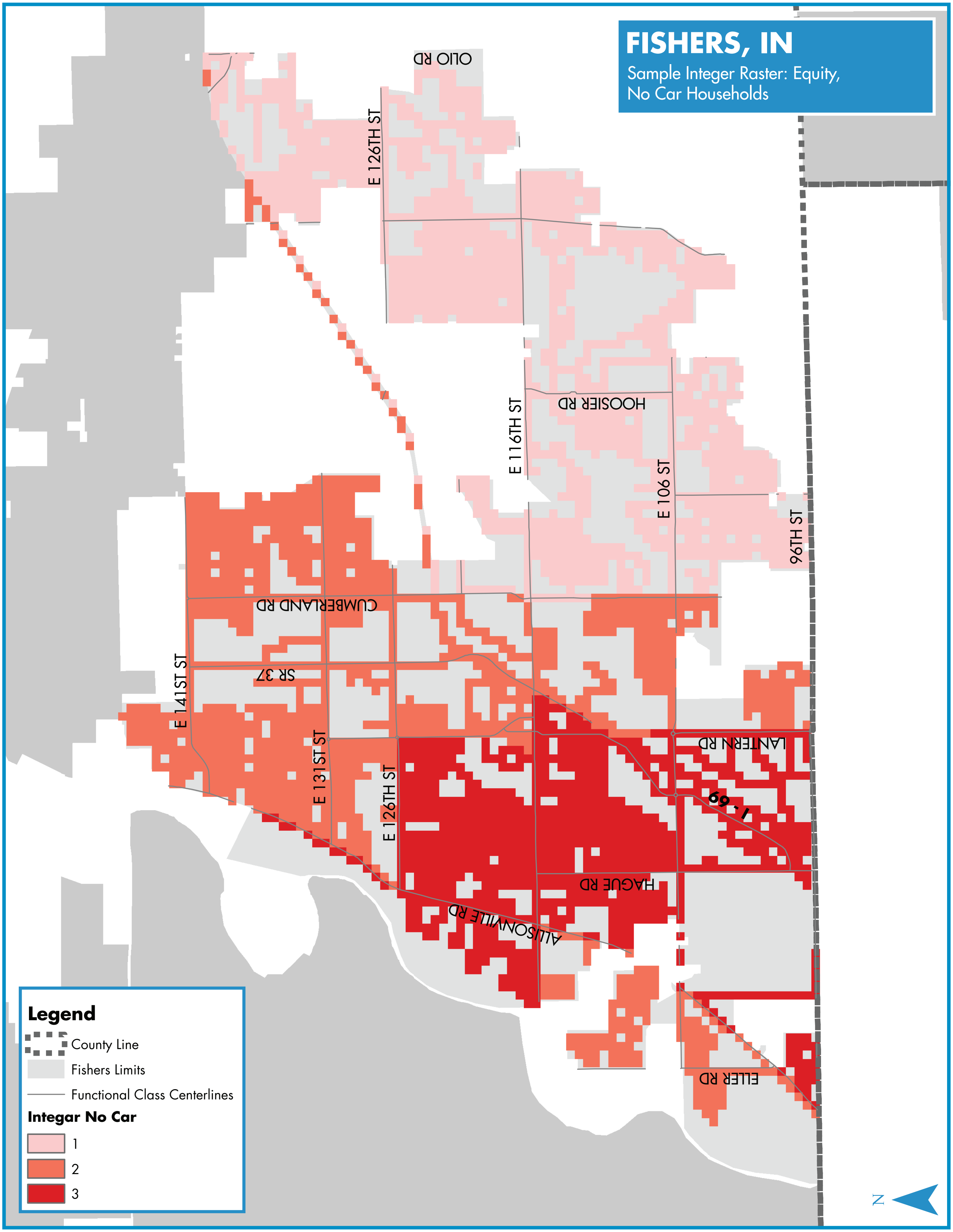


Figures 14-15. Pixel Type and Integer Raster.

- Click **ArcToolbox > Spatial Analyst Tools > Math > Trigonometric > Int**.
    - For ***Input Raster***, select the raster to convert from a floating type raster to an integer type raster.
    - Set a name for the ***Output Raster***.
    - Click **Environments > Raster Analysis**. ***Cell Size*** stays as default, and ***Mask*** should use the clipped functional classification.
    - Click **Okay**.

FISHERS, IN

Sample Integer Raster: Equity, No Car Households



Reclassification

Once each of the rasterized Index Measures layers is in signed integer raster format, they must be reclassified. Since each of the index rasters have different numbering systems with different ranges, in order to combine them into a single analysis, they must be reclassified into a common scale. **Reclassification** restructures input cell values to alternative values based on a series of specified intervals to create a common evaluation scale of preference (**Figure 16**).

