GIS-Based Open Space Prioritization

WAKE COUNTY
NORTH CAROLINA

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Open Space Prioritization

- **Why we needed an automated process**
- **The tools we used**
- **Why GIS was important**
- **How the Model works**
- **How we use the results**

Program Background

- **$91 million in open space bonds**
- **70%+ voter approval**
- **Goal of 30% of County area as open space**
- **$10 million remaining**
- **Scarce resources need to be spent wisely**

Open Space Acquisition

Wake County needs adequate open space for the:

- preservation of natural resources and habitat;
- protection of forest and farm land;
- provision of outdoor recreation;
- preservation of historical and cultural properties;
- protection of scenic landscapes; and
- protection of riparian corridors and water quality.

Problem to Solve

- **Land acquisition – case-by-case**
- **Acquisitions were rated on criteria that were more qualitative than quantitative**
- **Did not have a systematic, repeatable, quantifiable process for prioritization**

Simplified...

Were we acquiring the best property?

$<$

$>$

$=$

Solution

Staff from Wake County Environmental Services, Facilities Design & Construction, GIS, Parks Recreation & Open Space and Planning

- **Identify and define criteria for prioritization**
- **Create a model that would enable the quantitative evaluation of those criteria**
- **Use ranking and weighting of criteria to establish scores**
- **Use GIS to support the identification of parcels with highest scores**

Prioritization Committee

- **Researched previous work**
- **Evaluated other models**
- **Determined a catalog of indicators related to the criteria by which to rate parcels**
- **Identified spatial and non-spatial data to characterize the indicators**

Categories of Criteria

- **Location**
- **Parcel Size**
- **Species and Habitat**
- **Water Quality**

Open Space Categories

Representative <u>existing</u> GIS data identified and defined for each criteria

Water Quality	Parcel Size	Species & Habitat	Location
• High Quality Waters • Water Supply Watershed • Headwater Proximity • Wetlands • Floodplain • 303D Impaired Waters	• >100 Acres • 75 but < 100 acres • 50 but < 75 acres • 25 but < 50 acres • 5 but < 25 acres	• Bio Diversity Index 8 thru 10 • Bio Diversity Index 4 thru 7 • Bio Diversity Index 0 thru 3	• Links to Multiple Parcels • Links to Single Parcels • Proximity to Greenways/Trails • Historic Significance • Proximity of ¼ mile or less

Ranking and Weighting

- **Staff and Open Space and Parks Advisory Committee**
- **Forced Choice Matrix**

OPEN SPACE PRIORITIZATION FORCED CHOICE WEIGHTING MATRIX

OSAPAC

Open Space Index	Score
1. Water Quality	7
2. Location	4
3. Species & Habitat	4
4. Parcel Size	1

Staff Committee

Open Space Index	Score
1. Water Quality	7
2. Parcel Size	5
3. Species & Habitat	2
4. Location	1

Combined Score

Open Space Index	Weights	
1. Water Quality	4.0	Deffered to Staff Score
2. Parcel Size	3.0	
3. Species & Habitat	2.0	
4. Location	1.0	

Water Quality

OSAPAC Variable:

Variable	Score
1. H.Q. Waters	16
2. W. S. Watershed	12
3. Headwater Stream	11
4. Wetlands	8
5. Floodplain	7
6. 303(d) List	4
7. No Value	1

Staff Committee Variable:

Variable	Score	Highest Possible Matrix
1. Headwater Stream	18	
2. H.Q. Waters	11	
3. Wetlands	11	19
4. W. S. Watershed	8	38 (x2)
5. 303(d) List	7	
6. Floodplain	4	
7. No Value	1	

Combined Water Quality:

