The Anchor Strategy: Prioritization of the Western Reserve

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Abstract

The Western Reserve region encompasses nearly 4.3 million acres of land in northeastern Ohio and 165 miles of Lake Erie shoreline. Spanning 14 counties and 356 municipalities, the region is home to 4 million people. The high quality watersheds and exceptionally diverse habitats that characterize the Western Reserve are facing development pressures from urban sprawl.

Western Reserve Land Conservancy (WRLC) seeks to preserve the scenic beauty, rural character, and natural resources of the Western Reserve region through direct land protection. In order to effectively implement its land protection program, WRLC created the Anchor Strategy, a land protection prioritization model that identifies and prioritizes individual parcels based on specific ecological, agricultural, and scenic criteria.

The Anchor Strategy is a comprehensive regional plan that incorporates the key resources and priorities of numerous state agencies and local conservation organizations to identify the top ranking 1,250 properties in the Western Reserve. The prioritization of these properties represents the first critical step in implementing a regional land protection program that will allow WRLC to work with its conservation partners to contact landowners and develop conservation strategies for each priority property, ultimately resulting in tens of thousands of acres of preserved land in the Western Reserve.

Project Summary

Western Reserve Land Conservancy (WRLC) is a non-profit conservation organization that was formed in early 2006 as the result of a merger of eight land trusts in northeastern Ohio spearheaded by the former Chagrin River Land Conservancy (CRLC). WRLC seeks to preserve the scenic beauty, rural character, and natural resources of the Western Reserve region through direct land protection and promotion of the responsible use of land and water resources. In order to effectively implement a land protection program to preserve land in a strategic manner, WRLC first has to be able to identify and prioritize properties based on specific criteria at the parcel level. Modeled after Chagrin River Land Conservancy's Anchor Strategy, which formed the Ohio Department of Natural Resources- and Ohio Environmental Protection Agency-approved land protection

component of the Chagrin River Watershed Action Plan, this unique approach has only been completed in the Chagrin River watershed. It allowed CRLC to annually contact every prioritized parcel owner and develop a conservation strategy for each parcel.

Past experience has shown us that this approach to comprehensive watershed-based prioritization and land protection is highly effective. Utilizing this strategy in the Chagrin River watershed enabled CRLC to permanently preserve nearly 7,500 acres on 150 properties. In each of the last two years leading up to the merger into WRLC, CRLC exceeded 1,000 acres of preserved land, a pace never before realized in Ohio and a testament to the effectiveness of the Anchor Strategy. With a significantly increased service area, WRLC needs a similar strategy to direct our efforts in the most strategic and focused way.

The Anchor Strategy utilizes Geographic Information Systems (GIS) technology to identify large critical resource areas connected by corridors of protected properties. Because the large resource areas serve as "anchors" in the landscape, we call this the Anchor Strategy. The protected properties and parks form corridors of preservation throughout the Western Reserve region. From an ecological standpoint, corridors are not only important but also necessary for the movement of wildlife and the establishment of territories and nesting habitats. Corridors and large tracts of protected land also provide the greatest potential for groundwater recharge, filtering of nutrients and pollutants, and scenic beauty. Creating large tracts of protected, relatively undeveloped parcels has greater benefits than isolated pockets of protected lands. Focusing on anchors and the connections via corridors to other anchor properties will enable WRLC to connect the natural landscapes within the Western Reserve region to create the greatest ecological, agricultural, and scenic benefit and most manageable goals for land protection.

The Anchor Strategy was a two-year process that began with the acquisition of large datasets to map the key natural resources, agricultural, and scenic qualities of the Western Reserve region. Because Ohio lacks a clearinghouse of GIS data, WRLC had to create its own database from countless sources and establish a corresponding GIS server to house, analyze, and map the important features and data. Parcel level information is essential to the success of the Anchor Strategy and this data had to be acquired from each of the 14 county auditor's offices. At the end of the first year, we had acquired over 700 different data layers from reliable sources.

Once we started to collect and assemble data, we coordinated with numerous state agencies and conservation organizations that are responsible for facilitating the Lake Erie Protection & Restoration Plan to determine their priority areas and key resources that are essential to the health of Lake Erie and its basin. In addition, we met with local municipalities, park districts, watershed organizations, and other conservation organizations to facilitate the Balanced Growth Initiative in determining key conservation areas. Because these agencies and organizations have developed land protection and management strategies of their own, or are focused on the impacts of development, we are producing and implementing a unified Anchor Strategy that incorporates key resources and protection areas for the entire Western Reserve.

The second year of our project involved the configuration of the GIS server, software upgrades, and creation of unique toolboxes in ArcEditor software to build the Anchor Strategy model. We developed a list of 27 criteria that were then incorporated into the model using overlay analysis. For the first iteration of the plan, which is presented in this report, we ran the model on each of the 14 counties and ranked scores for every property. We selected the top ranking 1,250 properties over 50 acres size throughout the region to create our Land Protection Priority List (LPPL). Over the course of the next couple of months, we plan on working closely with our board and staff to ground truth these 1,250 properties and apply local knowledge. We will also evaluate the distribution of these priorities based on the locations of our central and field offices as well as any weights to criteria. We will run another iteration of the model at this time and will then share the final results with our state agencies and conservation partners so that we can begin to implement our strategic land protection program. The Anchor Strategy is a dynamic model that changes as new knowledge and data become available.

Introduction

The eight organizations that merged to form Western Reserve Land Conservancy in January 2006 did so to bring increased land protection capacity to the Western Reserve region. Chagrin River Land Conservancy, Bratenahl Land Conservancy, Firelands Land Conservancy, Headwaters Landtrust, Hudson Land Conservancy, Medina Summit Land Conservancy, Portage Land Association for Conservation and Education (PLACE), and Tinkers Creek Land Conservancy had a similar vision for a regional land trust that could preserve more land and resources in less time than if each of these organizations worked independently.

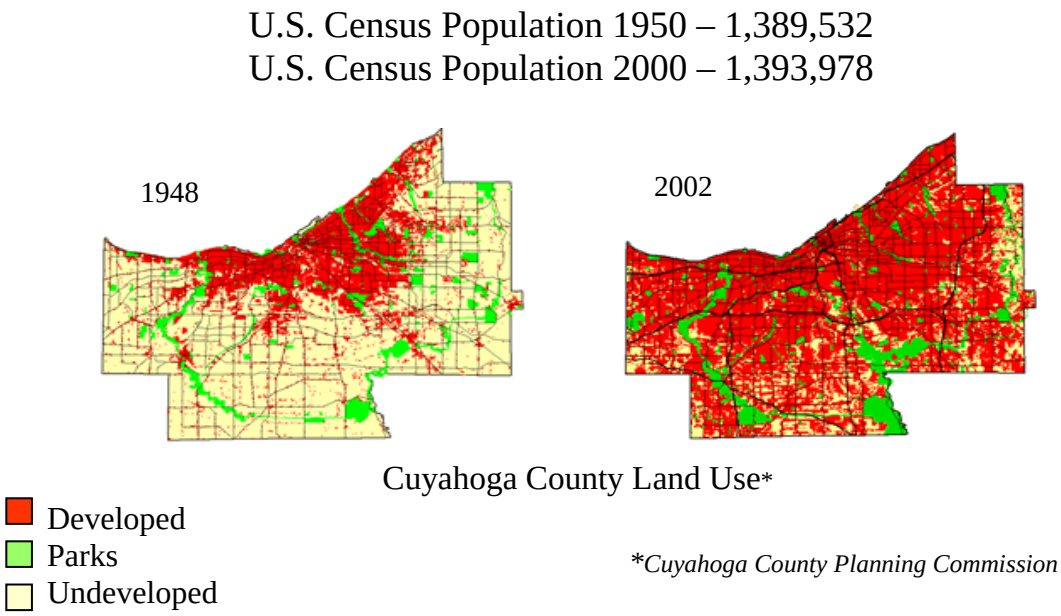
Western Reserve Land Conservancy operates in the 14-county Western Reserve region, which includes Ashtabula, Cuyahoga, Erie, Geauga, Huron, Lake, Lorain, Mahoning, Medina, Portage, Summit, Stark, Trumbull, and Wayne Counties. The region contains over 4.3 million acres of land with more than 4 million residents living in 356 distinct municipalities. This area includes all or parts of 16 different watersheds, 11 of which drain directly into Lake Erie. Over 165 miles of Lake Erie shoreline and nearly 40% of the Lake Erie basin are included in WRLC's service area.

High quality watersheds and exceptionally diverse habitats such as mature forests, prime agricultural land, glacial kettlehole lakes, emergent marshes, fens, and riparian corridor in rural, semi-rural, and urban landscapes characterize the Western Reserve region. But this unique landscape is facing intense development pressures from urban sprawl.

Urban sprawl is rapidly changing the face of northeastern Ohio and the Western Reserve. Low-density housing developments are emerging in communities throughout the region at a pace so staggering that one would think northeastern Ohio is experiencing a population explosion. To the contrary, the population of the region has experienced zero population growth, yet we've developed over 40% more land. This pattern epitomizes the

definition of urban sprawl. As defined by the Brookings Institution[1], a region is characterized as sprawling "if land is being consumed at a faster rate than population growth". One need not look further than Cuyahoga County to see this population trend. Figure 1 below shows the developed areas, undeveloped areas, and parks in Cuyahoga Counties between 1948 and 2002. The Emerald Necklace of the Cleveland Metroparks represents the majority of parkland in 1948, which grew only slightly by 2002. Developed areas only included the City of Cleveland and the inner ring of suburbs in 1948. By 2002, nearly the entire county is developed with virtually no change in population.

Figure 1. Cuyahoga County Population and Land Use.



The rate at which northeastern Ohio is developing far outpaces the region's land and water protection successes. As this kind of indiscriminate and unplanned development continues, the region's economic and environmental resources are being degraded and destroyed. Additionally, a region's physical growth affects its economic growth; more compact development increases economic productivity. Between 1982 and 1997 northeastern Ohio's (Cleveland-Akron-Lorain) residential density decreased by approximately 23.8%, while the amount of urbanized land increased 31.7%. During this time period the population of the region increased by less than one half percent[2]. This dispersal of the region's population has thinned the tax base while increasing the need for infrastructure and community services, such as roads, sewers, schools, police, etc.

