

Creation of the Franklin County, Ohio, Ultra-High Resolution Hydrography Geodatabase

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Abstract

The Franklin Soil and Water Conservation District has entered the final year of a five year project to field verify, photograph, and georeference surface drainage and outfalls outside of the road right-of-way throughout incorporated and unincorporated Franklin County. FSWCD staff have walked over 1,000 miles of stream and tributary and used backpack GPS and digital cameras to collect information for over 26,000 data points, including 12,000+ outfalls. FSWCD field staff inventoried an ArcInfo drainage layer originally created by FSWCD staff between 1998 and 2002 at a 1:6000 scale and edited at a 1:1200 scale between 2002 and 2005. The layer was converted into a geodatabase in March 2006 and contains over 3600 miles of drainage routes with directionality and node connectivity. At the end of 2007, Franklin County will have a drainage geodatabase with nearly 100,000 records that will meet or exceed National Hydrology Dataset standards.



Franklin County Background

The Franklin Soil and Water Conservation District serves the metropolitan region of Columbus, Ohio.

- 13 municipalities 320.65 square miles population 1,011,193.
- 13 villages 30.87 square miles population 24,724.
- 17 townships 192.42 square miles population 95,987.
- 42 local governments 543.94 square miles population 1,131,904.

Additional local government offices with a strong interest in local hydrology include:

Mid-Ohio Regional Planning Commission

Franklin County Engineer's office

Franklin County Sanitary Engineer's office

Franklin County Development Department

Franklin County Board of Health

Franklin County Metro Parks

Franklin County Auditor's Office

Franklin County Commissioners

Franklin Soil and Water Conservation District

Historical Project Background

1. First stage of project was funded by Franklin Soil and Water (1995-2002) and City of Columbus Division of Sewerage and Drainage (1996-2002). Funding was used to create one position housed at Franklin Soil and Water with approximately 60% time dedicated to project. Funding for GIS software, hardware, and digitizer came from County Commissioners in 1996.
2. Original scope of project was to research all records pertaining to county-petitioned drainage in Franklin County and compile into a database, transfer location information to stable 1" to 6000" mylars, then digitize information to create an ArcInfo coverage.
3. Digitizing started in 1998 and continued through 2002. Original scope of project only included digitizing county-petitioned drainage, but digitizing was expanded in late 1998 to include all surface drainage, including road right-of-way drainage, culverts, bridges, and stormwater connectors as information became available.
4. Source information for mylars including 1990 Metamap hydrology information from Auditor (no directionality or connectivity, information missing if subsurface), 10 foot contours and spot elevations from 1990 DEM, parcels, buildings, and roads).
5. Directionality was determined using 10 foot contours and spot elevations, then adjusted with 2 foot contours from a 1996 DEM that were made available in 1998.
6. Stormwater information was not available for Columbus or other municipalities during this time period with the exception of some City of Dublin cad files.

ArcInfo Drainage Coverage May 2002

3,450+ Miles of Drainage Routes with directionality and node connectivity

75,000+ records

Completed just in time to receive new orthophotography from Auditor



Field Verification Project Background

1. In August 2001, Franklin Soil and Water proposed a five-year project to the City of Columbus and Franklin County Commissioners to field verify surface drainage outside of the road right-of-way.
2. Franklin Soil and Water demonstrated in presentations how the field verification project would assist Franklin County in meeting their NPDES Phase II permit obligations and Columbus in meeting their NPDES Phase I permit obligations.
3. Landowners along drainage routes would receive a letter of notification describing the project and a contact number for questions and concerns.
4. Two Franklin Soil and Water field staff would walk surface drainage during the months of October through April and use a backpack gps system and a digital camera to georeference and photograph discharge locations (outfalls), bridges and culverts (crossovers), surface drainage points (intersections, start of tribs, rills, etc.), and other miscellaneous information (illegal dump sites, ponds, obvious illicit discharges). Staff would log a minimum of five points per feature and would log an in-between feature point every five seconds.
5. Meanwhile, back at the office, the Natural Resources GIS Coordinator would differentially correct and process field data while editing each watershed prior to project work.
6. Initial funding was secured in 2002 and enabled Franklin Soil and Water to purchase equipment and hire two full-time seasonal field workers for the 2002-2003 field season (just in time to get hit with the second worst winter in central Ohio history).