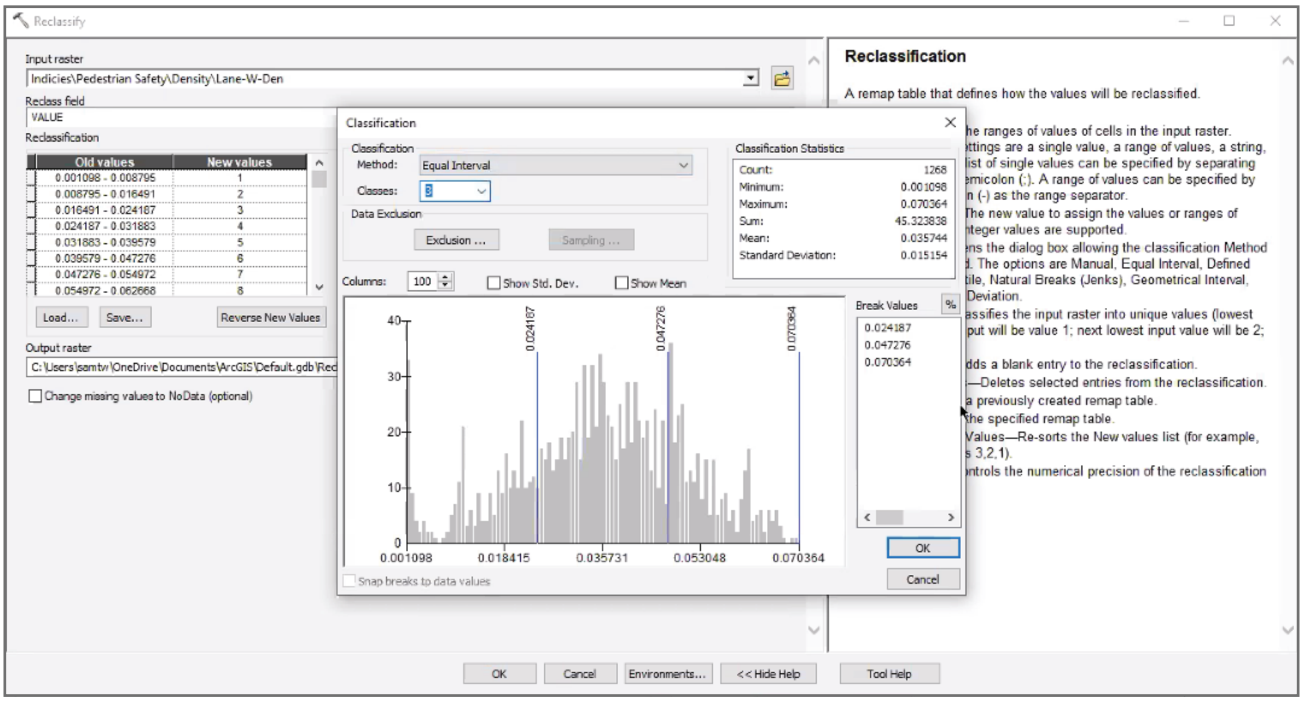
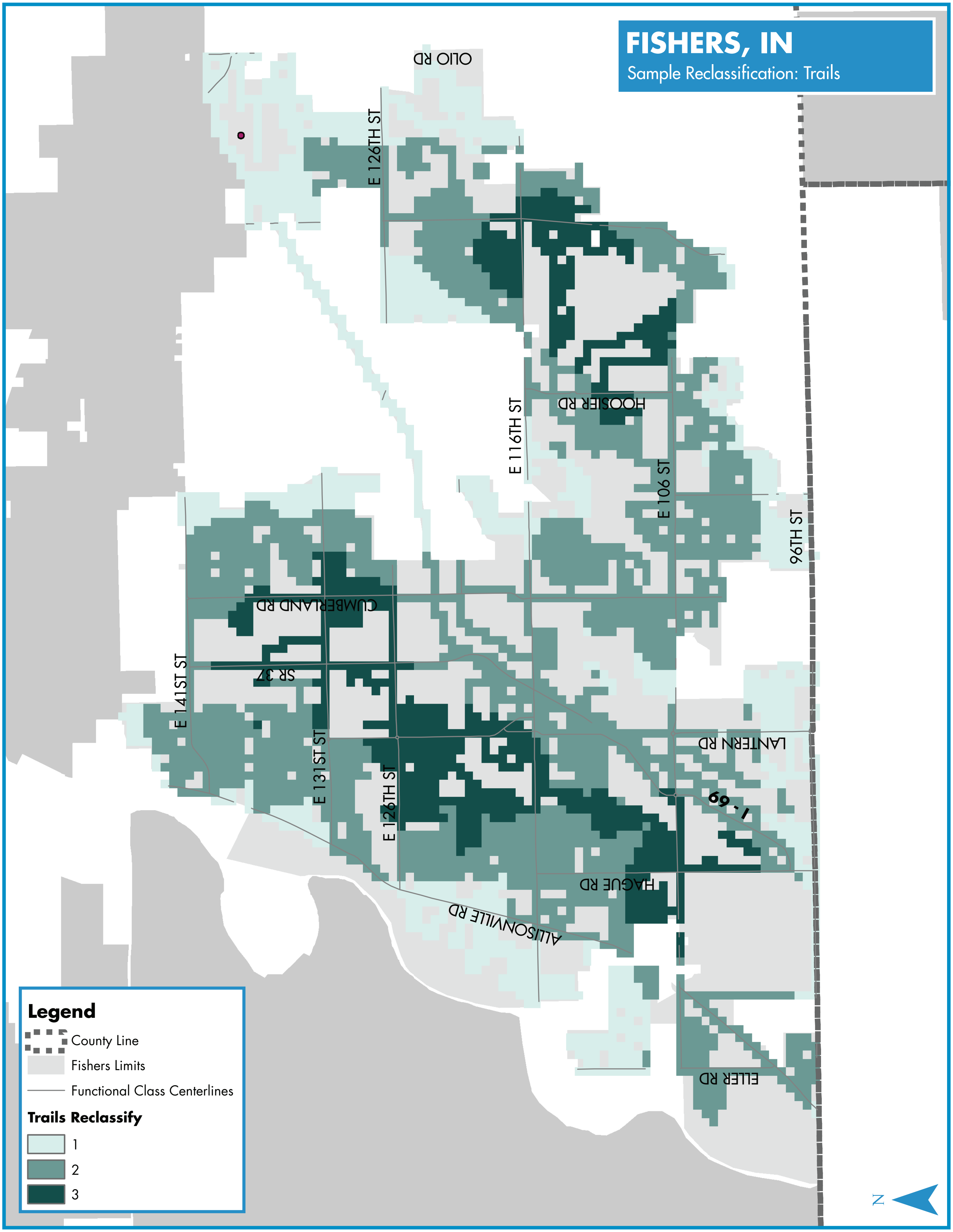


Figure 16. Reclassification.

- Click **ArcToolbox > Spatial Analyst Tools > Reclass > Reclassify**.
  - For ***Input Raster***, select the raster to reclassify.
  - For ***Reclass Field***, select the field denoting the values that will be reclassified. In most cases, this field will be Value.
  - Click **Classify**.
  - For ***Classification Method***, select Equal Interval.
  - For ***Classes***, select 3 for the 3 tiers of prioritization we are determining in this analysis.
  - Click **Environments > Raster Analysis**. ***Cell Size*** stays as default, and ***Mask*** should use the clipped functional classification.
  - Click **Okay**.


FISHERS, IN
Sample Reclassification: Trails
OLIO RD
E 126TH ST
HOOSIER RD
E 116TH ST
E 106 ST
96TH ST
CUMBERLAND RD
SR 37
E 141ST ST
E 131ST ST
E 126TH ST
LANTERN RD
I - 69
HAGUE RD
ALLISONVILLE RD
ELLER RD
N
Legend
County Line
Fishers Limits
Functional Class Centerlines
Trails Reclassify
1
2
3

Weighted Overlay: Priority Investment Areas Indices

In order to create heat maps for each of the five indices, the **Weighted Overlay** Tool must be used to establish "hot spot" priority areas (Figure 17). The **Weighted Overlay** tool assigns preference on a common scale to determine influence and meaning. The evaluation scale is set that represents the range of prioritization, with the values of each scale representing either end of the extreme. Since the input rasters have already been reclassified into a common measurement, the evaluation scale must match the one used during reclassification.