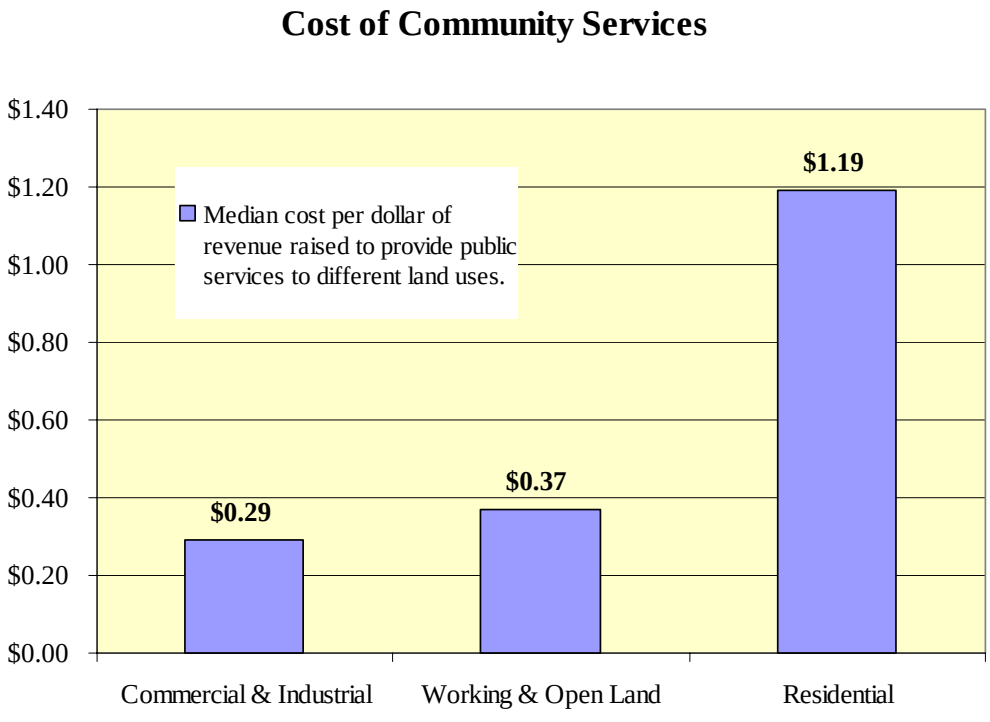
[1] Fulton, William; Pendall, Rolf; Nguyen, Mai; Harrison, Alicia, July 2001, "Who Sprawls Most? How Growth Patterns Differ Across the U.S.," Survey Series, The Brookings Institution Center on Urban & Metropolitan Policy, pages 3 and 19.
[2] Fulton, William; Pendall, Rolf; Nguyen, Mai; Harrison, Alicia, July 2001, "Who Sprawls Most? How Growth Patterns Differ Across the U.S.," Survey Series, The Brookings Institution Center on Urban & Metropolitan Policy, pages 3 and 19.

Growing suburbs struggle to keep up with the growing demand, while the dwindling populations of the urban core and older suburbs struggle to maintain existing infrastructure and services, ultimately draining the wealth of the region.

Increased development and the resultant loss of natural resources lead to increased impervious cover (e.g. rooftops and roads) and the destruction of streams and wetlands. Combined, these impairments cause direct storm water impacts such as increased storm water runoff and flooding, decreased infiltration and hindered aquifer recharge, and increased erosion and sedimentation. These threats have economic as well as environmental implications and underscore the need to protect land at a watershed level and regional scale.

Cost of Community Service Studies (COCS) show that low density residential land use requires more tax dollars to provide community services than is generated by taxes and is an overall net drain on local government budgets. A mix of farms and natural areas are necessary to help balance the deficit created by subdivisions and residential land use. Adjacency or proximity to parks and preserves has been shown to increases property values and therefore the tax dollars that can be generated. Figure 2 represents a COCS study by the American Farmland Trust [3] that shows that for every dollar of revenue generated from residential properties, it costs the community $1.19 to provide services to those properties. Working farms and open land, however only cost the community $0.37 for every dollar generated.

Figure 2. Cost of Community Services Study by American Farmland Trust



[3] American Farmland Trust, Farmland Information Center. Fact Sheet: Cost of Community Services Studies, August 2006.

WRLC's goal is not to stop development, but rather to influence patterns of development so that permanently preserved natural areas are woven throughout the fabric of the Western Reserve. We envision large areas, or anchors, of protected land such as parks and public lands, farms and family properties, connected by preserved corridors. There currently exist approximately 230,000 acres of parks and preserved land in the Western Reserve region. We hope that by identifying and prioritizing properties, we can work with our conservation partners to double this figure over the next 20 years.

Land conservation is an extremely time consuming process and we have found that the current structure of the conservation community in the region simply cannot address land and water protection needs. By prioritizing the entire region at the parcel level, we will be expediting the land protection process. Once the planning process is complete, the most important ecological, agricultural, and scenic properties will have been identified. State agencies and conservation organizations can begin to proactively protect these properties. Landowners can be contacted and cultivated, and individualized conservation strategies can be developed.

WRLC follows a tri-fold land protection process: identify, protect, and steward. The first step in the land protection process is to identify and prioritize properties based on their high quality characteristics. The identification and subsequent ranking of priority properties allows us to proactively contact, cultivate, and ultimately work with landowners to protect land. WRLC utilizes many different land protection tools in which to protect land. WRLC purchases or accepts donations of conservation easements, we partner with public entities to pre-acquire land, which we then transfer to public entities with passive park conservation easements, and we also purchase and sell conservation properties through our conservation buyer program. The final step in our land protection process is to steward the lands we have preserved in perpetuity. The identification phase of this tri-fold process provides the foundation for our land protection program and is essential to our success.

Our goal with the Anchor Strategy is to create a comprehensive regional land protection model that will facilitate the creation of an extensive network of permanently preserved properties throughout the Western Reserve region by providing information that can be immediately implemented by conservation organizations. The Anchor Strategy model and the resulting Land Protection Priority List (LPPL) is grounded in the goals of the Lake Erie Protection and Restoration Plan and the Balanced Growth Initiatives as it is representative of all partnering and collaborating state agencies and conservation organization's priorities.

Activities and Timeline

The Anchor Strategy was a two-year process beginning in January 2006 and concluding in early 2008. The following is a simplified outline of the activities and timeline.

YEAR ONE (2006 CALENDAR YEAR):

1. Data collection: We spent a large portion of the first year collecting GIS data from a variety of different sources around the state. We gathered parcel information and other base data from each of the county auditors, aerial photographs from county engineers, and ecological and agricultural data from countless state agencies and conservation organizations. We also consulted with regional experts about the sources and validity of some of the data.

2. Data creation: Not all counties have digital parcel information available, such as Portage County. A 100-acre grid system was created for those portions of the county that lack digital parcel information. Ashtabula County has their parcel information in CAD format, but we were able to work with ODNR to obtain the GIS shapefiles that they created and joined them to a table of landowner and parcel information. We were able to acquire parcel information for each of the remaining 12 counties through the individual county auditor's offices.

3. Data reconciliation and projection: The GIS data layers were compared to aerial photos and other manual means of verification to validate the electronic data. All data were projected into State Plane 1983, Ohio North, Feet.

4. Coordination and collaboration with partners: We met with representatives from ODNR – Division of Wildlife, ODNR – Division of Wildlife's Fish Management, ODNR – Division of Natural Areas and Preserves, ODNR – Division of Surface Water, ODNR – Division of Forestry, ODNR – Division of Soil and Water Conservation, ODA – Office of Farmland Preservation, ODNR – Office of Coastal Management, OEPA – Cuyahoga RAP, and OEPA – Black River RAP to discuss the Anchor Strategy and how it relates to the Lake Erie Protection & Restoration Plan and to gather information on their priority areas and data. We also collaborated with many of the county park districts and other conservation organizations.

5. Determine criteria: We developed our list of 27 criteria for the Anchor Strategy based on our meetings with the state agencies and conservation organizations as well as the available data. The criteria fall into three basic categories: ecological, agricultural, and scenic.

YEAR TWO (2007 CALENDAR YEAR AND EARLY 2008):

1. GIS Hardware and software: In 2007 we purchased a dedicated enterprise GIS server to house all of the data we collected. We also upgraded our software to ESRI's ArcEditor. In order to make use of the full functionality of the GIS server once it was configured, we had to take all our 700+ GIS shapefiles and convert those into feature classes within a geodatabase and create separate file geodatabases for each county.

2. Methodology: We developed the basic framework for our methodology based on CRLC's Anchor Strategy project in the Chagrin River watershed and from a prioritization project that CRLC completed in Medina and Summit Counties, both of which utilized overlay analysis using GIS. For the criteria that covered large areas, we wanted to calculate the percentage of each property that contained that particular feature or criteria. We worked with computer programmers to develop ArcToolbox tools that automate the steps involved in calculating scores for the percentage of each property that contains each criterion. For the criteria that consisted of point locations, we simply determined presence or absence. Within ArcToolbox, we also wanted to build a tool that would allow us to easily add and change weights to all of the criteria. The programming of 27 individual tools for each of the 14 counties took much longer than expected, primarily because the tools were first created in an old version of ArcGIS that is not fully compatible with ArcEditor 9.2.

3. Perform regional modeling: The new ArcToolbox tools allowed for quick modeling of the Anchor Strategy. We ran the model on a county by county basis because our parcel information came from individual county offices and formats vary from one county to the next. While running the first pass of our model, we encountered many errors in parcel topology and geometry that had to be repaired. We also discovered that certain parcels are represented as on-contiguous polygons, which caused the initial scores to be skewed. We had to reprogram approximately half of our tools to correct this problem. Finally, we ran the model with no problems in each of the 14 counties and compiled the results. We decided to only look at those properties whose acreage was 50 acres or more and then we used natural breaks in three classes on the top ranking 1,250 properties to create our LPPL.

4. Create Land Priority Protection List (LPPL): After running several passes of our model using all parcels, we developed a final Land Protected Property List (LPPL) of the top ranking 1,250 properties.

5. Refine LPPL list: The LPPL from our first iteration is presented in this report. During the first two months of 2008, however, we will also distribute the LPPL to WRLC staff and field directors for ground truthing. The staff and directors will apply local knowledge and experience to the list and provide recommendations and corrections for incorporation into the LPPL. We will continue to go through this process with our board members as we become more familiar with the properties on the LPPL. Because WRLC's service area is divided into 5 separate field regions based on the field directors who manage land protection projects, we may further refine the list to include an equal number of properties in each area, which will facilitate contacting landowners. From our initial LPPL, we have identified High, Medium, and Low Priority properties based on their overall scores.

6. Distribution: We will distribute the results of the Anchor Strategy to the WRLC staff and board members for their input in early 2008. We will also begin distributing the results to our state agencies and local conservation organization partners for their feedback and input. The Anchor Strategy is a dynamic model that changes as more information becomes available about priority properties and as properties are preserved or developed.

Data

We spent a large portion of the first year of this project acquiring GIS data from numerous sources. Because WRLC seeks to protect the natural resources, scenic beauty, and rural character of the Western Reserve region, we sought data that would support these three basic approaches to our land protection program: ecological, agricultural, and scenic qualities of land. Because Ohio lacks a clearinghouse of GIS data, we had to create our own. Please see Appendix A. for a spreadsheet of all the data collected.

The first step was to acquire all the base information from each of our 14 county auditor's offices. Each office was able to provide us with data concerning parcels, roads, municipal boundaries, utility lines, topographic or contour lines, detailed hydrography, aerial photographs, and other base data upon which we could examine the ecological, agricultural, and scenic qualities of the region. The Anchor Strategy requires parcel-level information so that we can identify ownership of each high quality property in order to contact landowners, develop conservation strategies, and effectively implement our land protection strategy.

Portage County provided a bit of a challenge in that the county has not yet completed its creation of digital parcel information. The City of Aurora provided some digital parcel information. Additional work had been done by Kent State University and they provided the property boundaries without any corresponding landowner or parcel number information for approximately 2/3 of the county. We will able to use plat books to determine the landowner names of those parcels that ranked highly in the Anchor Strategy and from there, we can go online to the Portage County website to acquire parcel numbers for those properties. In order to prioritize the remainder of the county, we created a 100-acre grid system using the Fishnet extension in ArcGIS.