Field Verification Background

1. Franklin Soil and Water, City of Columbus, and 5 County agencies provided base funding for all five field seasons.
2. Supplemental funding for each project year was provided by villages, townships, and municipalities having jurisdiction within each watershed. Costs to funding partners came to just \$500 per mile inventoried (three local consultants that we interviewed were charging \$1,500 to \$2,000 per mile in 2002 for the same work).
3. Stabilization of funding enabled Franklin Soil and Water to hire a full-time field coordinator and one seasonal field worker for the 2003-2004 field season. Franklin Soil and Water secured funding to purchase a 2nd backpack unit and hire two seasonal field workers for the 2005-2006 field season.
4. During summer of 2006, seasonal field staff were retained to conduct illicit discharge detection and elimination work for 82 pockets of pollution in Franklin County (unincorporated with significant failing septic problems that are completely surrounded by municipalities). An on-going commitment from county stormwater budget for IDDE services enabled Franklin Soil and Water to promote both seasonal field workers to full-time positions and hire two seasonal field workers for 2006-2007 field season.

Field Verification Funding Results

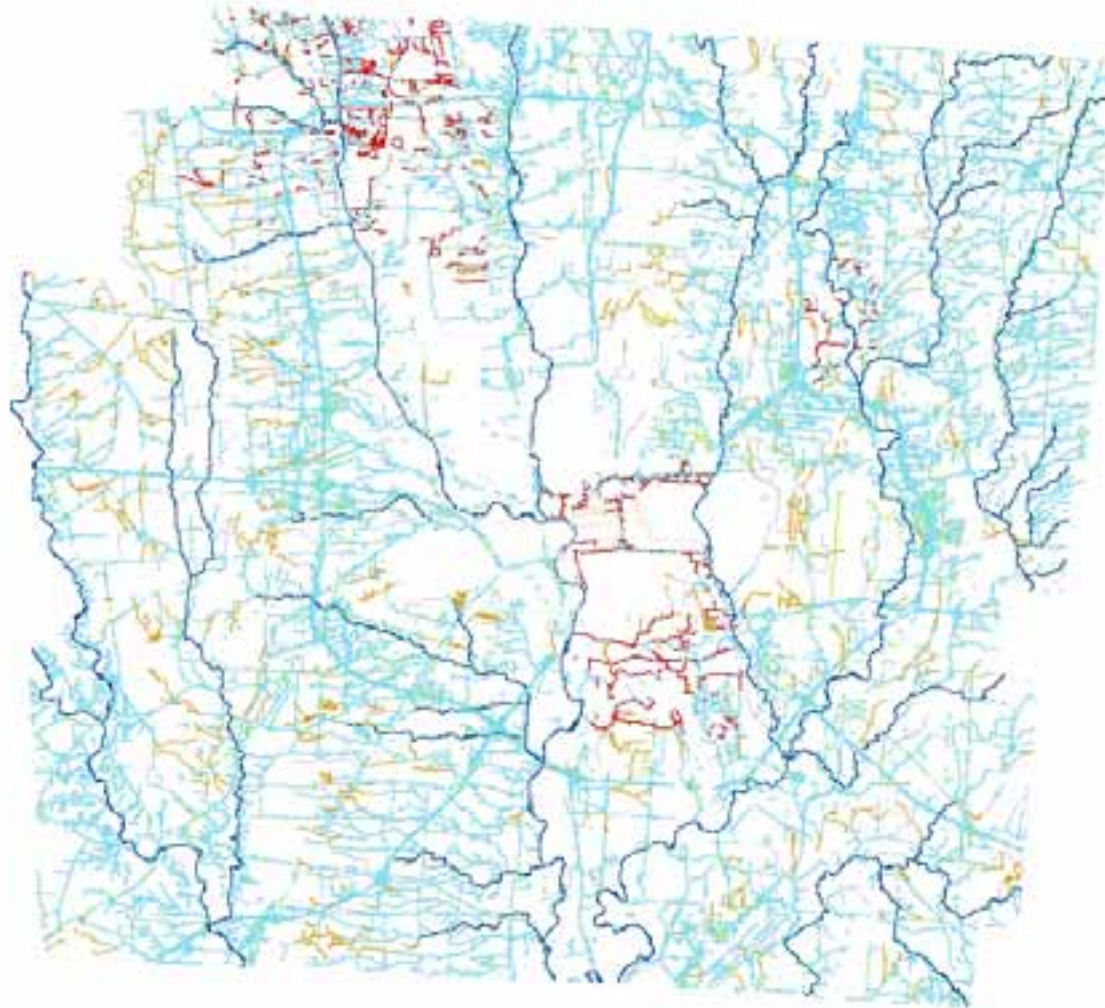
- 7 municipalities funded full field verification efforts in their jurisdiction.
- 1 municipality completed its own field verification (16 miles) and will share data with Franklin Soil and Water.
- 3 municipalities did not fund but have less than 2 miles of surface drainage combined.
- 2 municipalities did not fund, appear not to have completed an inventory yet, and represent most of remaining surface drainage outside of the road right-of-way that was not inventoried.
- 3 villages funded field verification efforts. Of remaining 10 villages, only one has a significant amount of drainage (5 miles).
- 14 townships funded the project.
- 17 townships were inventoried (2 townships comprise a state scenic river watershed but aren't covered under NPDES Phase II).