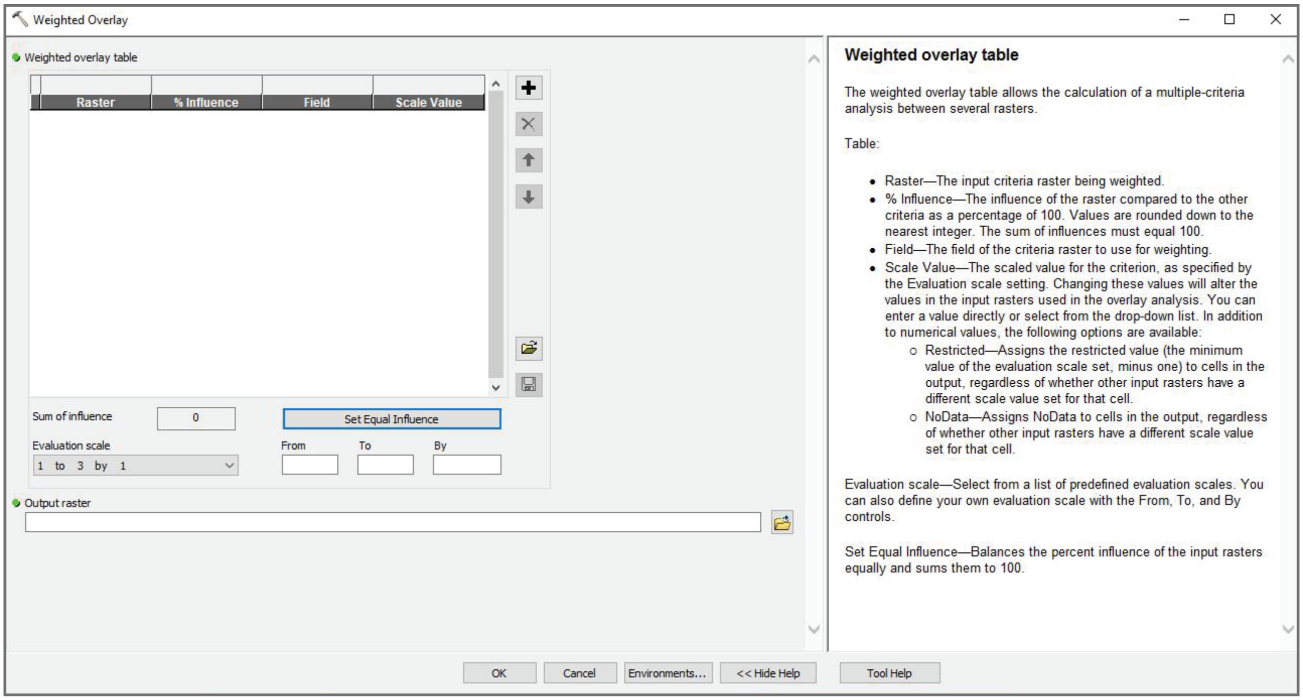
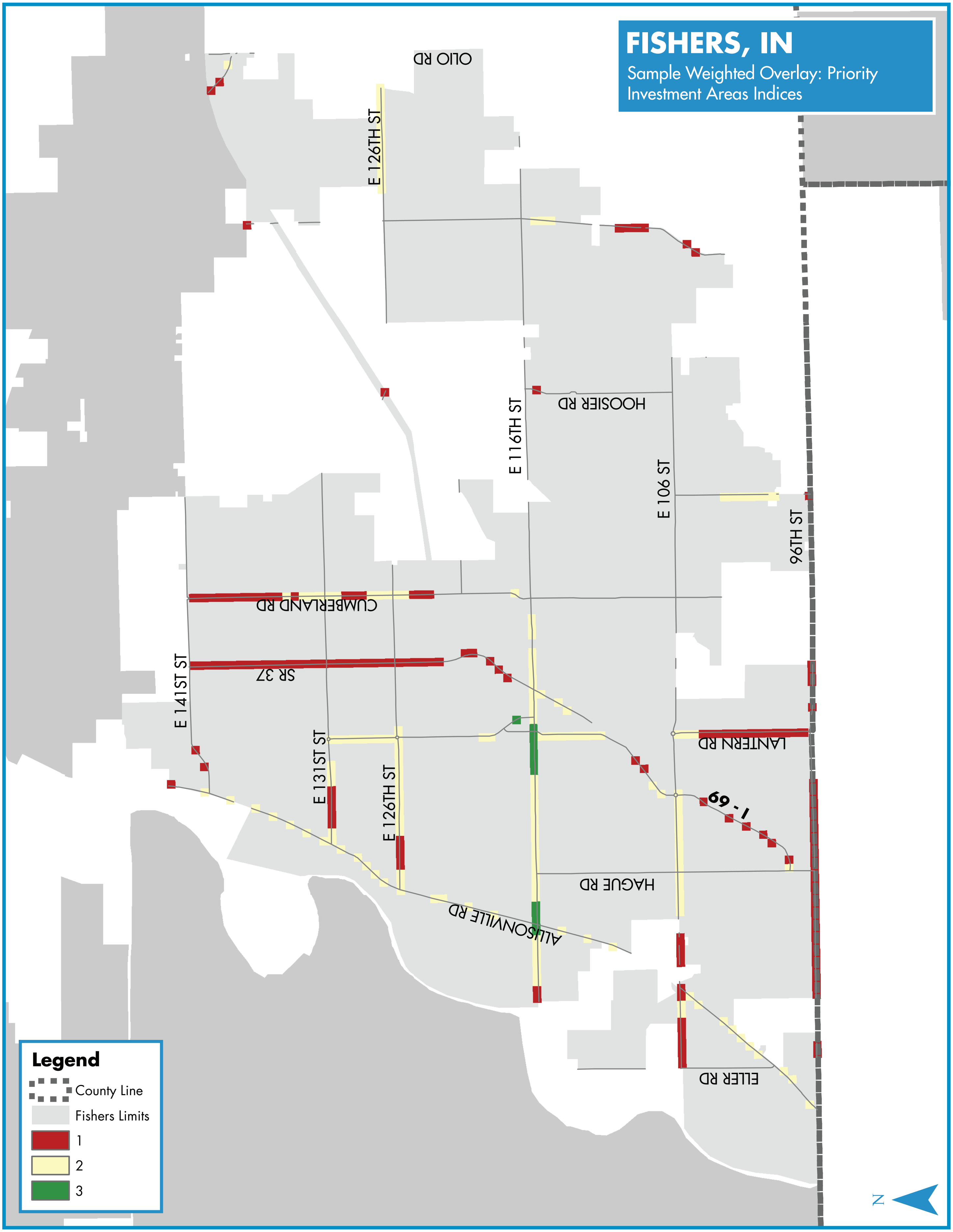


Figure 17. Weighted Overlay: Priority Investment Area Indices.