	Combined Scores	CS/HPMS	x 10	40 point scale		FINAL SCORES
1. Headwater Stream	29	0.8	8.0	10.0	Headwater Stream	10 Headwater Stream
2. H.Q. Waters	27	0.7	7.0	8.8	H.Q. Waters	9 H.Q. Waters
3. Wetlands	19	0.5	5.0	6.3	Wetlands	6 W. S. Watershed
4. W. S. Watershed	20	0.5	5.0	6.3	W. S. Watershed	6 Wetlands
5. 303(d) List	11	0.3	3.0	3.8	303(d) List	4 303(d) List
6. Floodplain	11	0.3	3.0	3.8	Floodplain	4 Floodplain
7. No Value	2	0.1	1.0	1.3	No Value	1 No Value
			32.0	40.0		40

Location

OSAPAC:

	Score
1. Link to Multiple	16
2. Link to one Parcel	10
3. Greenways/Trails	8
4. Historic Sig.	7
5. ¼ mile or less	4
6. No Value	1

Staff Committee:

	Score	Highest Possible Matrix
1. Link to Multiple	16	
2. Link to one Parcel	13	
3. Greenways/Trails	8	16
4. Historic Sig.	7	32 (x2)
5. ¼ mile or less	4	
6. No Value	1	

Combined Location:

	Combined Scores	CS/HPMS	x 10	40 point scale		FINAL SCORES
1. Link to Multiple	32	1.0	10.0	13.3	Link to Multiple	13 Link to Multiple
2. Link to one Parcel	23	0.7	7.0	9.3	Link to one Parcel	9 Link to one Parcel
3. Greenways/Trails	16	0.5	5.0	6.7	Greenways/Trails	7 Greenways/Trails
4. Historic Sig.	14	0.4	4.0	5.3	Historic Sig.	6 Historic Sig.
5. ¼ mile or less	8	0.3	3.0	4.0	¼ mile or less	4 ¼ mile or less
6. No Value	2	0.1	1.0	1.3	No Value	1 No Value
			30.0			40

Parcel Size

OSAPAC:

1. > 100 acres
2. 75 but < 100 acres
3. 50 but < 75 acres
4. 25 but < 50 acres
5. 5 but < 25 acres
6. No Value

Staff Committee:

	Score	Highest Possible Matrix
1. > 100 acres	19	
2. 75 but < 100 acres	16	
3. 50 but < 75 acres	13	19
4. 25 but < 50 acres	10	
5. 5 but < 25 acres	7	
6. No Value	1	

Combined Parcel Size:

	Combined Scores	CS/HPMS	x 10	40 point scale		FINAL SCORES
1. > 100 acres	19.0	1.0	10.0	11.4	> 100 acres	11 > 100 acres
2. 75 but < 100 acres	16.0	0.8	8.0	9.1	75 but < 100 acres	9 75 but < 100 acres
3. 50 but < 75 acres	13.0	0.7	7.0	8.0	50 but < 75 acres	8 50 but < 75 acres
4. 25 but < 50 acres	10.0	0.5	5.0	5.7	25 but < 50 acres	6 25 but < 50 acres
5. 5 but < 25 acres	7.0	0.4	4.0	4.6	5 but < 25 acres	5 5 but < 25 acres
6. No Value	1.0	0.1	1.0	1.1	No Value	1 No Value
			35.0			40

Species & Habitat

OSAPAC:

	Score
1. Biodiv. 8 thru 10	10
2. Biodiv. 4 thru 7	7
3. Biodiv. 0 thru 3	4
4. No Value	1

Staff Committee:

	Score	Highest Possible Matrix
1. Biodiv. 8 thru 10	10	
2. Biodiv. 4 thru 7	7	10
3. Biodiv. 0 thru 3	4	20 (x2)
4. No Value	1	

Combined Species & Habitat:

	Combined Scores	CS/HPMS	x 10	40 point scale		FINAL SCORES
1. Biodiv. 8 thru 10	20.0	1.0	10.0	18.2	Biodiv. 8 thru 10	18 Biodiv. 8 thru 10
2. Biodiv. 4 thru 7	14.0	0.7	7.0	12.7	Biodiv. 4 thru 7	13 Biodiv. 4 thru 7
3. Biodiv. 0 thru 3	8.0	0.4	4.0	7.3	Biodiv. 0 thru 3	8 Biodiv. 0 thru 3
4. No Value	2.0	0.1	1.0	1.8	No Value	1 No Value
			22.0			40

