

FINAL REPORT

LAKE ERIE PROTECTION FUND GRANT

PROJECT ID: LEPF 97-16

TWENTY YEAR

LANDCOVER CHANGE ANALYSIS

OHIO'S LAKE ERIE WATERSHED

Gary Schaal, Project Manager
Bruce Motsch, Image Processing Coordinator

March, 1999

Ohio Department of Natural Resources
Division of Real Estate and Land Management

PROBLEM IDENTIFICATION

Farmland protection; water resources protection, conservation and management; habitat loss; comprehensive management plans, coastal land use and development; increasing urbanization; and nonpoint source pollution are all issues identified in various coastal management strategies and plans. These issues and others are all directly affected by changing patterns of land use over time. Though a general notion exists of how land use is changing, there is a need for quantified data as well as geographically referenced data which can be used as a tool for analyzing land use trends and incorporating this knowledge in strategic planning efforts.

PROJECT OBJECTIVE

The objective of this project is to determine how the land cover in Ohio's Lake Erie watershed has changed over a twenty-year period and to provide this information to appropriate agencies/programs as a tool for their use in coastal management.

SPECIFIC TASKS

- A. Classify 1974 Landsat MSS digital data into the following classes of landcover:
1. Urban (impervious areas)
Keep in mind the satellite detects land cover the way you would see things from an aircraft. In an urban area, you would see areas of buildings and concrete such as shopping centers, large industries, commercial areas, central business districts and other built up areas including new housing developments not obscured from view by mature trees. Any land area including older neighborhoods, which are obscured from view from above by trees, is classified as wooded.
 2. Agriculture and Open Urban
This includes pasture, cropland, and farmsteads as well as open parkland, golf courses and other large open expanses of grass including large estate type yards.
 3. Wooded
Deciduous and coniferous.
 4. Open Water
From small ponds to large bodies of open water. May include wider rivers or portions thereof.
 5. Barren
Strip-mines, quarries sand and gravel pits, and beaches.
- B. Compare the results of Task A. With existing 1994 land cover data to quantify and graphically display land cover changes from 1974 to 1994.

PROCESS

The 1974 Landsat MSS data was analyzed by computer using ERDAS images processing/GIS software. A procedure known as unsupervised classification was used to classify the data. In using this procedure, the analyst gives instructions to the computer to classify the MSS data into an arbitrary number of similar classes based upon the sunlight reflected from the 5 categories of land use and recorded by the Landsat MSS. Generally, 255 classes are initially requested. Each of these classes is displayed in turn on a color monitor. Using maps, aerial photos and field work each class is identified either as being one of five categories of landuse, or as being a mixed class (i.e. a class which contains several landuses). Of the initial 255 classes, those, which are uniquely identified as one of the desired categories of landuse, are saved. Those, which were mixed, were then fed back to the computer with the instructions to re-analyze and group into 255 or so classes again. This procedure is repeated again and again, each time saving the unique classes and resubmitting the mixed classes, until all the land features have been uniquely grouped into the desired classes.

United States Geological Survey (U.S.G.S.) data from 1974-1976 was used to augment the MSS land cover classification.

Once the 1974 land cover was completed, it was digitally compared to the existing 1994 land cover data. From this comparison, maps and numeric data can be produced to show location and quantity of land cover changes within Ohio's Lake Erie watershed.

RESULTS OF 1974/1994 CHANGE ANALYSIS

1. Urban

Some 62,000 acres (97 square miles) of new urban areas appeared over the 20-year period. Of that figure 46,000 acres (72 square miles) were previously in agriculture/open urban areas and 15,000 acres (23 square miles) were wooded in 1974. Some observations of the urban change follow:

Expansion of urban areas around most municipalities

Largest new urban areas include:

West side of Toledo in Lucas County
West side of Cuyahoga County
Strongsville area
Avon Lake area, Ford – Ohio Truck Plant
Northern Medina County
New road construction west of Akron City Res.
New development between Solon & Twinsburg
New development around Twinsburg
South of I 480 & I 77 Independence
Sandusky Rt. 250 development