- Click **Arc Toolbox > Spatial Analyst Tools > Overlay > Weighted Overlay**.
    - In the Weighted Overlay dialog box, click **+** to select the reclassified Index Measures rasters for each measure within a single index to specify the input criteria rasters to be weighted.
    - Click **Set Equal Influence** to balance the percent influence of the input rasters equally and sum them to 100.
    - Set the ***Evaluation Scale*** to 1 to 3 by 1.
    - If the ***Scale Values*** in the ***Weighted Overlay Table*** aren't automatically updated, manually change them from 1 to 3.
    - Set a name for the ***Output Raster***.
    - Click **Okay**.


FISHERS, IN
Sample Weighted Overlay: Priority Investment Areas Indices
OLIO RD
E 126TH ST
HOOSIER RD
E 116TH ST
E 106 ST
96TH ST
CUMBERLAND RD
SR 37
E 141ST ST
E 131ST ST
E 126TH ST
LANTERN RD
I - 69
HAGUE RD
ALLISONVILLE RD
ELLER RD
N
Legend
County Line
Fishers Limits
1
2
3

Weighted Overlay: Final Composite

Create the Final Composite raster for your community using the **Weighted Overlay** tool (Figure 18). At this time, you will need to establish a ranking strategy for the five indices, or use the final composite ranking strategy defined in the Regional Pedestrian Plan.

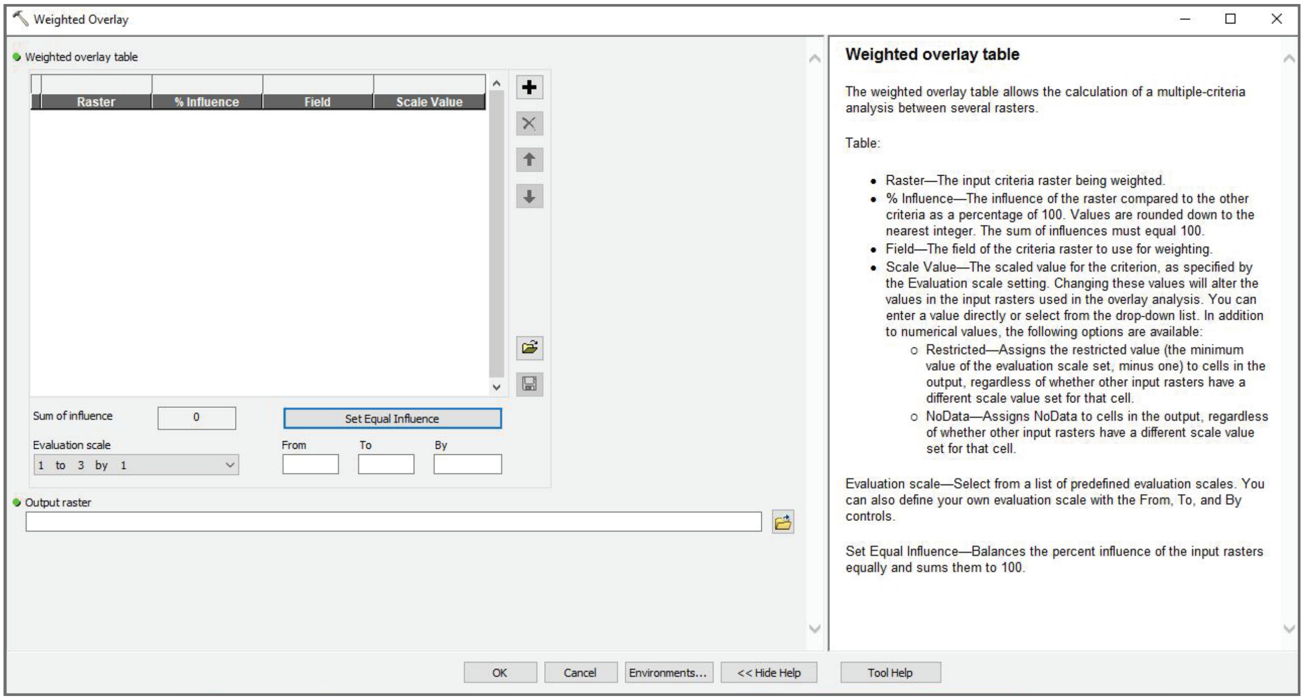
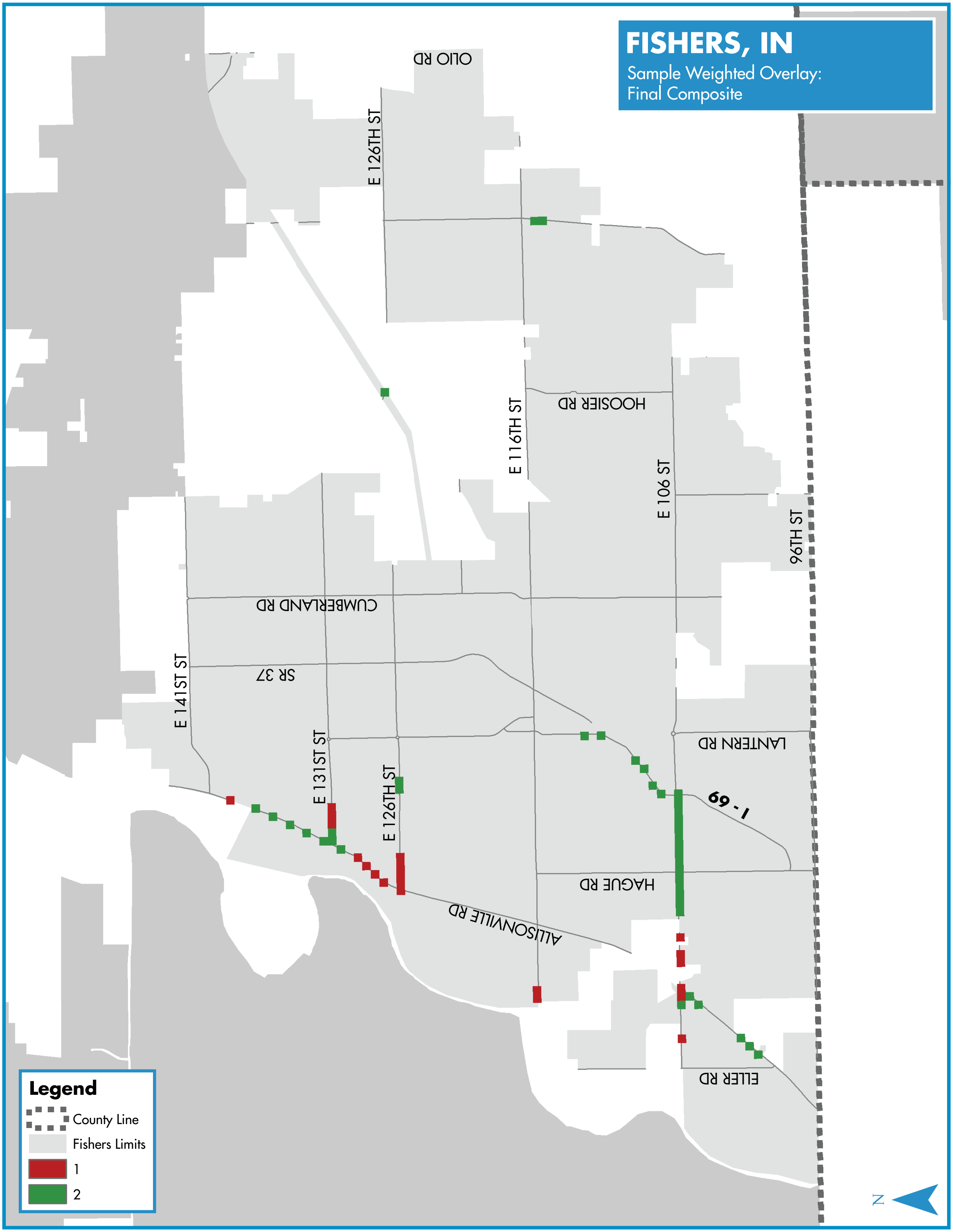