Ashtabula County has their parcel information in CAD format, but ODNR had converted those to GIS shapefiles, which they shared with us. We obtained a table of landowner and parcel information that we were able to join to the shapefiles.

Cuyahoga County is currently working to update all of their digital parcel information, which we expect to have sometime in 2008. In the meantime, we used the latest available parcel information for the county. To double check the accuracy of those properties identified in the Anchor Strategy, we will be able to go online to the Cuyahoga County website and update any landowner information.

Wayne, Huron, Portage, and Stark Counties had many topology errors that had to be corrected before any analyses could be run. In a few instances, the problems were so great that a few small parcels had to be eliminated from the dataset. Because the majority of the county offices use simplistic shapefiles instead of geodatabases or feature classes, they are unaware of these problems in geometry and topology, which tend to show up in any advanced analyses using feature classes and geodatabases.

In searching for ecological data to support the Anchor Strategy, we coordinated with all of our state agencies to acquire such information as groundwater resources, groundwater pollution potential, wetlands, 1:24000 streams, watersheds, digital elevation models (DEMs), natural heritage species and community data, floodplains, forest legacy areas, coastal wetlands, coastal butterfly breeding areas, coastal breeding bird habitats, and soils. We worked with many local conservation organizations and park districts to acquire other data including parks and conservation easements and important bird areas. We also used the National Land Cover Data Model to map 500+ acre blocks of deciduous forest cover and used the DEM of Ohio to derive steep slopes over 12%.

Agricultural data is, by and large, difficult to find in Ohio because many of the agricultural features such as granary locations and farming infrastructure have not been mapped. In order to capture agriculture in the Anchor Strategy, we looked at the locations of existing farms preserved through the state's agricultural easement purchase program (AEPP) as well as prime farmland soils as designated by the Natural Resource Conservation Service (NRCS). Finally, we used the National Land Cover Data Model and mapped 500+ acre blocks of cultivated crops.

Scenic data included information from Ohio's Historic Preservation Office such as archeological sites, Ohio historic places, and the national register. Also, two important scenic byways traverse the Western Reserve region: the Lake Erie Coastal Scenic Byway and the Ohio & Erie Canal Scenic Byway.

All of the data necessary for this project are housed in WRLC's enterprise GIS server. ESRI's ArcEditor was used to identify and prioritize the Western Reserve region. The data are projected in State Plane 1983, Ohio North, Feet. The following table provides a brief description of the each of the 27 criteria and corresponding data sources used.

Table 1. GIS Data

DATA LAYER	SOURCE	DESCRIPTION
1. Existing Parks and Preserves	DNAP, local park districts and communities	Locations of existing parks and preserves
2. WRLC Conservation Easements	WRLC	Locations of WRLC conservation easements
3. Lake & Reservoir Frontage	County auditors and NOACA	Major lakes and reservoirs (not ponds)

4. River & Tributary Frontage	1:24000 streams from NHD	Major rivers and tributaries
5. Wild-and Scenic-Designated Rivers	DNAP's Scenic Rivers program	Portions of the Grand, Upper Cuyahoga, and Chagrin Rivers
6. 100-year Floodplain	County auditors and ODNR	100-year floodplain
7. Groundwater Pollution Potential	ODNR – Division of Water	Groundwater Pollution Potential >= 160 (measures groundwater vulnerability to pollution)
8. Groundwater Resources	ODNR – Division of Water	Groundwater Well Yields >= 100 GPM
9. Wetlands	ODNR – Division of Wildlife and Natural Resources Conservation Service (NRCS)	Ohio wetlands inventory, Davey Resource inventory of Summit County, and Portage County pristine wetlands inventory.
10. Hydric Soils	NRCS SSURGO	Hydric soils and soils with hydric inclusions
11. Forest Cover	National Land Cover Data Model (NLCD) 2001	500+acre blocks of deciduous forest cover, Portage County pristine woodlands inventory
12. Forest Legacy Areas	ODNR - Division of Forestry	Forest Legacy Areas – portions of Ashtabula and Trumbull Counties
13. Natural Heritage Database	ODNR – Division of Natural Areas and Preserves	Ohio's rare, threatened, and endangered species and communities
14. Audubon Important Bird Areas (IBA)	Audubon Ohio	Audubon's designated Important Bird Areas (sites that provide essential habitat for birds)
15. Steep Slopes >= 12%	ODNR – Division of Geological Survey	Slopes greater than or equal to 12% derived from DEM of Shaded Elevation
16. Coastal Butterfly Breeding Areas	ODNR – Office of Coastal Management	Monarch butterfly habitat along coastal Lake Erie
17. Significant Coastal Breeding Bird Habitat	ODNR – Office of Coastal Management	Significant bird habitat along coastal Lake Erie
18. Coastal Wetlands	ODNR – Office of Coastal Management	Significant wetlands along coastal Lake Erie
19. Prime Wetlands	ODNR – Office of Coastal Management	Prime wetlands identified by ODNR that are not protected

20. AEPP Farms	ODA – Farmland Preservation Office	Mapped locations of all the state's Agricultural Easement Purchase Program farms from list of parcel numbers from ODA
21. Prime Agricultural Soils	NRCS SSURGO	NRCS-designated prime farmland soils
22. Agricultural Blocks	National Land Cover Data Model (NLCD) 2001	500+ acre blocks of cultivated agricultural crops
23. Lake Erie Coastal Scenic Byway	National Scenic Byway Program, ODNR – Office of Coastal Management	Lake Erie Coastal Scenic Byway
24. Ohio & Erie Canal Scenic Byway	National Scenic Byway Program, National Park Service	Ohio & Erie Canal Scenic Byway
25. Archeological Sites	Ohio Office of Historic Preservation	Mapped locations of archeological sites
26. Ohio Historic Places	Ohio Office of Historic Preservation	Mapped locations of historic places
27. National Register	Ohio Office of Historic Preservation	Mapped locations of national register sites

Methodology

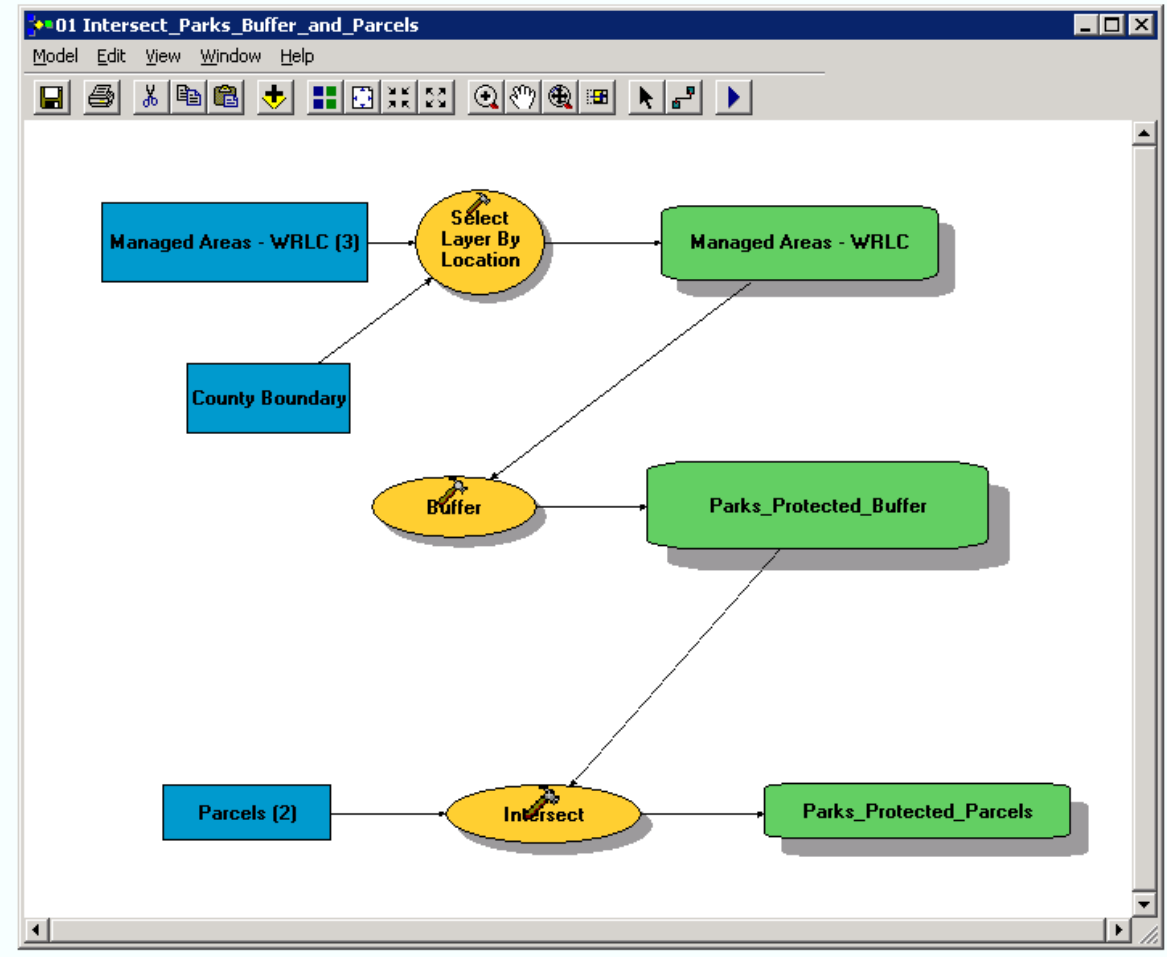
After determining the 27 criteria for the Anchor Strategy and preparing the necessary data, we wanted to develop an objective, quantifiable way to score each property based on its presence, absence, total coverage, or adjacency to every criteria. We hired consultants from EnSafe to reprogram a custom set of tools we had designed several years ago for the former Medina Summit Land Conservancy. Using ArcEditor with Visual Basic programming language, the consultants programmed individual toolboxes within ArcToolbox to score every parcel in each county based on its presence, absence, total coverage, or adjacency to criteria using overlay analysis.

We developed a map project for each of the 14 counties that included the reference data layers of the 27 criteria with consistent names in each project, custom toolboxes within ArcToolbox, and a new table called Parcels_County to which scores were written. The Parcels_County table in each county contains the permanent parcel numbers and fields for scoring each of the 27 criteria and a field for the overall total score. Each of the 27 criteria had its own custom toolbox to automate and accelerate the process of overlay analysis.

For three of our criteria, we wanted to examine the adjacency of each property to properties that have already been preserved as parks, conservation easements, or agricultural easements. By preserving a property that is immediately adjacent to a protected property, we will automatically add to an existing block of preserved land.

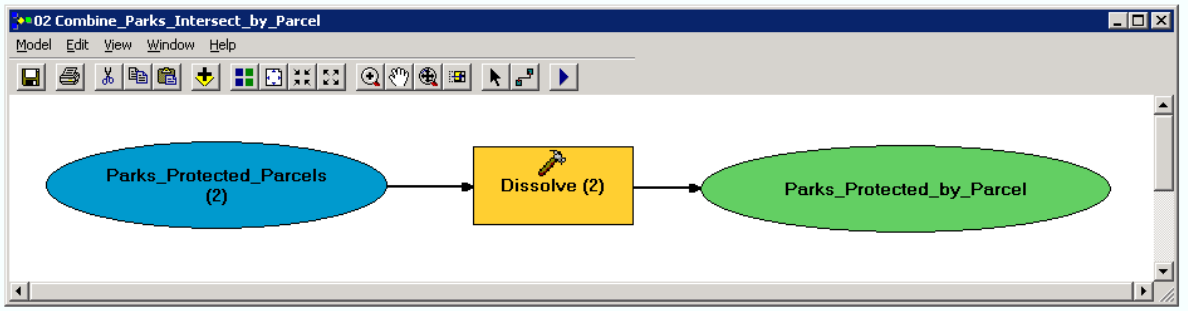
From an ecological standpoint, corridors and large blocks of land are not only important but also necessary for the movement of wildlife and the establishment of territories and nesting habitats. Corridors and large tracts of protected land also provide the greatest potential for groundwater recharge, filtering of nutrients and pollutants, and scenic beauty. Creating large tracts of protected, relatively undeveloped parcels has greater benefits than isolated pockets of protected lands.