Geospatial Data Compilation

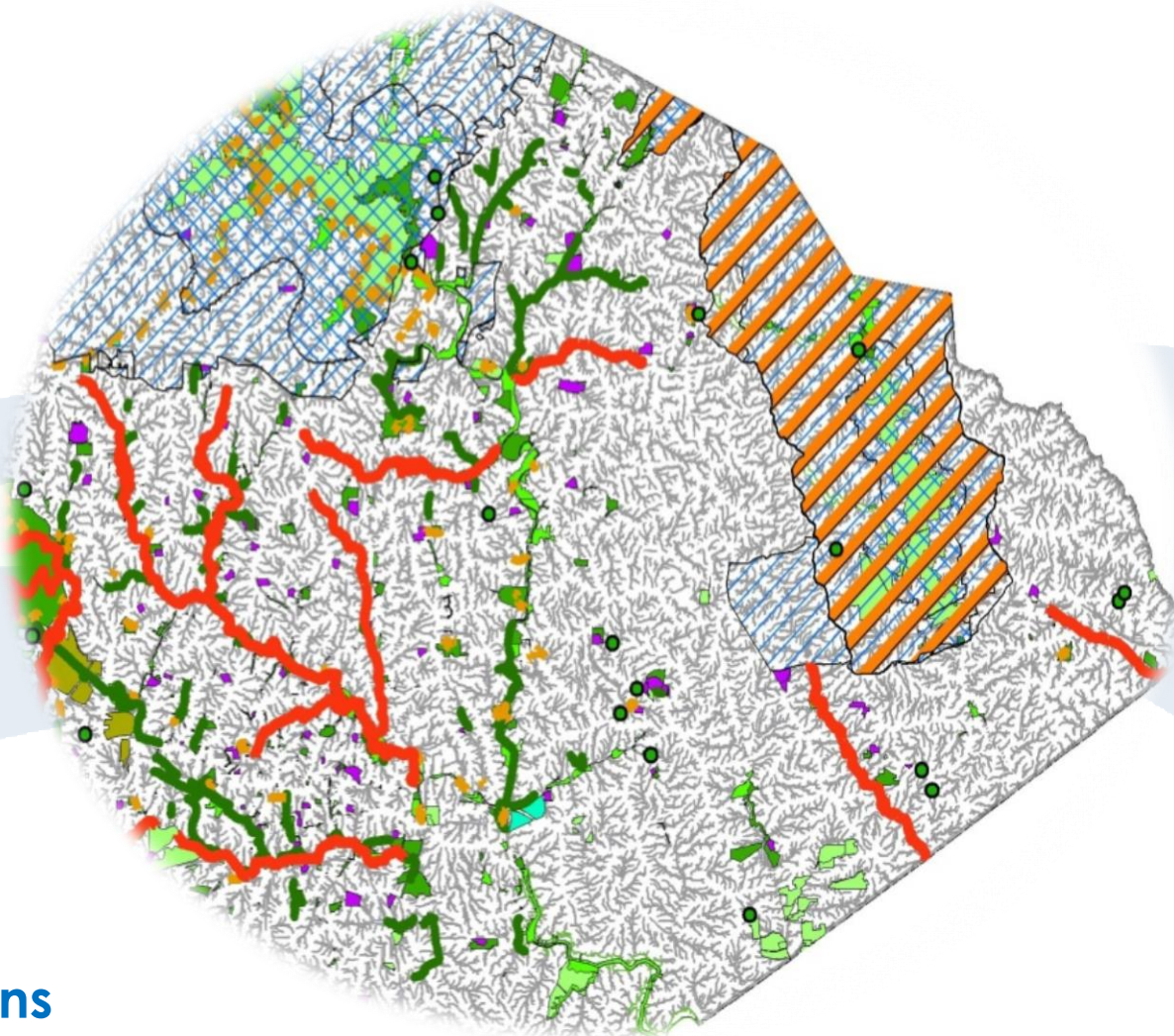**A combination of derived, County, State and Federal datasets:**