Figure 18. Weighted Overlay: Final Composite.

- Click **Arc Toolbox > Spatial Analyst Tools > Overlay > Weighted Overlay**.
  - In the Weighted Overlay dialog box, click **+** to select the reclassified Index Measures rasters for each measure within a single index to specify the input criteria rasters to be weighted.
  - Set ***% Influence*** for each of the five index heat maps. For example, 20% Pedestrian Safety, 20% Equity, 20% Wellness, 20% Pedestrian Demand and 20% Walking Comfort. The sum of influences must equal 100.
  - Set the ***Evaluation Scale*** to 1 to 3 by 1.
  - If the ***Scale Values*** in the ***Weighted Overlay Table*** aren't automatically updated, manually change them from 1 to 3.
  - Set a name for the ***Output Raster***.
  - Click **Okay**.


FISHERS, IN
Sample Weighted Overlay:
Final Composite
OLIO RD
E 126TH ST
HOOSIER RD
E 116TH ST
E 106 ST
96TH ST
CUMBERLAND RD
SR 37
E 141ST ST
E 131ST ST
E 126TH ST
LANTERN RD
I - 69
HAGUE RD
ALLISONVILLE RD
ELLER RD
N
Legend
County Line
Fishers Limits
1
2

Raster to Polygon

Based the Final Composite raster that organizes pedestrian projects into three tiers of priority, the existing pedestrian network must be cross-referenced and categorized in order to determine where gaps fall in the tier system. Since the clipped Gap Projects layer is line data, the final composite raster must be converted from Raster to Polygon in order to compare them **(Figure 19)**.

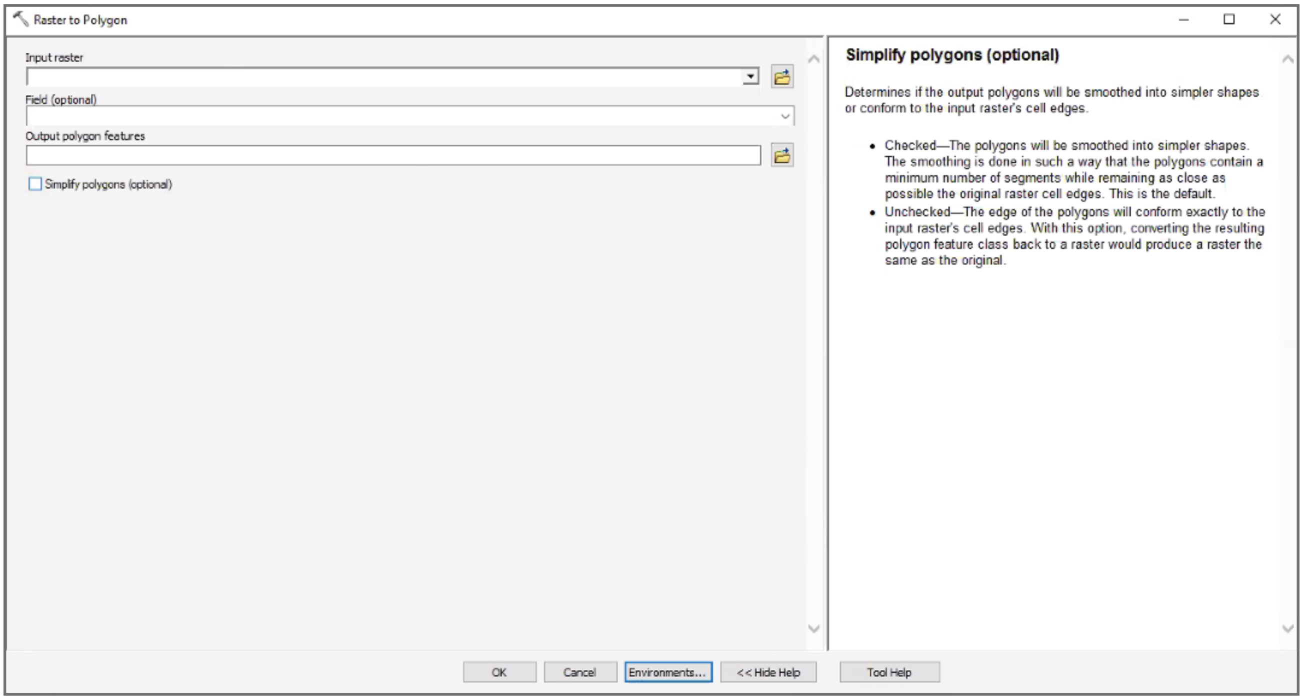
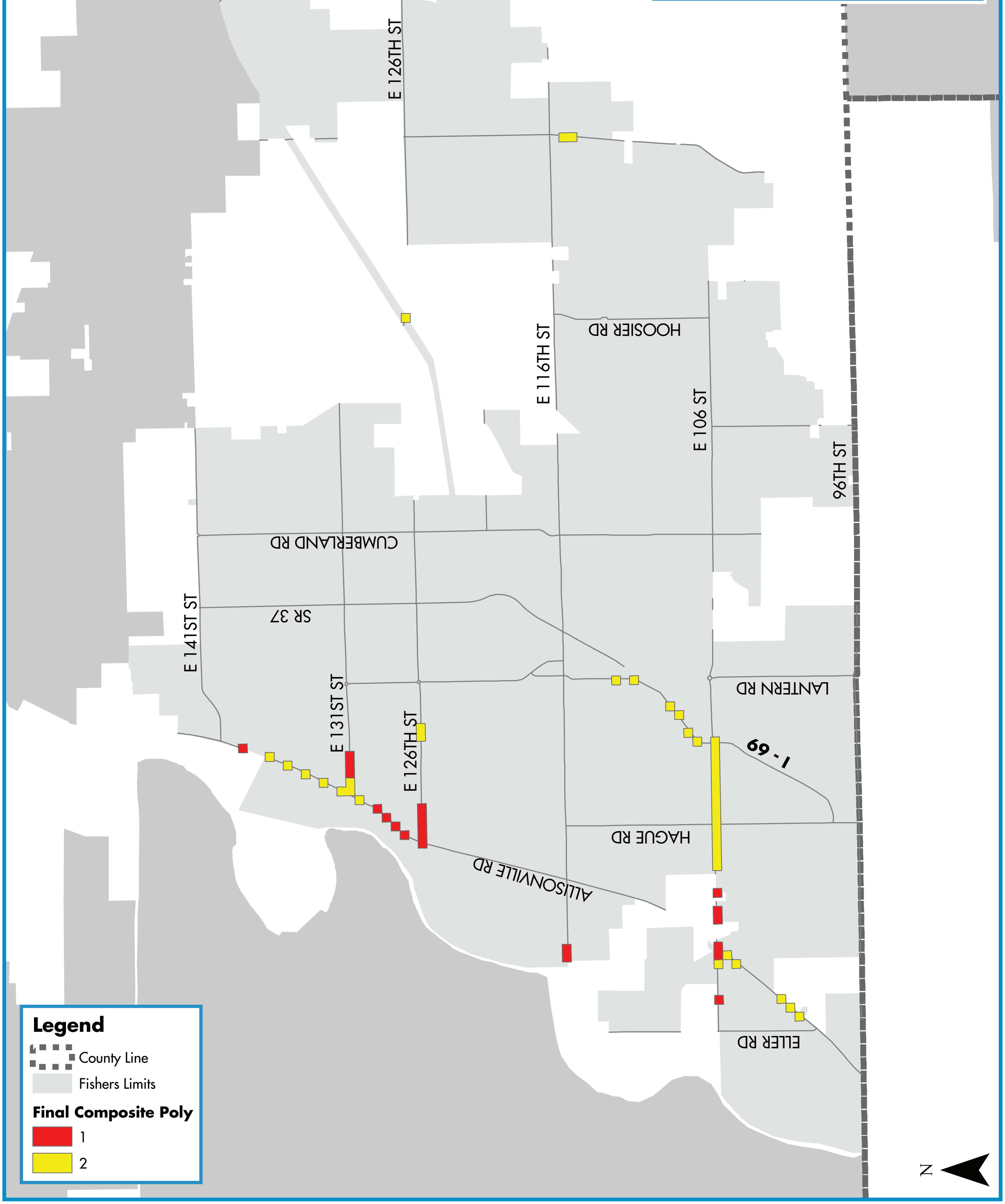