For example, in order to quantify adjacency of properties to existing parks, we developed a tool that first selects all of the parks and managed areas within the county boundary and creates a 43.56-foot buffer around the perimeter of each park, which generates a new feature class called Parks_Protected_Buffer. The tool then takes the Parks_Protected_Buffer layer and intersects it with the parcels layer for that county, which generates a new feature class called Parks_Protected_Parcels that contains the park and parcels that fall within the area of intersection created by the buffer. See Step 01 of the tool below for a diagram of the tool with its inputs in blue, tools in yellow, and outputs in green.

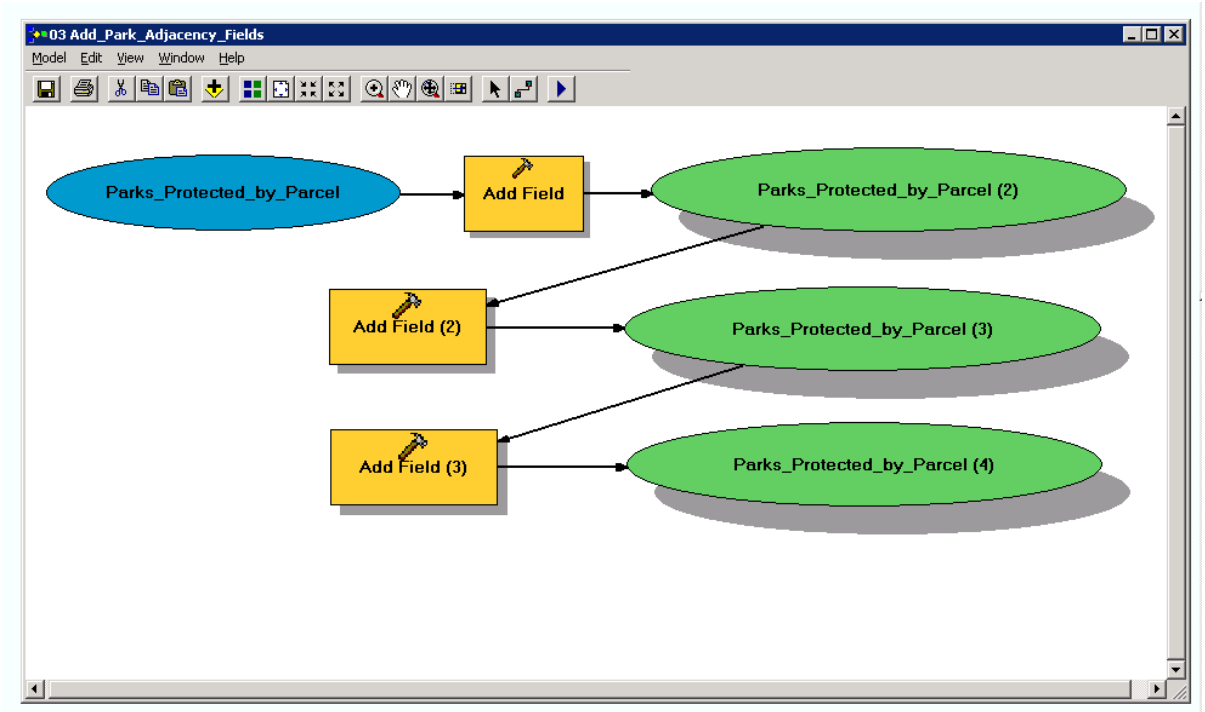


Following this first step, a dissolve is then performed on the Parks_Protected_Parcels layer to combine all the polygons created for that parcel that resulted from the

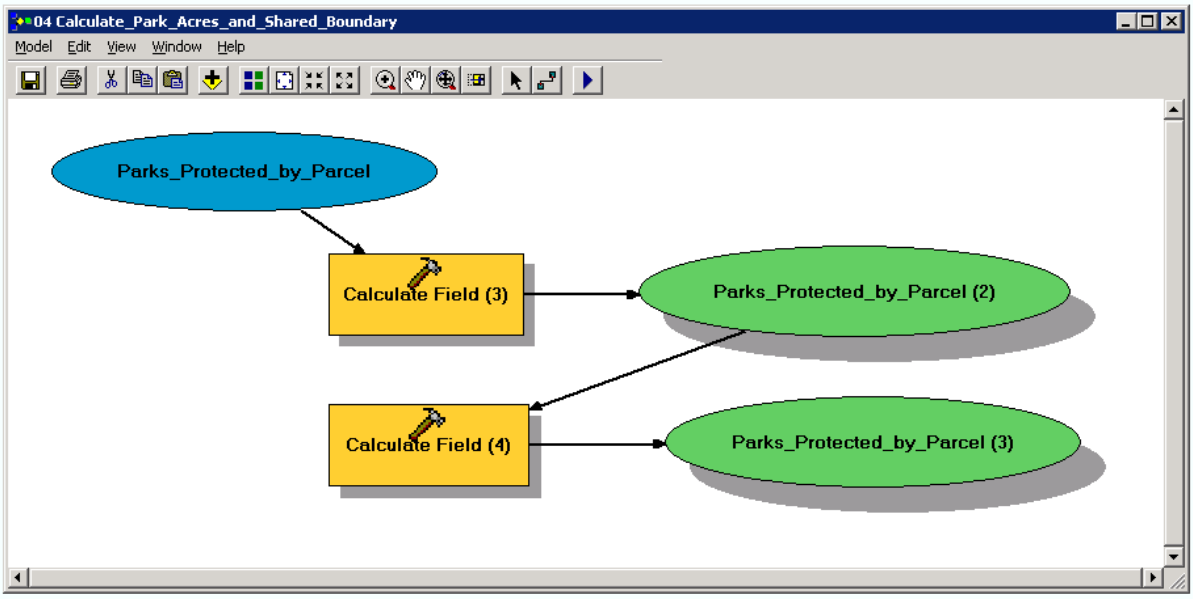
intersection with the buffer around the adjacent park. The dissolve operation uses the permanent parcel number to create a new feature class called Parks_Protected_by_Parcel. See Step 02 below:



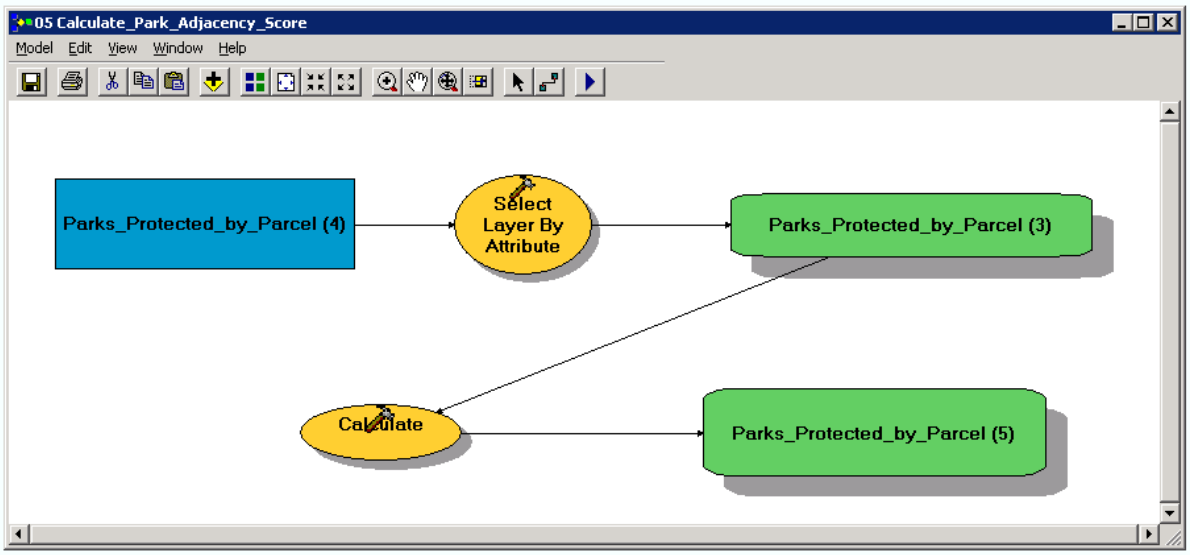
In the third step, three fields are added to the newly created Parks_Protected_by_Parcel layer. These fields include an Acres field for the area of intersection, a Length field for the length of the shared boundary between the park and the adjoining property, and a Score field for a percentage of the property's adjacency with the park. See Step 03 below:



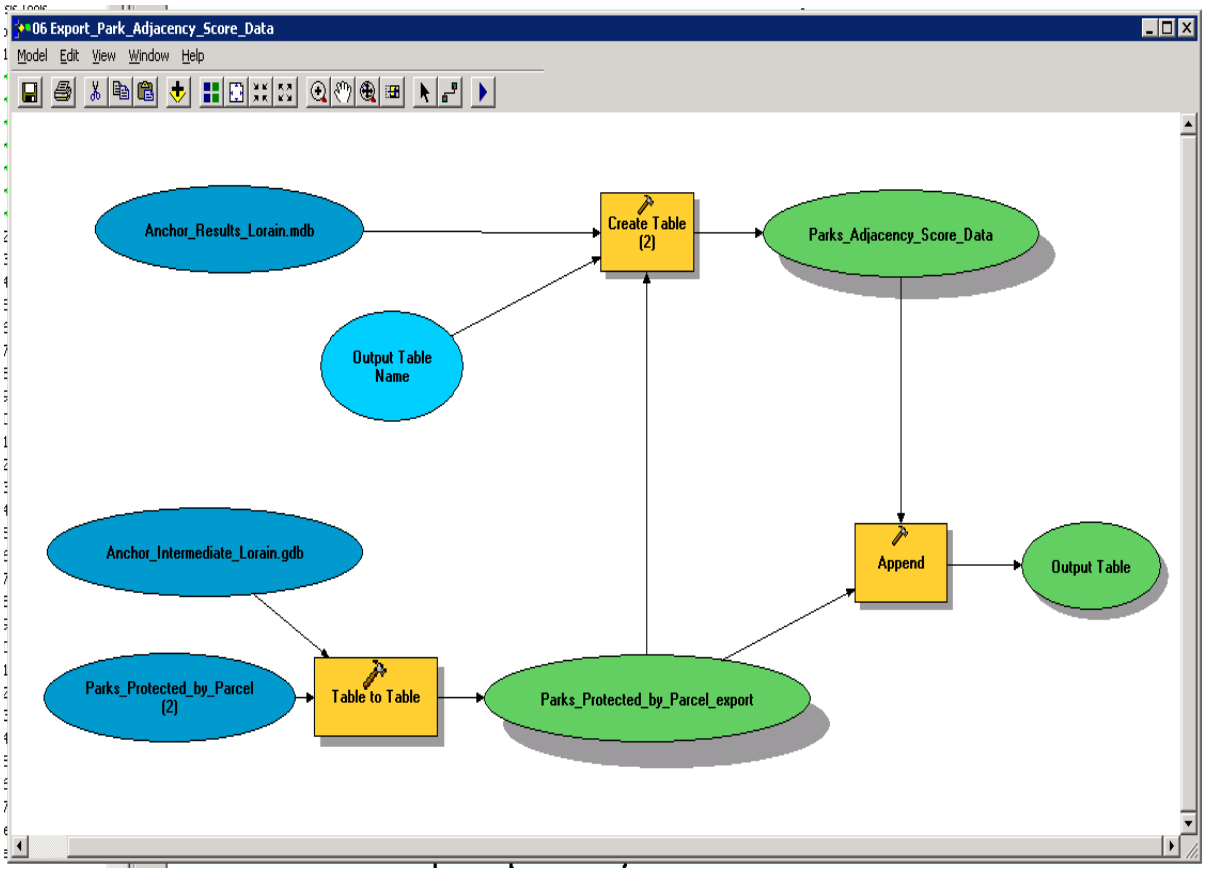
In the fourth step, the Acres and Length fields are calculated and their resulting values are added to the Parks_Protected_by_Parcel table. See Step 04 below:



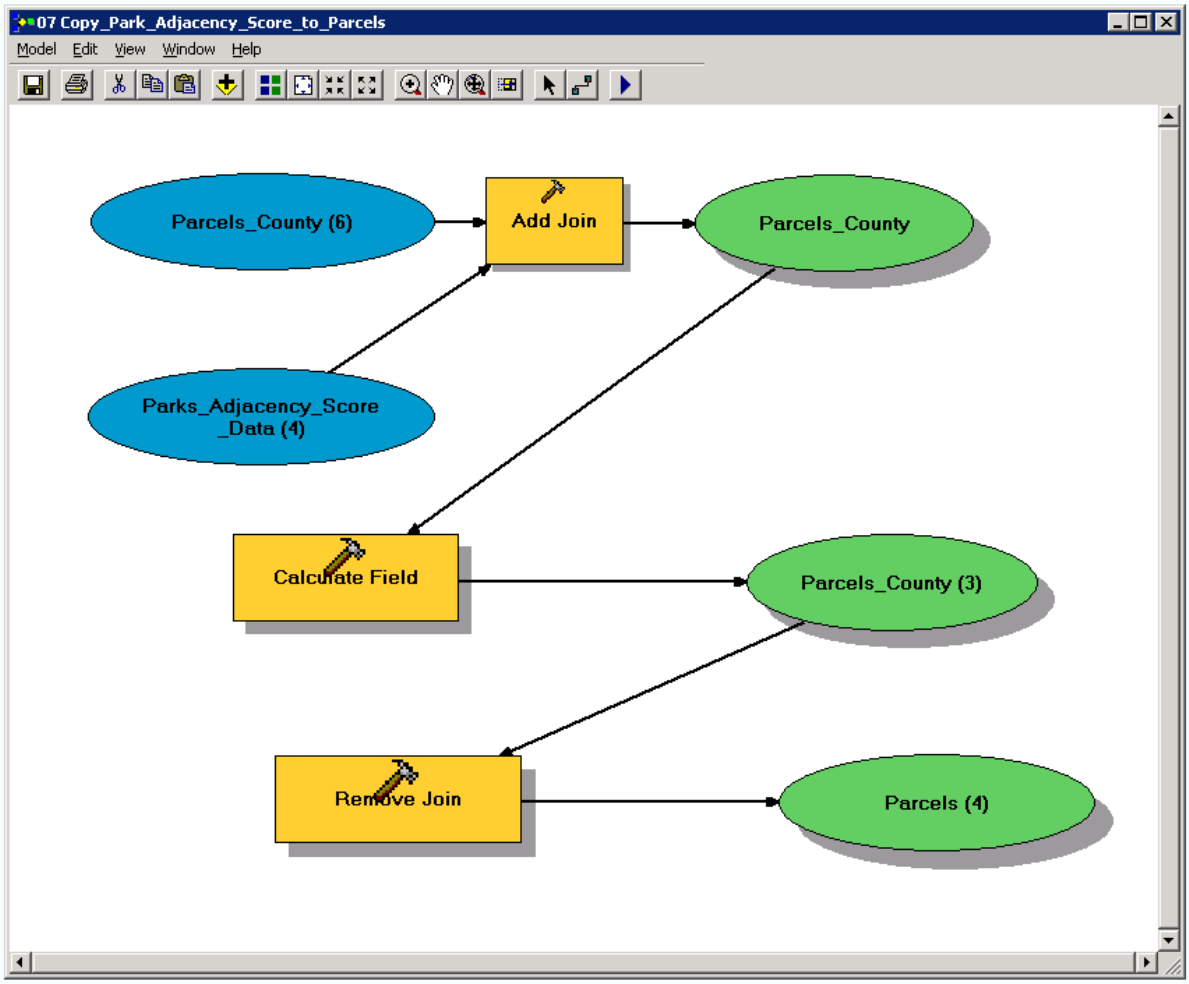
In the fifth step, the Score field is calculated using the following the formula: ([Area of intersection in acres]/ [Total acres of the property]) * 100. This represents the area of intersection of a property with the adjoining park buffer as a percentage of the property's total acreage. See Step 05 below:



In the sixth step, the a new table is created using only those properties whose Score is greater than zero. The new table, called Parks_Protected_by_Parcel_export is exported to a personal geodatabase for that county. A new table, called Parks_Adjacency_Score_Data, is created within the personal geodatabase and is then appended with values from the exported table. See Step 06 below:



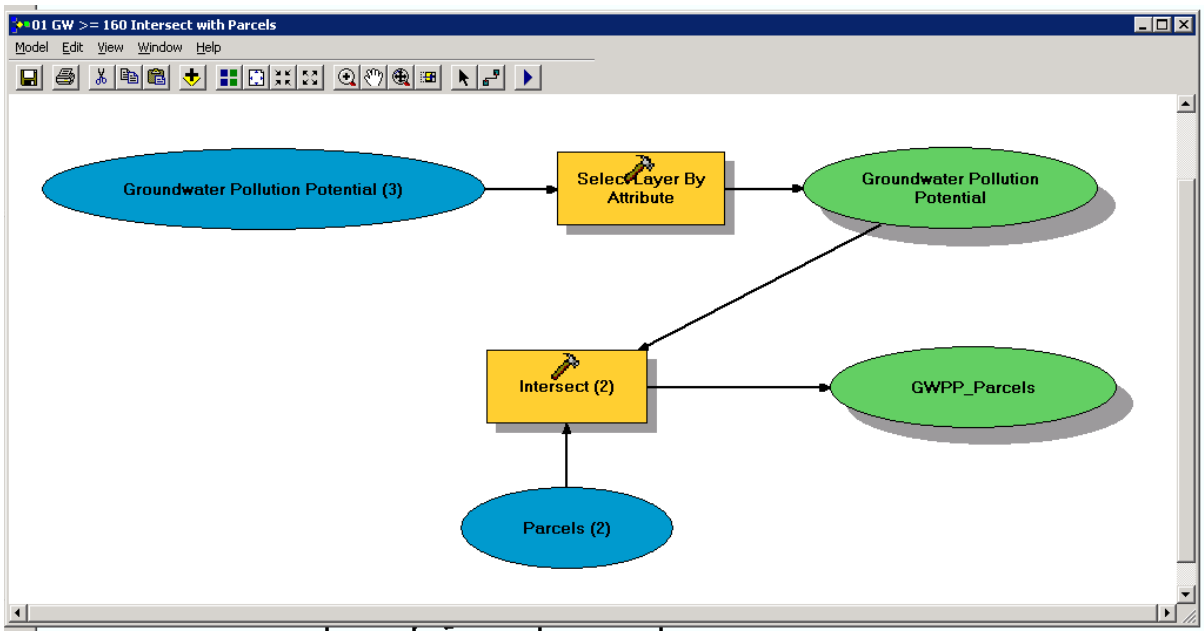
In the seventh and final step of the tool, the newly created Parks_Adjacency_Score_Data table is joined to the Parcels_County layer by the Parks_Adj score field. All properties that do not contain a score, and are therefore not adjacent to a park, are given the value of zero in the calculation step. Finally, the join is removed between the two tables. See Step 07 below:



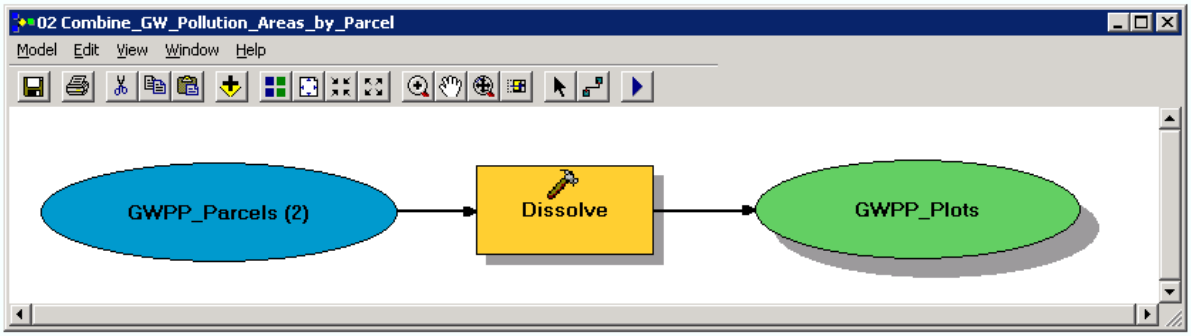
Because we wanted to examine the adjacency of properties to parks as well as to that of WRLC conservation easements and the state AEPP farms, we created identical tools for the conservation easements and AEPP criteria.

For many of the criteria that cover discrete areas, we wanted to determine the exact acreage of each feature that was present on each property. For wetlands, rivers and streams, wild and scenic rivers, lakes and tributaries, hydric soils, agricultural soils, groundwater pollution potential, deciduous forest cover, 100-year floodplain, steep slopes, and agricultural row crops, a tool was developed for each that first calculates the acreage of each feature for every property and then calculates this acreage as a percentage of the property's overall acreage. This percentage becomes the parcel's score for every criterion.