- **Derived –** headwater streams
- **County –** current open space, water supply watersheds, parcels
- **State –** high quality waters, impaired waters, biodiversity significance
- **Federal –** floodplains, wetlands

More than twenty geospatial data layers

GIS Data

## in all forms...

- ● **Points**
- 〜 **Lines**
- ▱ **Polygons**

Tools Utilized for Analysis

- **ArcGIS**
- **Model Builder**
- **Geo-processing Toolbox**
- **Spatial Analyst Extension**

How the Model Works…

- **Model is a toolbox with a series of routines that connect several processes**
- **The processes assign a method of intersection, a query of attributes, or a calculation using GIS**
- **Parcel data used to record scores as intersected with specific variables**
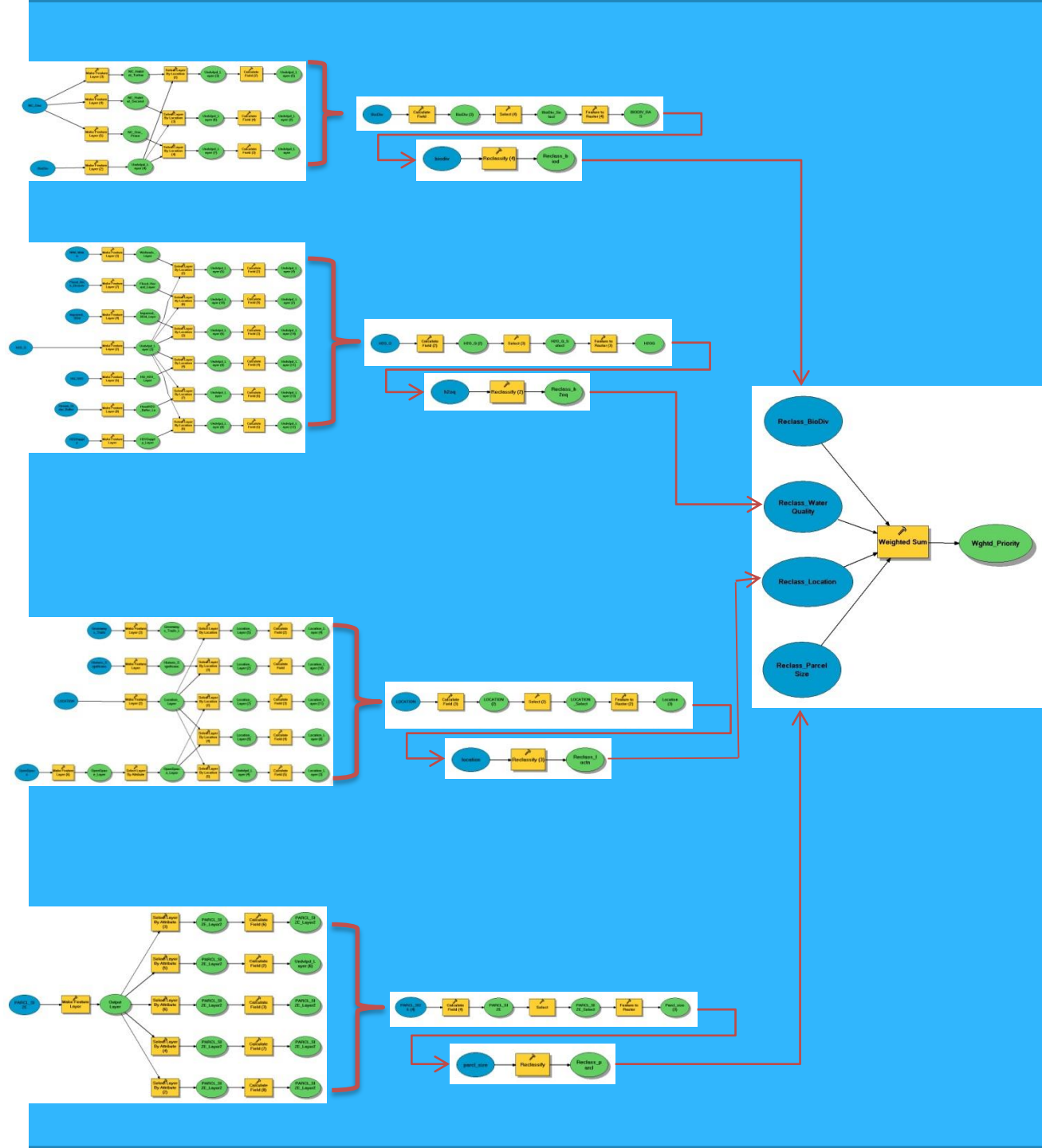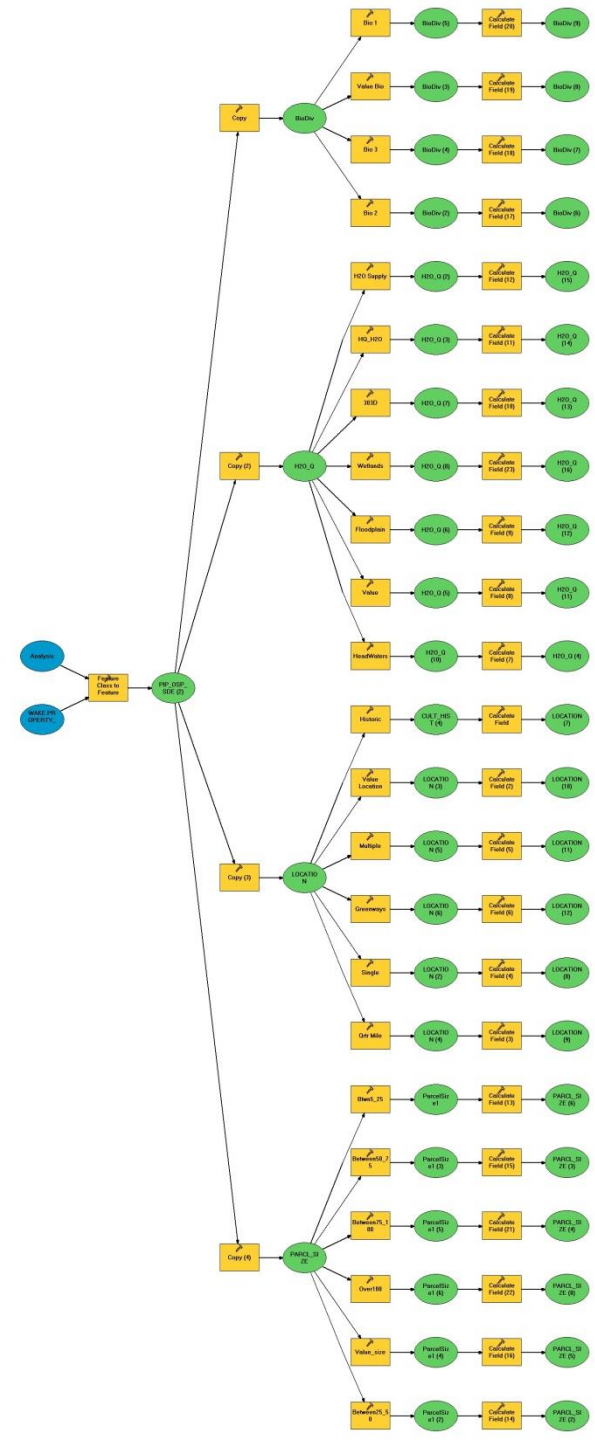
Scored Open Space Categories

