

Pierce Cedar Creek Institute GIS Development – Final Report

Grand Valley State University

Major Goals of Project

The two primary goals of the project were to provide Matt VanPortfliet, GVSU student, the opportunity to gain experience in developing a geographic information system database; and to provide the Pierce Cedar Creek Institute (PCCI) with an up-to-date, geographic information system (GIS), that provides a geospatial data framework on which researchers can continue to develop. Both goals have been accomplished.

Project Results

The project has provided Matt with extensive experience in developing a GIS database. Typically, development starts with the identification and collection of existing GIS data from various local, state, and federal organizations. Most all of our data came from either the Michigan Center for Geographic Information or the Barry County GIS Department. Once the data were collected it was processed for display purposes into three geographic areas including county, watershed, and project area. The processing also included the selection of a consistent coordinate system that the data could be registered to. In this case, the data were transformed into the State Plane coordinate system, Michigan southern zone, based on the North American datum of 1983. U.S. feet were chosen as the desired measurement units.

The development of associated attribute tables was also a large part of processing the data. For example, for the soil data, various soil parameters regarding soil type characteristics (texture, drainage potential, hydric soil etc.) were developed as part of the

GIS database. For many of the data layers, attributes needed to be updated and created to provide the necessary information on which to map a layer of data.

Matt also had the opportunity to utilize Global Positioning System technology in the field to collect locational information regarding the Institute’s trail system and other ground features.

To communicate the results of the project Matt created a full color Resource Atlas. The Atlas includes 33 pages of spatial information about the Pierce Cedar Creek Institute and other areas of Barry County. The following table indicates the map contents of the Atlas:

Area	Mapped Data	Comments
Pierce Cedar Creek Institute Property	Base Information	Roads, hydrology, buildings, parking areas etc.
	Digital Orthophotography	Leaf-off conditions – 2004 Black & White
	Topographic Contours	Derived from the National Elevation Dataset
	Soil Types	Identifies the kinds of soils
	Presettlement Landscape	Identifies the landscape during the early 1800’s
Project Area	Digital Orthophotography	Leaf-off conditions – 2004 Black & White
	Color Infrared Aerial Photography	Leaf-off conditions – 1998 Color infrared
	Wetlands	From the National Wetlands Inventory
	Soil Texture	Sand, loam, silt etc.
	Natural Runoff Potential	Based on hydrologic soil groups
	Presettlement Landscape	Identifies the landscape during the early 1800’s
	Land Use/Cover – 2004	Inventoried by Matt V. using photo-interpretation techniques and field work
Cedar Creek Watershed	Transportation System	Road network
	Digital Elevation Model (DEM)	Based on the National Elevation Dataset
	Topographic Slopes	Derived from the DEM

	Sub basins	Derived from the DEM
	Wetlands	From the National Wetlands Inventory
	Soil Texture	Sand, loam, silt etc.
	Hydric Soils	Typically, indicates wetlands
	Soil Drainage Class	Drainage potential of soils
	Natural Runoff Potential	Based on hydrologic soil groups
	Presettlement Landscape	Identifies the landscape during the early 1800's
	Land Use/Cover (2000)	Based on Landsat satellite images
Barry County	Political Boundaries	Identifies Township, City and Village boundaries
	Transportation System	Road network
	Hydrography	Lakes, rivers, creeks
	Digital Elevation Model (DEM)	Based on the National Elevation Dataset
	Topographic Slope	Derived from the DEM
	Wetlands	From the National Wetlands Inventory
	Soil Texture	Sand, loam, silt etc.
	Natural Runoff Potential	Based on hydrologic soil groups
	Presettlement Landscape	Identifies the landscape during the early 1800's
	Land Use/Cover (2000)	Based on Landsat satellite images

An inventory of current land use and cover was completed by Matt for the project area (an area including PCCI and surrounding adjacent lands). Manual photo interpretation procedures along with field investigation were utilized to update the previous land cover inventory done by the State of Michigan in 1978.

The final GIS database has been loaded onto the new PCCI GIS computer. To allow the data to be displayed in an organized and useful way, an ArcView GIS project file was developed for future GIS users at PCCI.

Recommendations

1. Now that a baseline geospatial data framework has been created for use at the PCCI, the next logical step is to begin to incorporate relevant geospatial data that have been created by the URGE participant researchers. For many of the researchers, the geospatial data component of their project will be the location of their sampling points. Incorporating those data should be relatively simple. However, for the location of sampling points to be useful, it would be important to have associated attribute information about those points. For example, if the points mark the capture site of salamanders, then it would be important to have data on what species were captured there, how many were caught, on what dates, etc. Having this type of information available would create a very useful geospatial data archive for future researchers at the Institute.

It is also important that PCCI develop geospatial data requirements that will communicate to future researchers how PCCI would like to receive GIS data. Having the requirements will allow PCCI to easily incorporate new data into the Institute's GIS.
2. Recommend that PCCI consider updating to the most recent version of ArcGIS from Environmental Systems Research Institute (ESRI). Since PCCI's original purchase of ArcView GIS, ESRI has made significant changes to their product line. ArcGIS products now are the company's primary GIS software. ESRI no longer provides updates to the ArcView GIS software that PCCI presently uses. To be consistent with the most state-of-the-art technology, and to be the most compatible with future researchers potential GIS data development, PCCI should update to ArcGIS 9.X version of the software.

3. Recommend that PCCI consider having flown an up-to-date, large scale aerial photo inventory of their property. The black and white digital orthophotography data provided by the Barry County GIS Department provide a very useful aerial photo record of the PCCI properties. However, because the data are black and white, and are taken with leaf-off conditions, vegetation differences are very difficult to determine. Also, the ground control used to create the County black and white orthophotography does not perform well when sub-meter GPS data are overlaid on top of it. It was not uncommon to find a horizontal distance difference between the County photography and our sub-meter accurate GPS points of 10 to 20 feet. A new aerial photo inventory with more accurate ground control, taken with color infrared film or even hyper-spectral film, taken during leaf-on and leaf-off conditions could provide an additional valuable tool for future researchers.
4. Recommend an assessment for future land use change and the expected impacts on the Pierce Cedar Creek Institute. The long-term sustainability of PCCI will in part depend on developmental pressures and land use decisions made near and around the PCCI properties, and most certainly within the Cedar Creek Watershed. A proactive approach intended to examine the impact of potential development scenarios is essential.

Conclusion

It was a pleasure to work with the staff at the Pierce Cedar Creek Institute. They were always very helpful and friendly. The facilities are of excellent quality, and the lunches provided by PCCI were always very good. Providing the meals and housing for students and faculty during their research at no additional cost is very generous of PCCI.