Shapefile October 2005

3,713 miles of drainage routes

85,017 records

Completed 48 hours before receiving new orthophotos from Auditor's office

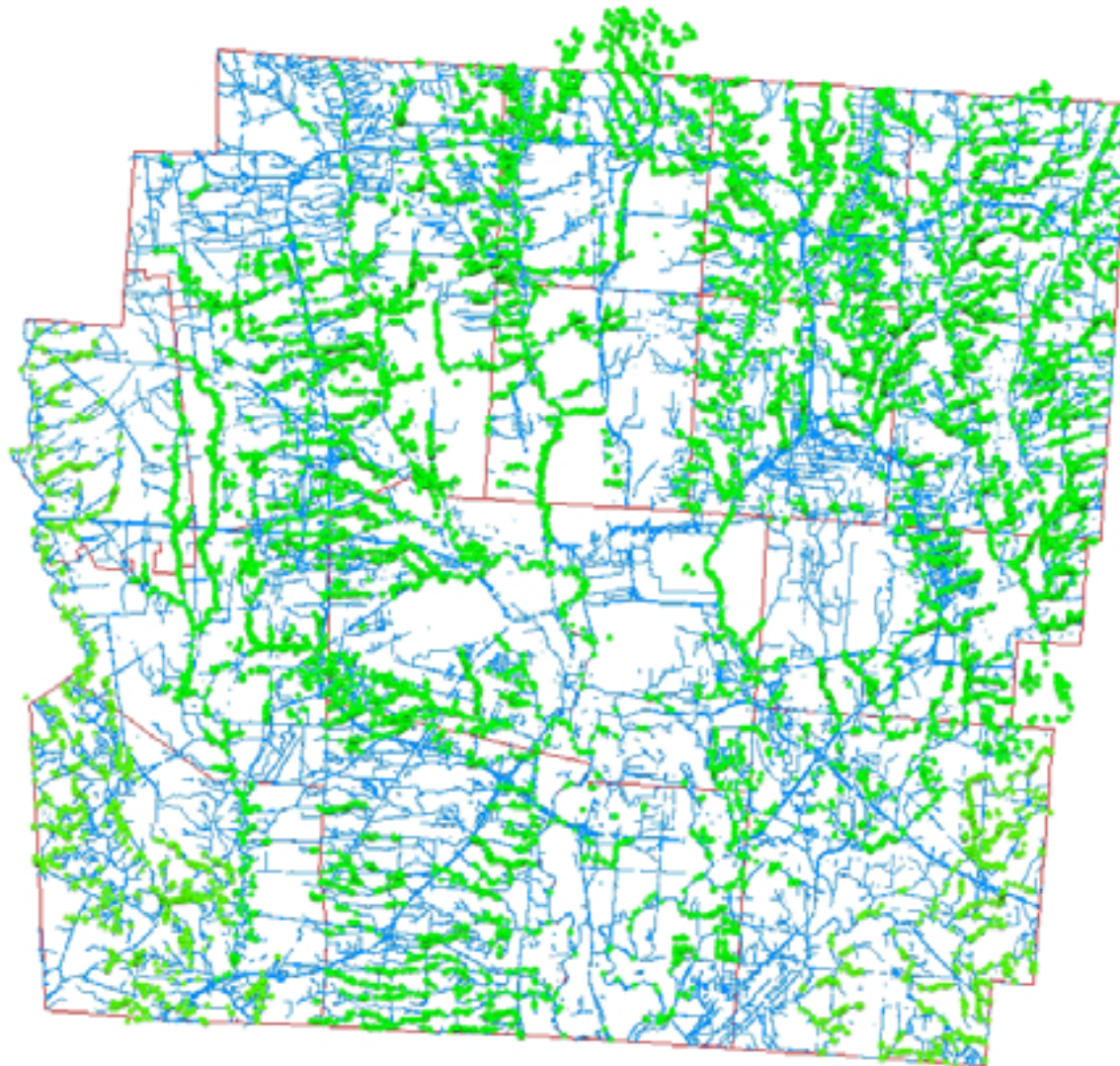


Field Verification Results

1. 1,300 miles of surface drainage was inventoried (represents over 91% of linear surface drainage outside road-right of way in Franklin County).
2. 200+ additional miles of pond, basin, and reservoir perimeter were also inventoried.

Watershed	Outfalls	Surface	Cross.	Others	Total
Alum Creek	2158	930	645	296	4029
Big Darby Creek	1014	1631	563	146	3354
Big Walnut Creek	2560	1990	819	440	5809
Blacklick Creek	2100	1262	571	349	4282
Full Hellbranch Run	766	309	192	73	1340
Little Darby Creek	66	111	41	7	225
Little Walnut Creek	673	493	215	165	1546
Olentangy River	1949	738	635	300	3622
Rocky Fork Creek	1660	653	458	262	3033
Scioto River	4999	1979	1630	734	9342
Totals	17,945	10,096	5,769	2,772	36,582

17,945 Outfall Locations



Pond In Columbus with Five Inflows and One Outlet
Horizontal Spatial Accuracy of All Six Points Is Sub-meter



Conversion and Editing to Date

1. Drainage shapefile was converted into geodatabase format in April 2006 (finally received ArcGIS 9.0 from USDA).
2. Domains set up for type of drainage and ownership fields to simplify editing. Type of drainage attributes were updated for conversion to reflect National Hydrography Dataset values while retaining drainage information not found (in 2006) in the high resolution NHD (road drainage, culverts, stormwater).
3. Twenty-five percent of records to date have been checked, edited if necessary, and converted over to updated attribute values. Remainder of records will be edited over the course of the next year at a 1: 1,200 scale or better. All data has been time-stamped with a last edit date and, if applicable, a gps date.
4. Orthophotography used for editing is year 2004 3" pixel, true color. Previous experience indicates that new orthophotography will be delivered shortly after the full database is converted.
5. Urban areas with stormwater connectors have taken a significant portion of editing and conversion time. 1 mile of an urban stormwater connector may be comprised of as many as 50 records, each with a unique main id and a map reference number.

Intermittent Stream with Medium and High Resolution NHD



Intermittent Stream In High Resolution NHD Now Routed Through Stormwater



Future of the Project

1. Will spend remainder of year converting attribute values and editing where necessary.
2. Editing and conversion will likely continue into 2008. Prior experience indicates that new orthophotography will appear shortly after the geodatabase is completed.
3. Funding for future maintenance of geodatabase will need to be secured.
4. Use of NHD and NHD editing tools will need to be examined in future. Ohio currently does not have a stewardship agreement with USGS to maintain the high resolution NHD.
5. Franklin Soil and Water will continue to provide Illicit Discharge Detection and Elimination services to the unincorporated portion of the county and, currently, four NPDES Phase II villages and municipalities.
6. Franklin Soil and Water is providing ArcHydro GIS work for a variable-width setback ordinance for the unincorporated portions of Franklin County.

Acknowledgements

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