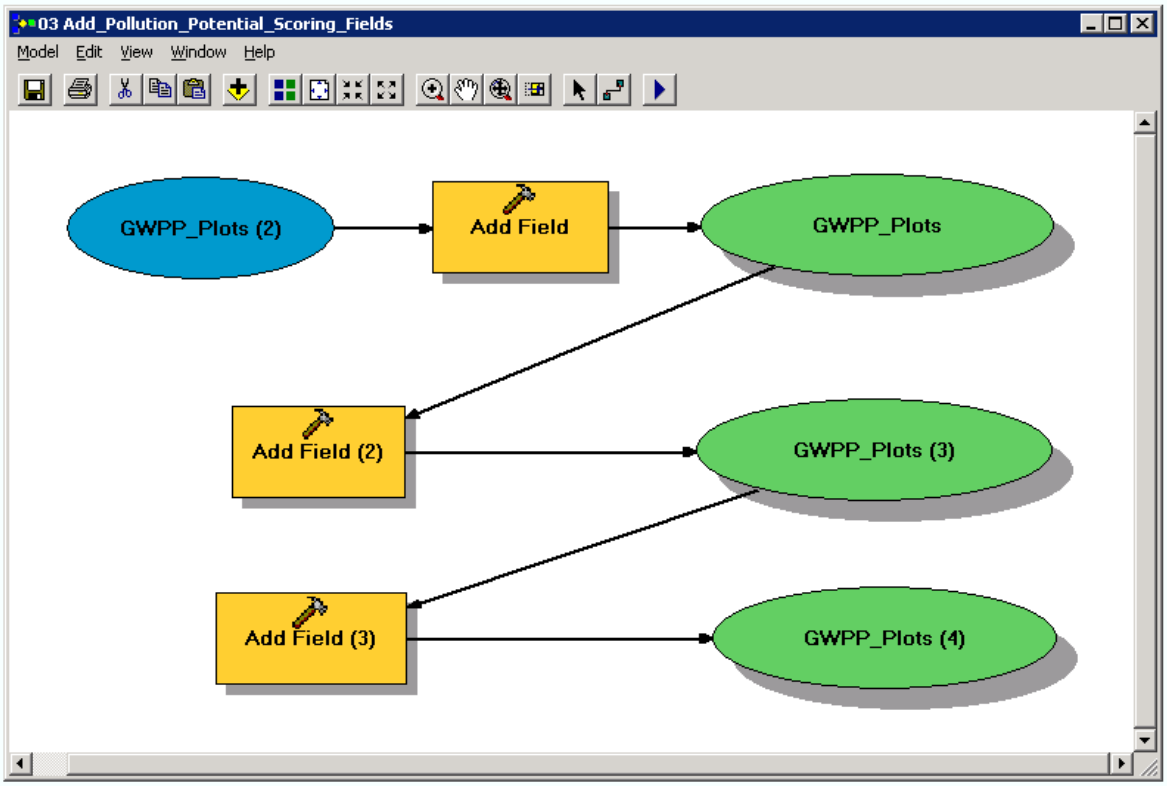
For example, for groundwater pollution potential we wanted to examine those properties that have a groundwater pollution potential number (POLN) greater than or equal to 160 because this indicates areas of high vulnerability to groundwater pollution. In the first step of the tool, all groundwater pollution potential areas where POLN is greater than or equal to 160 are selected. The tool then intersects these selected areas with parcels to generate a new table called GWPP_Parcels. See Step 01 below:



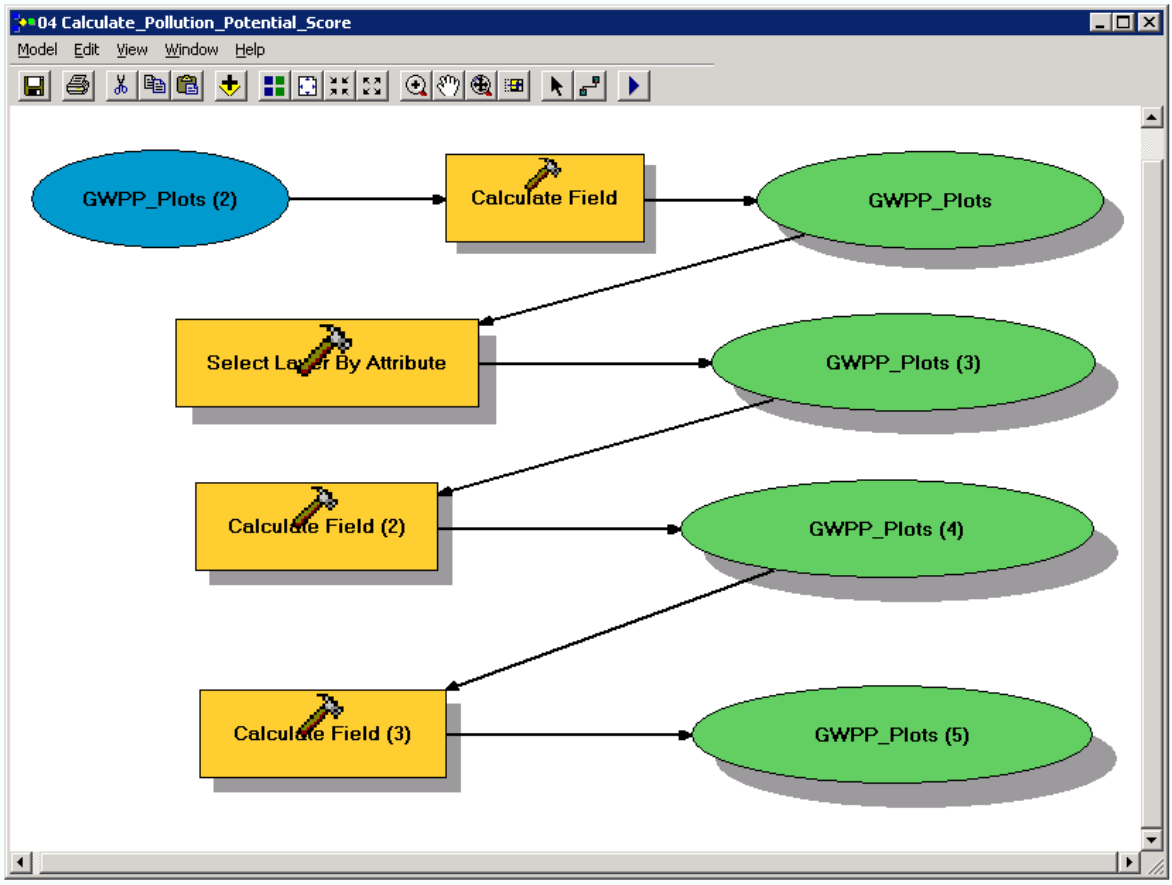
In the second step, a dissolve is performed on the GWPP_Parcels so that if a property intersects with more than one groundwater pollution potential area, it dissolves these discrete polygons into one polygon using the permanent parcel number. A new table, called GWPP_Plots is then created. See Step 02 below:



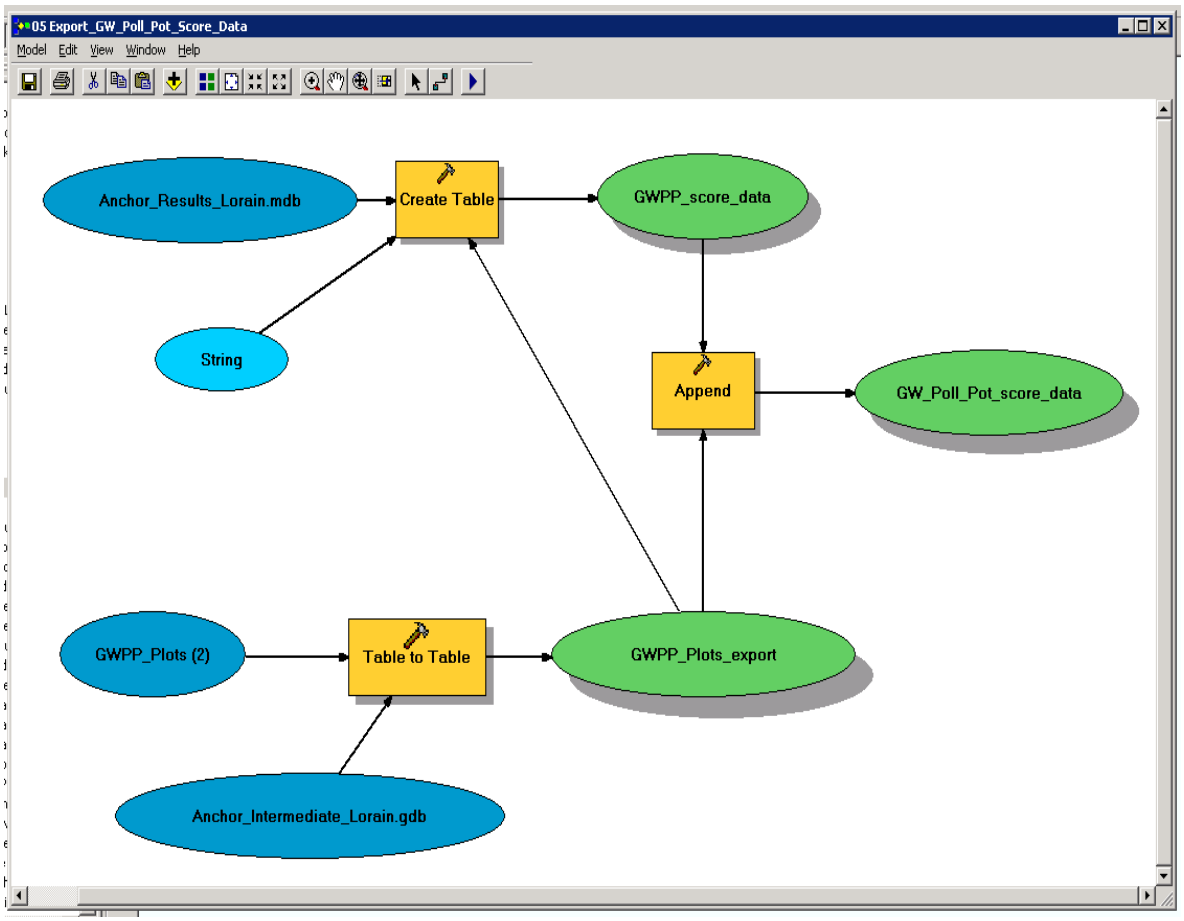
In the third step, three new fields are added to the GWPP_Plots table. These include an Acres field for the total number of acres of groundwater pollution potential areas on the property, a Percentage field to represent the percentage of the property that contains groundwater pollution potential areas, and a Score field for the total score. See Step 03 below:



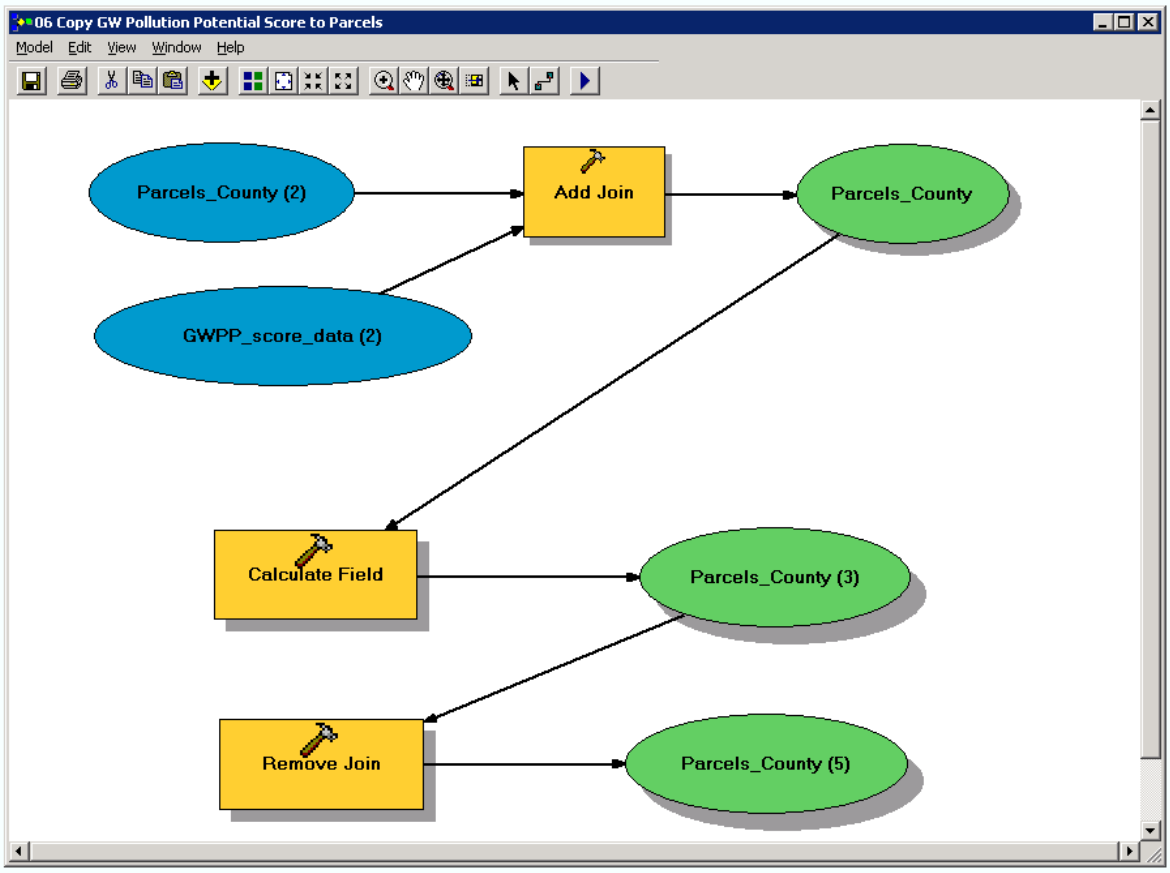
In the fourth step, the groundwater pollution potential coverage on a property is calculated from square feet into acres ([Shape_Area]/43560). It then selects all the properties within the GWPP_Parcels layer whose maximum total acres are greater than zero. From these selected properties, it then calculates the percentage of the property that contains groundwater pollution potential areas with this formula: ([GWPP_Acres])/ [Max_Acres_New]) * 100. Finally, the Score field is calculated from the Percentage Acres field (with this particular criterion, these values are identical). See Step 04 below:



In the fifth step, the tool exports the GWPP_Plots layer with its values to a personal geodatabase by creating a GWPP_Plots_export table. A new GWPP_ Score_Data table is created that contains only those properties with Scores greater than zero. Finally, the table is appended with the exported table. See Step 05 below:



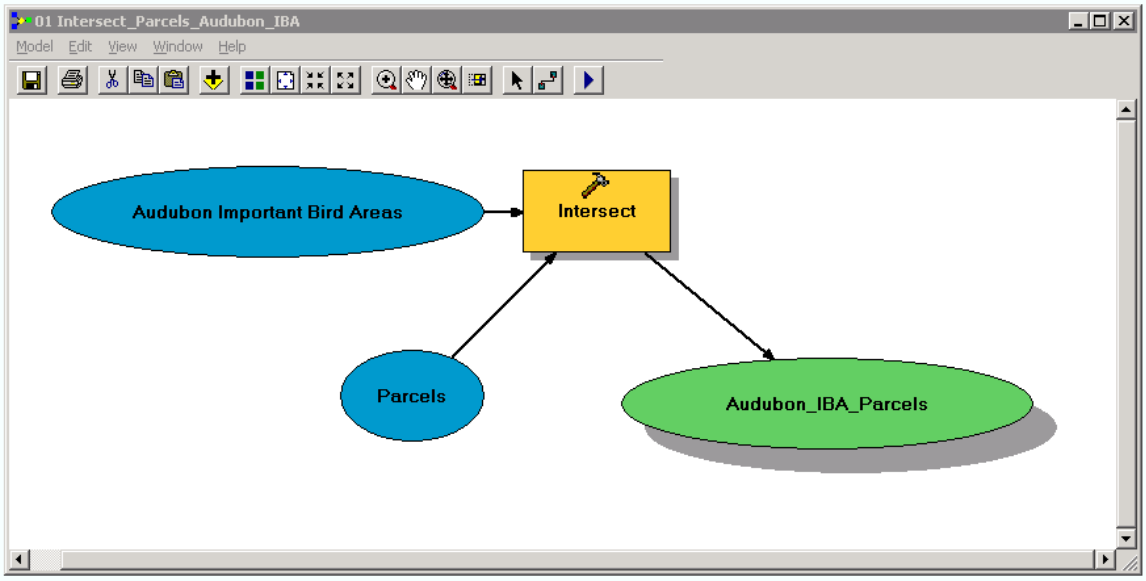
In the sixth and final step of the tool, the GWPP_Score_Data table is joined to the Parcels_County layer by the field that was created for the GWPP scores. All properties that do not contain a score for groundwater pollution potential are given the value of zero in the calculation. Finally, the join between the two tables is removed. See Step 06 below:



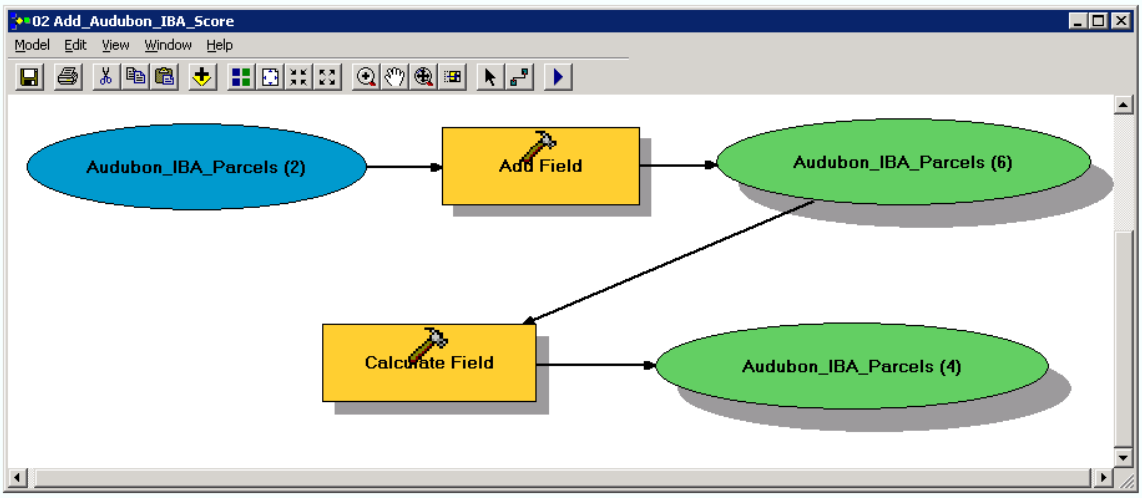
Similar tools were created for the remainder of criteria that examined coverage on properties. For the rivers and tributaries and wild and scenic rivers criteria, rasters had to be created in order to create and calculate an area of intersection.

For the remaining 13 criteria, we examined presence or absence of features on every parcel. We did this because many of the criteria were mapped as point locations and also because we many of the criteria covered such large areas that properties were either partially or wholly within the area or were not. We created 13 separate tools that calculate the presence or absence of each criterion. Properties are assigned a score of 100 for the presence of each criterion.

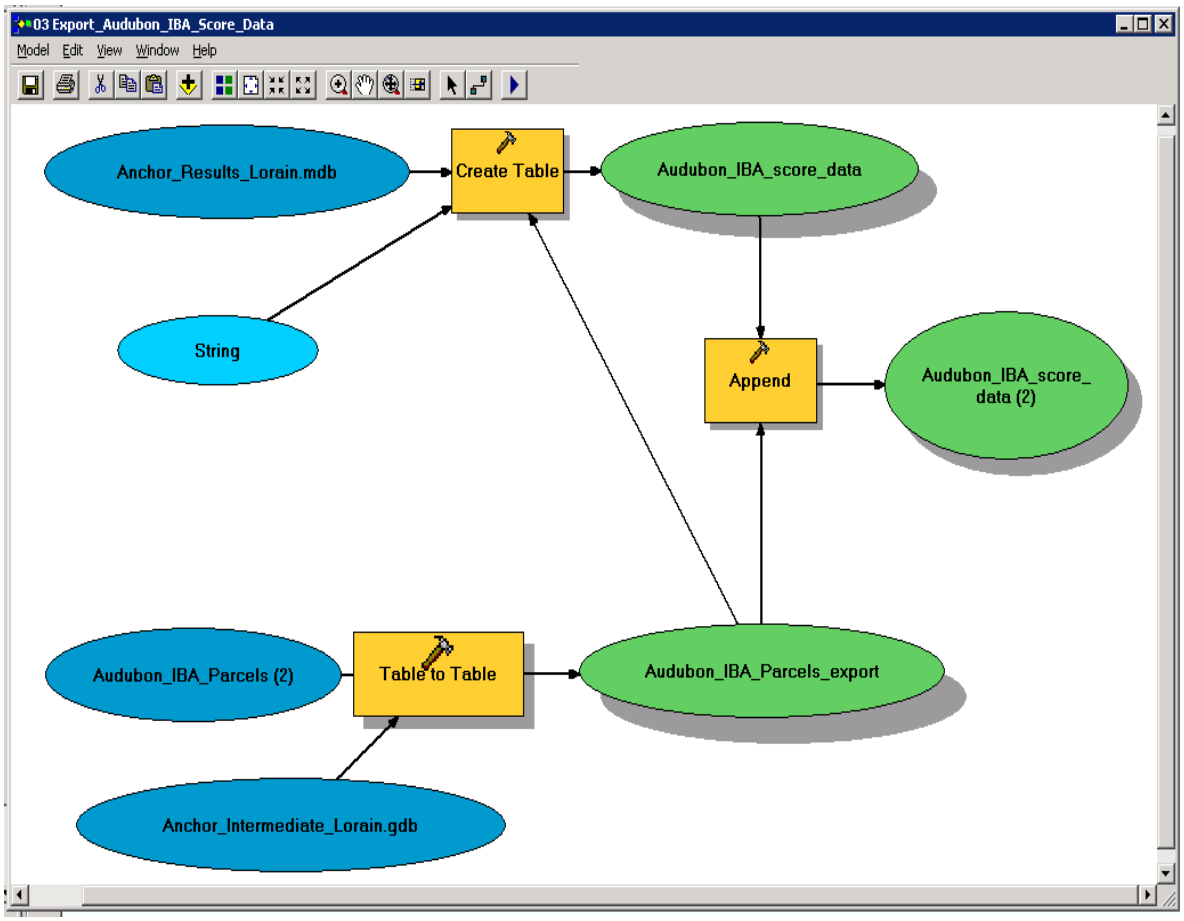
For example, the Audubon Important Bird Areas (IBA) cover relatively large areas within each county. The tool for Audubon IBA simply determines whether or not a property lies within an IBA area. In the first step of the tool, the IBA's are intersected with the parcels to create a new layer called Audubon_IBA_Parcels. See Step 01 below:



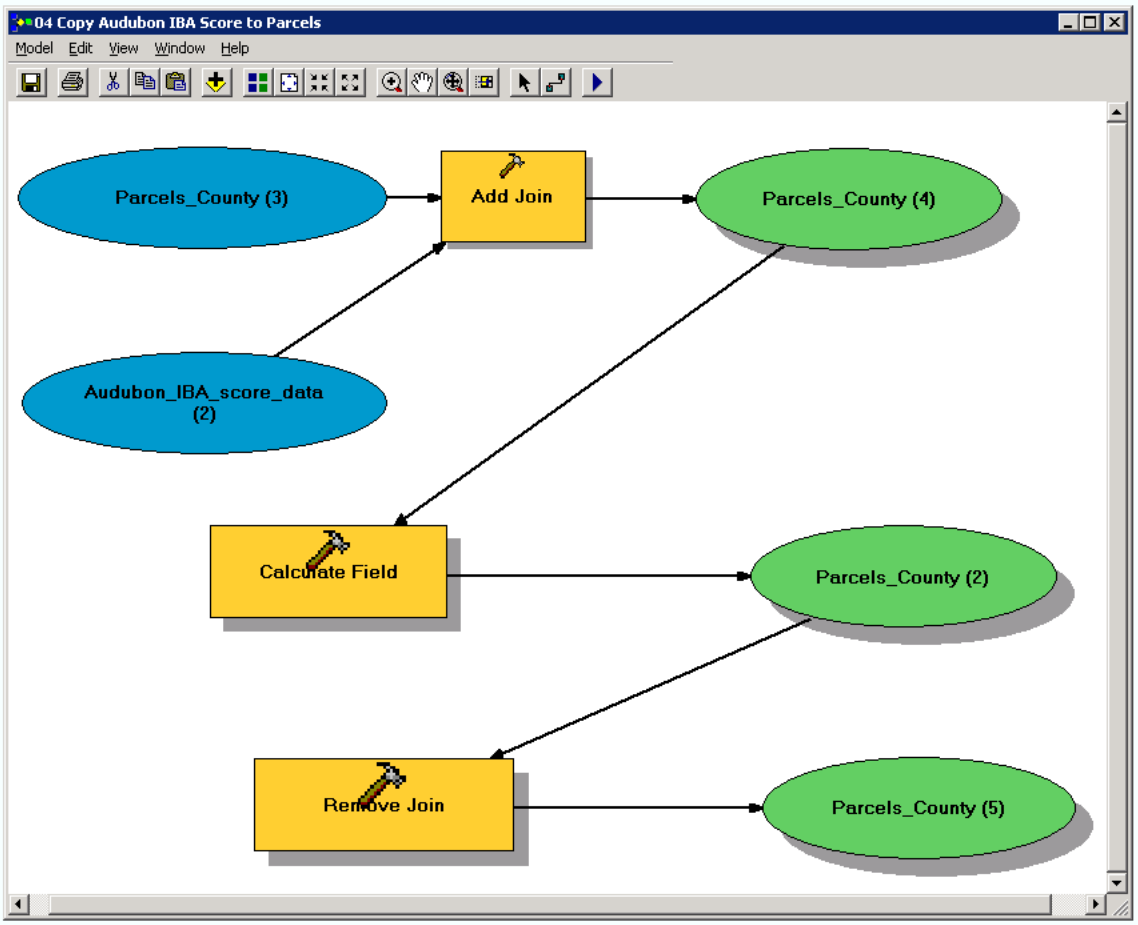
In the second step of the tool, a Score field is added to the Audubon_IBA_Parcels layer. The field is then calculated so that each record receives a score of 100. See Step 02 below:



In the third step, the Audubon_IBA_Parcels table is exported to a personal geodatabase. Within the geodatabase, a new Audubon_IBA_Score_Data table is created. The table is appended with the exported table. See Step 03 below:



In the fourth and final step of the tool, the Audubon_IBA_Score_Data table is joined to the Parcels_County layer. All properties that do not lie within an Audubon IBA area are given a value of zero. Finally, the join is removed. See Step 04 below:



Similar tools were created for the 12 remaining criteria that captured presence or absence.

Every analysis for the 27 criteria was conducted on a county by county basis. Because the parcel data are organized by county and formats vary from each county to the next, running analyses by county was the most efficient way in which to score parcels and maintain their corresponding permanent parcel numbers. Doing so also allowed us to keep the processing time to a minimum.

After running analyses for each of the 14 counties and generating scores within the Parcels_County layer for each county, we added all of the scores together to determine the final overall scores for each property within the county. We then merged all of these Parcels_County layers into one layer. After looking at the overall scores for the approximately two million properties within the Western Reserve, we decided to factor in acreage as component to the Anchor Strategy. Because WRLC has limited time and resources in which to preserve land, we have to focus on priority properties that have the greatest ecological, agricultural, or scenic impact on the region; typically this is accomplished with larger properties. It takes us just as long to negotiate a conservation easement on, or purchase of, a 5-acre property as it does a 200-acre property. Therefore, we have decided to look at properties 50 acres in size or larger. From the overall scores, we queried all properties 50 acres or greater in size.

WRLC operates in five offices throughout the Western Reserve. We have our central office in western Geauga County, our eastern office in Trumbull County, our southeastern office in Summit County, our southwestern office in Medina County, and our Firelands office in Lorain County. All of our land protection projects flow through a field director in each of the five offices. We have our 14-county service area broken down into regions around these offices, including the Central Region (Cuyahoga, Geauga, and Lake Counties), Eastern Region (Ashtabula, Trumbull, and Mahoning Counties), Southeastern Office (Portage, Summit, and Stark Counties), Southwestern Office (Medina and Wayne Counties), and the Firelands Office (Erie, Huron, and Lorain Counties).

As a staff, we decided that we could manage a total of 1,250 priority properties overall, with 250 properties in each field region. Therefore, we took the overall scores for all properties greater than or equal to 50 acres in size and took the highest ranking 250 properties in each of the five field regions. Within each field region, we broke the 250 properties into three classes using natural breaks to create High, Medium, and Low Priority Properties.

Results

The results of the first iteration of the Anchor Strategy yielded scores for every property in WRLC's 14-county service area. Each property has a score, or value, ranging from 0 to 100 for each of the 27 criteria in the Anchor Strategy and a total score representing the sum of the 27 scores. The resulting 1,250 properties from the Anchor Strategy were exported from ArcGIS into an Excel spreadsheet by field region. See Appendix B for the LPPL of 1,250 properties. This list represents nearly 150,000 acres of high quality, important ecological, agriculture, and scenic lands throughout the Western Reserve. See Appendix C for maps of the priority properties in the Western Reserve and in the five field regions of WRLC.

Due to time constraints with computer programming and the running of the analyses, we have not yet had time to ground truth the properties on the LPPL and apply local knowledge and experience. We have also no had time to compare the Portage County grid to tax maps and plat books to determine parcel numbers and landowner information. Our next steps include working with WRLC staff to evaluate the use of weights on several of the criteria. Because we are very confident about the nature and coverage of all of our ecological data, we may not see a need to weight any of their 19 criteria. For cultural and scenic data, we are also very confident about the coverage and sources of data, but cultural and scenic values haven't been our primary focus in the land protection projects we've completed over the years and we may elect to decrease the values of these 5 criteria during weighting. Because there is very little agricultural data that have been mapped throughout our region and the quality is not what we would like, we should look into weighting any or all of the 3 agricultural criteria. WRLC staff will need to look at the data and decide which of the 27 criteria should be weighted and to what extent. We will run a second iteration after these discussions.

We then plan on sharing the results of the second iteration with our board of trustees and will also meet with our state agencies and conservation partners during the spring and summer months to unveil the Anchor Strategy and discuss any refinements to the plan. With a staff of 25 people located throughout our five offices, WRLC is prepared to implement the 1,250 properties identified by the Anchor Strategy. Because this report is a public document, we have only included the parcel numbers, acreage, and scores. We do not want to upset any landowners that may be identified in this list. WRLC treats the LPPL and any corresponding maps as confidential information that we only share with our state agencies and conservation partners so that we can coordinate efforts and collaborate on projects.

WRLC has a system in place for implementing the Anchor Strategy that involves making quality contacts with each landowner on the LPPL each year. While 1,250 properties represent a large number of landowners, we will endeavor to cultivate as many as possible. Once we have ground truthed the LPPL and evaluated the use of weighting criteria, we will add all priority landowners to our tracking program and will begin cultivation through phone calls, face-to-face meetings, neighborhood gatherings, and invitations to hikes and other events. We also have a system for meeting regularly with our state agencies and conservation partners so that we can go over the list of priority properties and find opportunities to collaborate on projects, hand off projects, or take over projects where necessary.

As expected, the results of the Anchor Strategy analysis have yielded a set of priority properties throughout the Western Reserve region that identify the most important ecological, agricultural, and scenic lands. We now have the most comprehensive GIS database of conservation and other information in our region that we hope to be able to extend in the future to our conservation partners. This information will aid in developing conservation strategies for the 1,250 properties on the LPPL. We have an LPPL of the priority property landowners and corresponding mailing information so that we can begin contacting and cultivating these landowners. In addition, we have the ability to generate maps of the region and individual properties, which will greatly assist in working not only with our state agencies and conservation partners but also our priority landowners.

WRLC is very grateful for the support of OLEC in developing the Anchor Strategy. Without its assistance, we would not have been able to develop as sophisticated a system and model that we believe will result in the preservation of tens of thousands of high quality lands throughout the Lake Erie basin and the Western Reserve.

Challenges

Because Ohio lacks a clearinghouse of available GIS data, we encountered many challenges in acquiring data and building a database. Data were scattered throughout many different state agencies, local park districts, and county offices. We had to purchase a dedicated GIS server to store and analyze large volumes of data. One of the biggest hurdles was acquiring digital parcel information for Portage County. Portage County is currently working on digitizing all of the county parcels, but they don’t expect to finish

the project until late 2008 at the earliest. We were able to secure limited parcel information for approximately 2/3 of the county from several studies completed by Kent State University. We decided to use a 100-acre grid system for the remainder of the county that we could then check against plat books and county website for parcel and landowner information.

Once we installed and configured our GIS server, we realized that we would have to convert all of our GIS shapefiles into one large geodatabase and several smaller file geodatabases in order to make full use of the functionality of the server and our updated ArcEditor software. This proved to be a time consuming process and set us back approximately two months from our original timeframe.

During the beginning months of our work on this project, we hired a GIS technician to collect data, coordinate with our conservation partners, and to help build and run the Anchor Strategy model. Unfortunately, we had to let this employee go about nine months into the project and we were unable to fill the position. However, our project manager was able to rearrange her responsibilities and focus all of her efforts on completing this project. Our progress was only slightly hampered by this event.

We had several problems with topology errors in Wayne, Huron, Portage, and Stark Counties that had to be corrected before any analyses could be run. In many counties, we encountered instances where one parcel number was assigned to two non-contiguous polygons that generated incorrect scores in the analyses. We did not discover this error until after we had completed our analyses and noticed many scores greater than 100 in several fields. We had to go back and program a new tool that performs a dissolve in cases where the total maximum acres of a property do not equal the sum of the new acres generated from the overlay analysis. Essentially, we had to create a new tool that would consider these non-contiguous parcels as one parcel. We had to rerun approximately 15 tools in each of the 14 counties after this error was fixed. Because it takes several weeks to run all 14 analyses, this complication set us back in our progress and prevented us from finishing at the end of 2007. We still have more work to do in early 2008 in terms of evaluating the use of weights and ground truthing the results.