Figure 19. Raster to Polygon.

- Click **ArcToolbox > Conversion Tools > From Raster > Raster to Polygon** in order to convert the raster dataset into polygon features.
  - Select the Final Composite raster as the ***Input Raster***.
  - Set the ***Field*** as Value to assign values from cells in the input raster to the polygons in the output dataset.
  - Set a name for the ***Output Polygon Features***.
  - Uncheck ***Simplify Polygons***.
  - Click **Environments > Raster Analysis**. ***Cell Size*** stays as default, and ***Mask*** should use the clipped functional classification.
  - Click **Okay**.

FISHERS, IN
Sample Raster to Polygon



Intersect: Priority Pedestrian Infrastructure Projects

Intersect the Final Composite polygon layer with the clipped Gap Projects layer to determine pedestrian infrastructure prioritization for your community (Figure 20). The **Intersect** tool calculates an intersection of the input features in order to determine which features or portions of features overlap in all layers to write an output feature class.

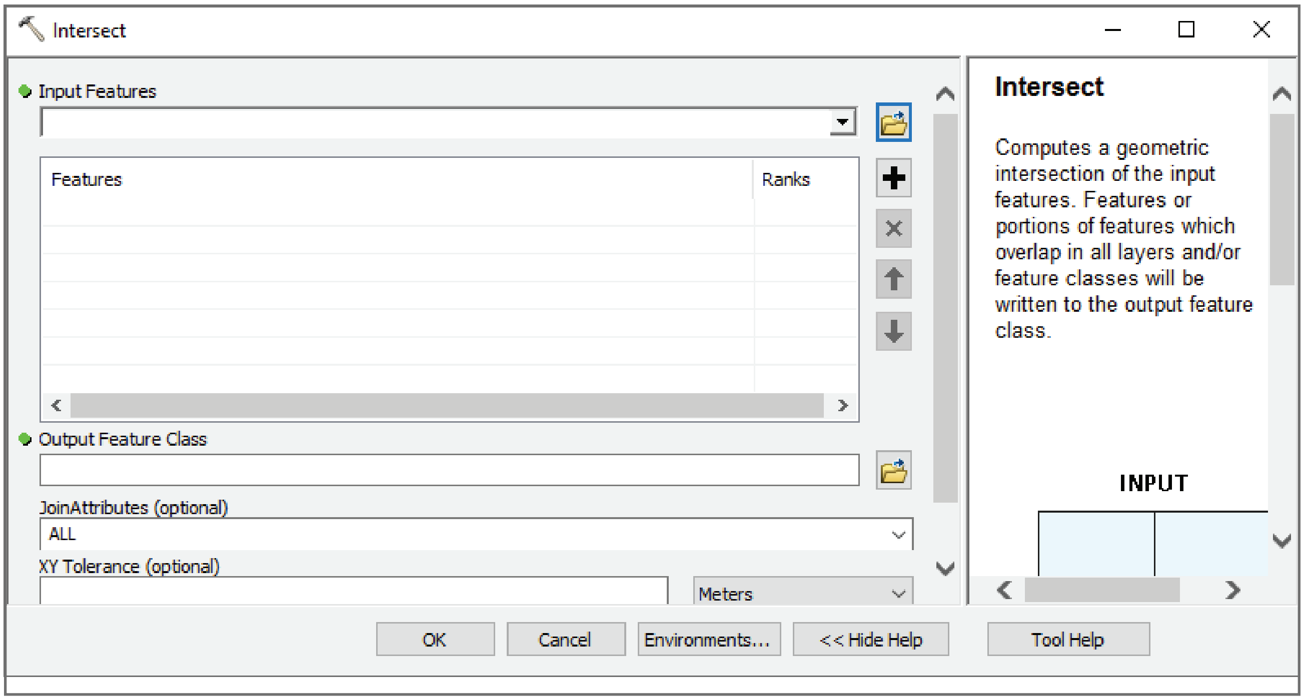
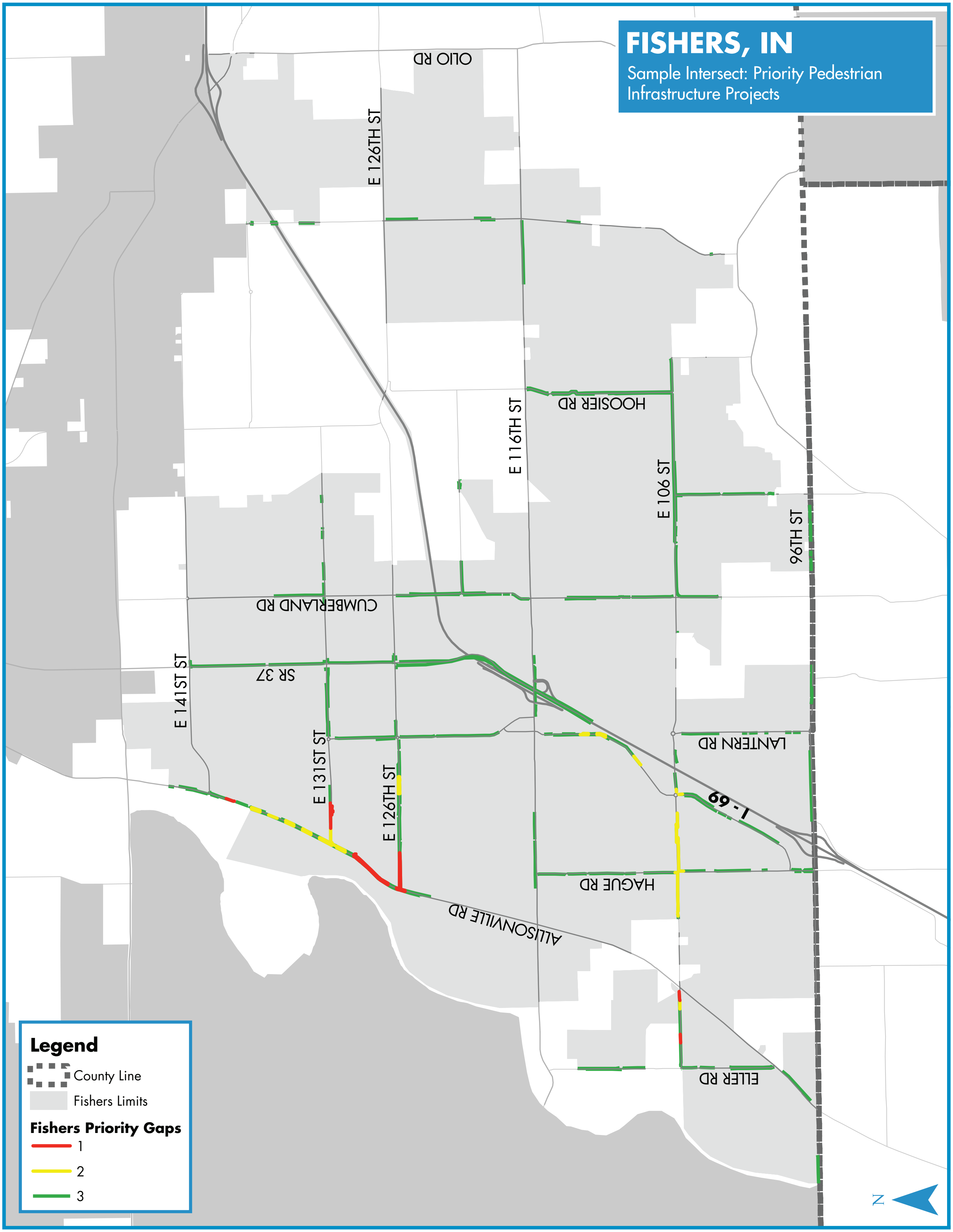


Figure 20. Intersect.

- Click **Geoprocessing > Intersect**.
  - Select the final composite layer and the clipped Gap Projects layer as ***Input Features***.
  - Set a name for the ***Output Feature Class***.
  - Set ***JointAttributes*** as All.
  - Set the ***Output Type*** as Line.
  - Click **Environments > Raster Analysis**. ***Cell Size*** stays as default, and ***Mask*** should use the clipped community limits, NOT the clipped functional classification. This is very important to change, or the command will not process.