Parcels in Play Scored by Occurrence with Criteria
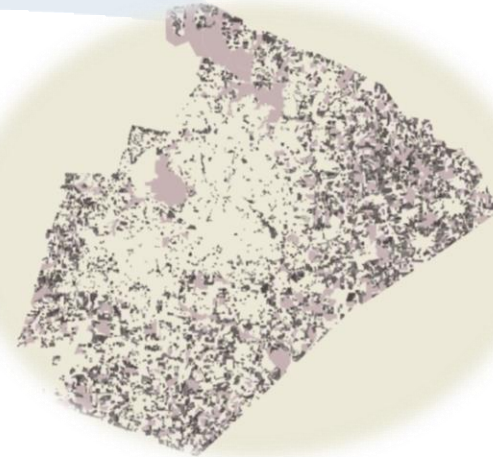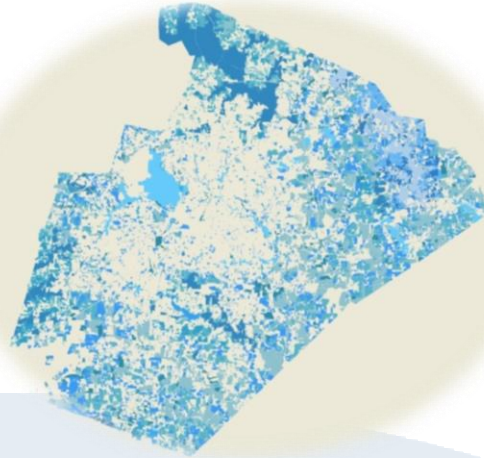
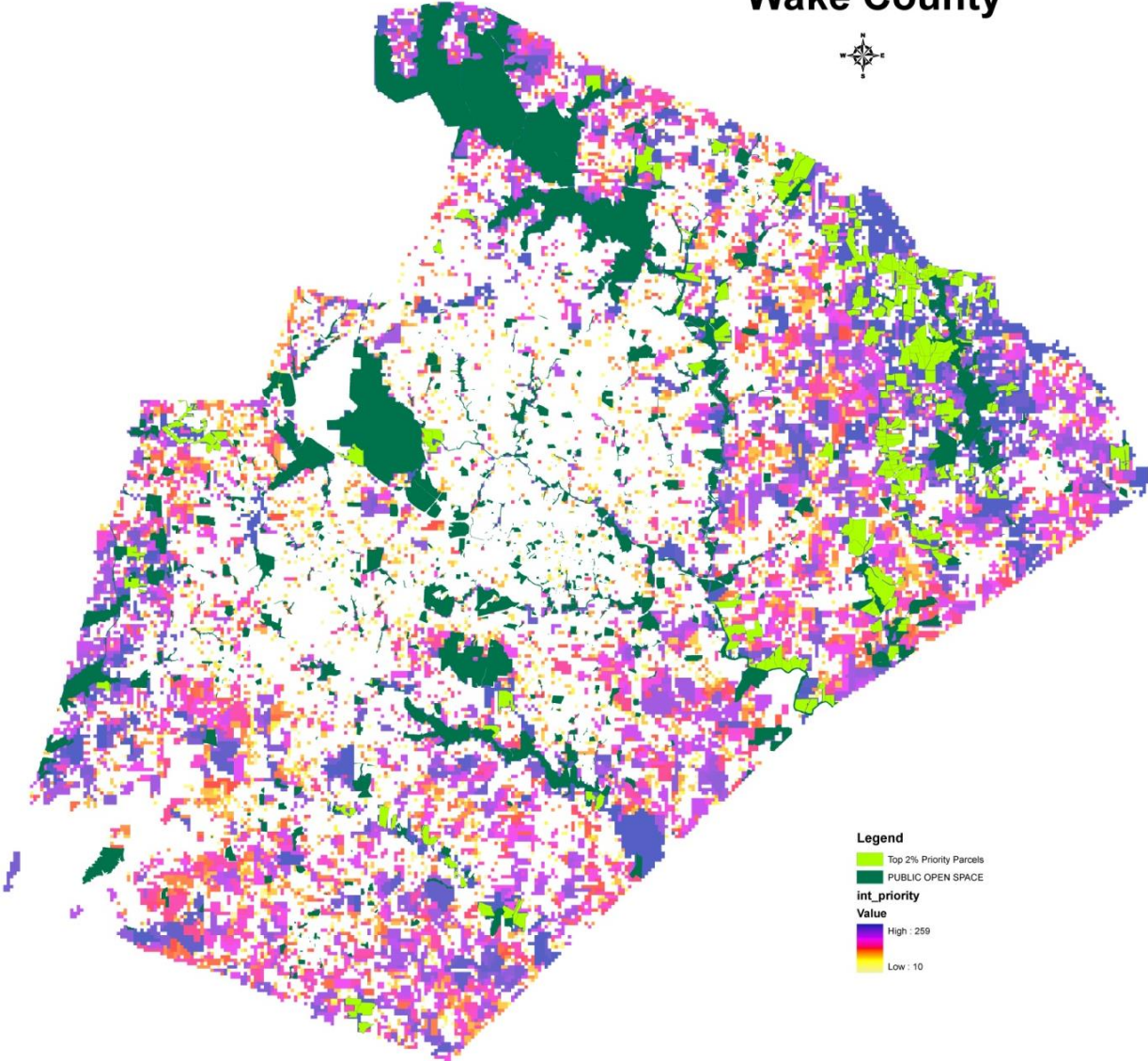Top 2% Prioritized Parcels
Parks, Recreation & Open Space
Wake County