  - Click **Okay**.
  - Open the Layer Properties dialog box by right-clicking the layer in the table of contents and selecting **Properties**, or by double-clicking the layer name.
  - Click **Symbology > Categories > Unique Value**s.
  - Change the ***Value Field*** to GRIDCODE. Click **Add All Values.**


FISHERS, IN
Sample Intersect: Priority Pedestrian Infrastructure Projects
OLIO RD
E 126TH ST
HOOSIER RD
E 116TH ST
E 106 ST
96TH ST
CUMBERLAND RD
SR 37
E 141ST ST
E 131ST ST
E 126TH ST
LANTERN RD
I - 69
HAGUE RD
ALLISONVILLE RD
ELLER RD
Legend
County Line
Fishers Limits
Fishers Priority Gaps
1
2
3
N

Troubleshooting: Project

In some conditions, the Density tool does not generate an output in ArcMap. This error occurs because the projection of the data is in a geographic coordinate system (GCS), and must be in a projected coordinate system (PCS) that uses a linear unit of measurement. If this occurs, open the Layer Properties dialog box by right-clicking the layer in the table of contents and selecting **Properties**, or by double-clicking the layer name. Click **Source>Geographic Coordinate System**. If the coordinate system is in GCS, continue with projection conversion.

- Click **ArcToolbox>Data Management Tools>Projections and Transformations>Project**.
  - For ***Input Dataset***, select the feature class to be projected from one coordinate system to another.
  - Set a name for the ***Output Dataset***.
  - For ***Output Coordinate System***, select Projected Coordinate System>UTM>NAD 1983 UTM Zone 16N.
  - Click **Okay**. The new layer is now ready for raster conversion.