Legend

Top 2% Priority Parcels
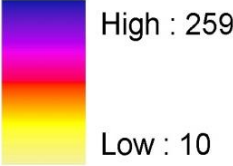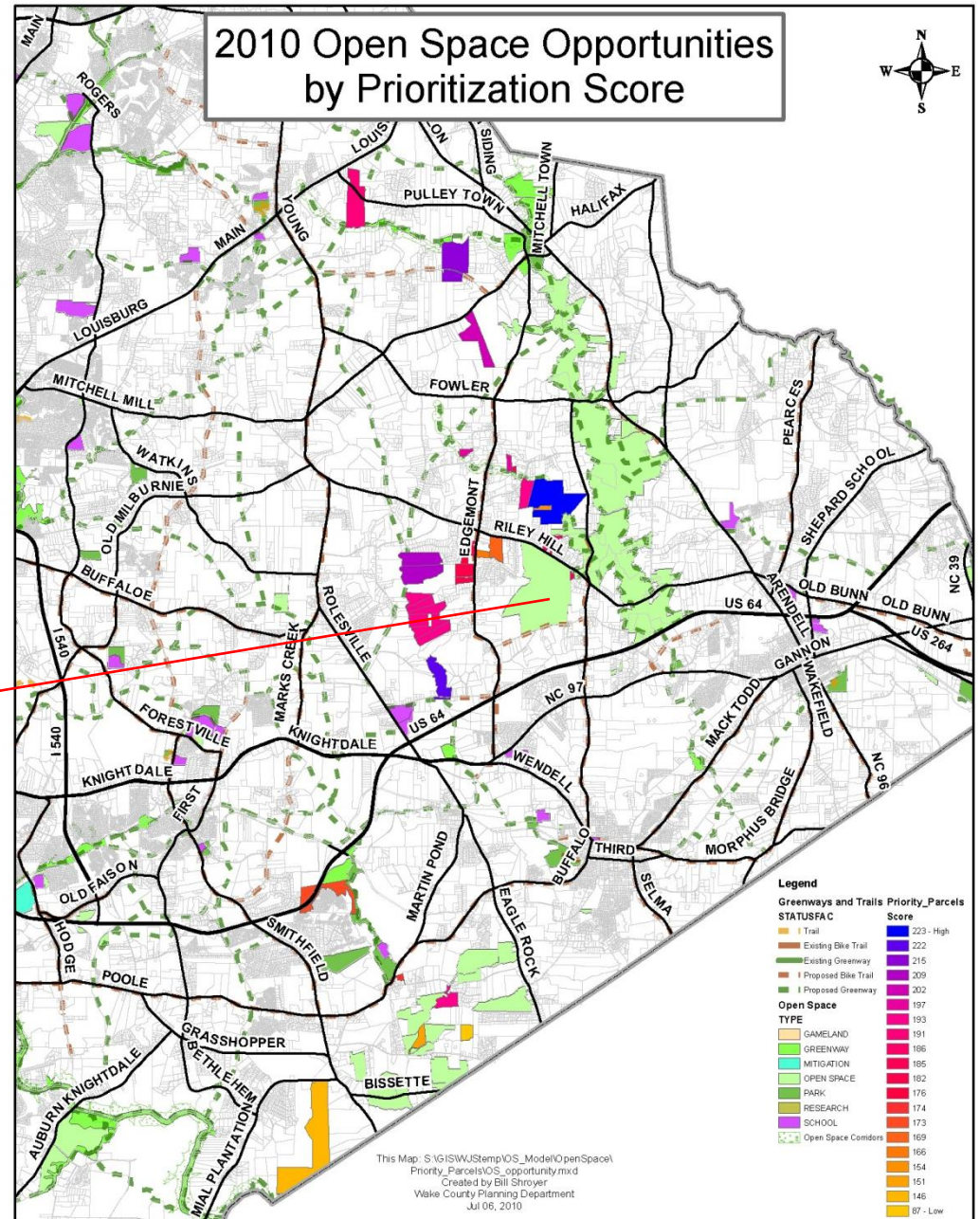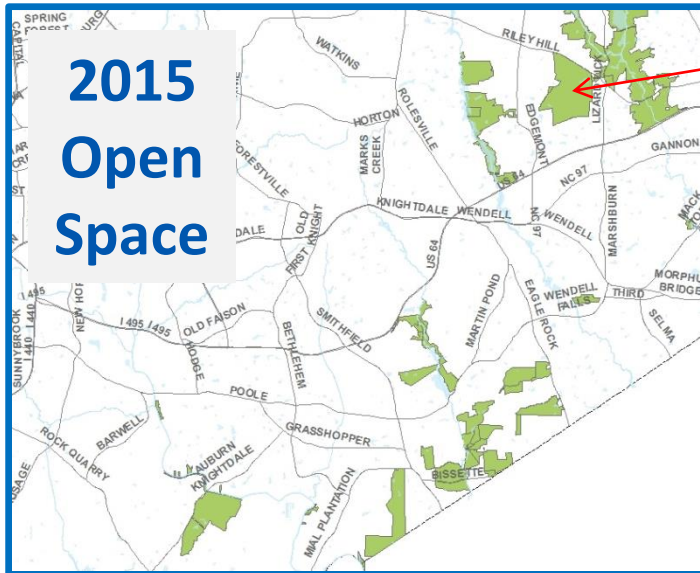
PUBLIC OPEN SPACE

int_priority

Value

High : 259

Low : 10

This Map: S:\GIS\WU\temp\OS_Model\OpenSpace\Prioritization_Final.mxd
Created by Wake County
Wake County Planning Department
Mar 09, 2010

Scores for Parcels under Consideration

2015 Open Space

2010 Open Space Opportunities by Prioritization Score

End Results

- **A tool that can be easily adjusted if criteria change**
- **Analytical method can be easily repeated to reflect current parcel inventory**
- **A rating scheme that can be applied to both parcels offered and parcels of interest**

Proactive vs. Reactive