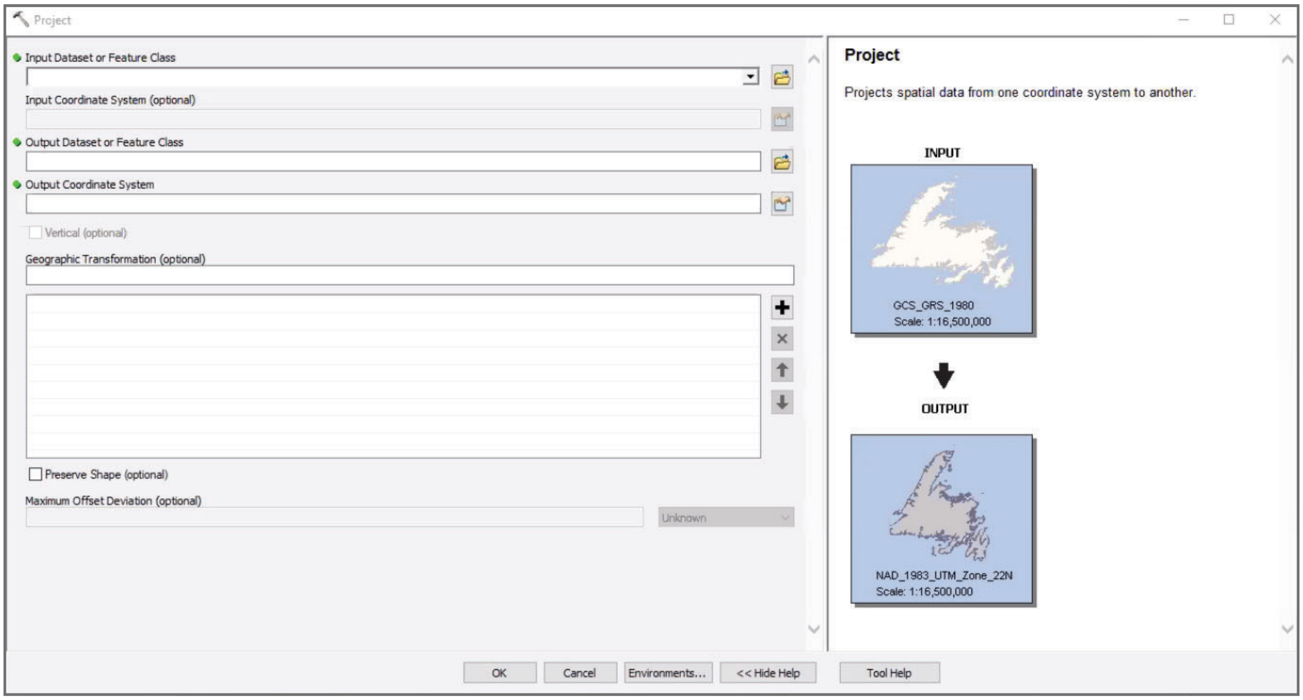


Figure 21. Project.

Analysis by Data Layer

Wellness

- **No_Gaps_Fishers**
  - Line Density
- **Trails_IDNR_IN_Fishers**
  - Line Density
- **Hospitals_Fishers**
  - Point Density
- **Pedestrian_2012_2017_Crash_Fishers**
  - Kernel Density

Equity

- **Youth_Population_Fishers**
  - Polygon to Raster
  - Reclassify: 3 Classes
  - Integer Raster
- **Senior_Population_Fishers**
  - Polygon to Raster
  - Reclassify: 3 Classes
  - Integer Raster
- **MinorityClip_Fishers**
  - Polygon to Raster
  - Reclassify: 3 Classes
  - Integer Raster
- **No_Car_Fishers**
  - Polygon to Raster
  - Reclassify: 3 Classes
  - Integer Raster
- **PovertyClip_Fishers**
  - Polygon to Raster
  - Reclassify: 3 Classes
  - Integer Raster

Pedestrian Demand

- **VER19_6_Fishers**
  - Kernal Density
- **Total_Population_Fishers**
  - Polygon to Raster
  - Reclassify: 3 Classes
  - Integer Raster
- **Employment_Groups_Fishers**
  - Polygon to Raster
  - Reclassify: 3 Classes
  - Integer Raster
- **School_Facilities_Data_Fishers**
  - Point Density

Walking Comfort

- **Speed_Fishers**
  - Line Density
- **T8_County_AADT_Top_Tier_Fishers**
  - Point Density
- **T8_County_AADT_High_Tier_Fishers**
  - Point Density
- **T8_County_AADT_Mid_Tier_Fishers**
  - Point Density
- **T8_County_AADT_Low_Tier_Fishers**
  - Point Density
- **T8_County_AADT_Bottom_Tier_Fishers**
  - Point Density

Pedestrian Safety

- **2015_Existing_Paths_Fishers**
  - Line Density
- **Ped_2012_2017_Non_Fatal_Non_Fishers**
  - Point Density
- **Existing_Ped_Network_Fishers**
  - Line Density
- **Lane_Widths_Fishers**
  - Line Density

Data Processing Definitions

- **Select by Attributes.** The Select by Attributes tool uses an attribute query to select features that match the selection criteria.

- **Clip.** The Clip tool extracts input features that overlay the clip features. This tool is particularly useful for creating new areas of interest that contain geographic subsets of another, larger feature class.

- **Normalization.** Normalization restructures input data by standardizing a field of measure (numerator) against a selected value (denominator) to minimize differences, thereby transforming counts (measures of magnitude) into ratios (measures of intensity). When normalizing data, it is necessary to consider the universes and units, where a universe is the value or population that forms the base from which the units are a subset.

- **Kernel Density.** Kernel Density calculates a magnitude-per-defined unit area from point or polyline features using a kernel function to fit a smoothly tapered surface to each point or polyline.

- **Line Density.** Line Density calculates a magnitude-per-defined unit area from polyline features that fall within a defined radius around each cell.

- **Point Density.** Point Density calculates a magnitude-per-defined unit area from point features that fall within a neighborhood around each cell.

- **Polygon to Raster.** Polygon to Raster converts polygon features to a raster dataset.

- **Project.** Project converts spatial data from one user coordinate system to another.

- **Integer Raster.** The Integer Raster (Int) tool converts raster cell values of a raster to integer format by truncation.

- **Reclassification.** Reclassification restructures input cell values to alternative values based on a series of specified intervals to create a common evaluation scale of preference.

- **Weighted Overlay.** The Weighted Overlay tool assigns preference on a common scale to determine influence and meaning. The evaluation scale is set that represents the range of prioritization, with the values of each scale representing either end of the extreme. If the input rasters are already reclassified to a common measurement, then the evaluation scale must match the one used during reclassification. During the weighted overlay process:

    - The input criteria layers are added to the weighted overlay;

    - scale values are assigned for the individual values within each reclassified integer raster, ranking them from most favorable to least favorable;

    - weights are assigned to each of the reclassified integer rasters, with the total influence for all rasters totaling 100%; and

    - final cell values are produced that represent tiers of prioritization ranked from high to low priority.

- **Raster to Polygon.** The Raster to Polygon tool converts raster datasets to polygon features.

- **Intersect.** The Intersect tool calculates an intersection of the input features in order to determine which feature or portions of features overlap in all layers to write an output feature class.

Regional PEDESTRIAN PLAN INDIANAPOLIS MPO

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