Major development along Lake Erie: Catawba Isl., West, & East Harbor marinas, Rt. 53
Marblehead Peninsula
Ottawa Co. marinas near Davis Besse Power Plant
Marinas on east side of Lucas County
Ottawa River Development
Erie Co. Cedar Point entrance development
Rt. 2 highway construction, Huron bypass
Lorain Co. Vermilion commercial development
Lake Co. Perry Power Plant
Ashtabula Co., Ashtabula & Conneaut

2. *Agriculture/open Urban

16,000 acres (25 square miles) of new agriculture and open urban areas were found to have come from 8,000 acres (12.5 square miles) of wooded land, 2,200 acres (3.5 square miles) of water and 5,900 acres (9 square miles) of barren land. Observations concerning the change from water and barren categories:

Quarry areas reclaimed (man-made or natural, revegetation)

Silica, west of Toledo
Marblehead, Ottawa Co.
Kelley's Island, Erie Co.
Port Clinton, Gypsum, Ottawa Co.
Sandusky Rt. 250, Erie Co.
Portage Co.
Seneca Co.
Geauga Co.

Dredge areas – water showing in 1974, areas now filled & vegetated

Toledo Harbor
Cleveland Harbor, off Burke lakefront Airport

Landfill areas reclaimed, revegetation

Cuyahoga Co. near Oakwood, Bedford Heights
Cuyahoga Co. near Junction Falls

*only areas of change 4 acres or greater

3. *Wooded

15,000 acres (23 square miles) of new wooded areas replaced 10,000 acres (16 square miles) of agriculture/open urban land, covered 3,000 acres (5 square miles) of water and 2,100 acres (3 square miles) of barren land.

General observations include:

COMMENTS

Wetland areas along Lake Erie and Sandusky Bay – wetland growth to woods

Turkeyfoot Wildlife Area in Henry Co. – shrub growth to woods

Pickerel Creek Wildlife Area in Sandusky Co. – shrub growth to woods

Abandoned field growth shrub to woods – scattered

Urban residential woods growth – scattered

Excavation area reclamation – Geauga Co., Trumbull Co.

*only areas of change of 6 acres or greater

4. *Water

4,400 acres (7 square miles) of new water covers 2,500 acres (4 square miles) of previous agriculture/open urban lands, 1,200 acres (2 square miles) of previous wooded land and 800 acres (1 square mile) of previous barren land. Following are observations:

Barren (quarries) have filled with water.

New ponds at Maumee Bay State Park, Pickerel Creek Wildlife Area.

New ponds along highways (borrow pits).

New pond at Resthaven Wildlife area, flooded woods to water.

New reservoirs at Bucyrus and Forstoria.

*only areas of change of 2.5 acres and greater

5. * Barren

Some 3,000 acres (5 square miles) of new barren land resulted mainly from expansion of existing barren areas (primarily quarries) into 2,700 acres (4 square miles) of agriculture/open urban as well as some wooded and some water areas.

*only areas of change of 4 acres and greater

DATA RESOURCES

- 1974 Landsat Multispectral Scanner (MSS) scenes:

| <u>Path</u> | <u>Row</u> | <u>Date</u> |
|-------------|------------|-------------|
| 19 | 31 | 7/6/74 |
| 20 | 31 | 7/7/74 |
| 20 | 32 | 4/26/74 |
| 21 | 31 | 6/2/74 |
| 21 | 32 | 6/2/74 |
| 22 | 31 | 9/19/74 |
| 22 | 32 | 9/19/74 |

- 1974, aerial photography from various resources
- 1974/76 Ohio land cover data files - United States Geological Survey (USGS)
- 1994 Ohio Land Cover data files (Ohio DNR)

PRODUCTS

Besides the data presented here, statistics and maps can be generated for any area for which a digital boundary file exists or can be created. Examples of existing areas include counties and watersheds.

For assistance in obtaining maps/statistics for an area of interest contact:

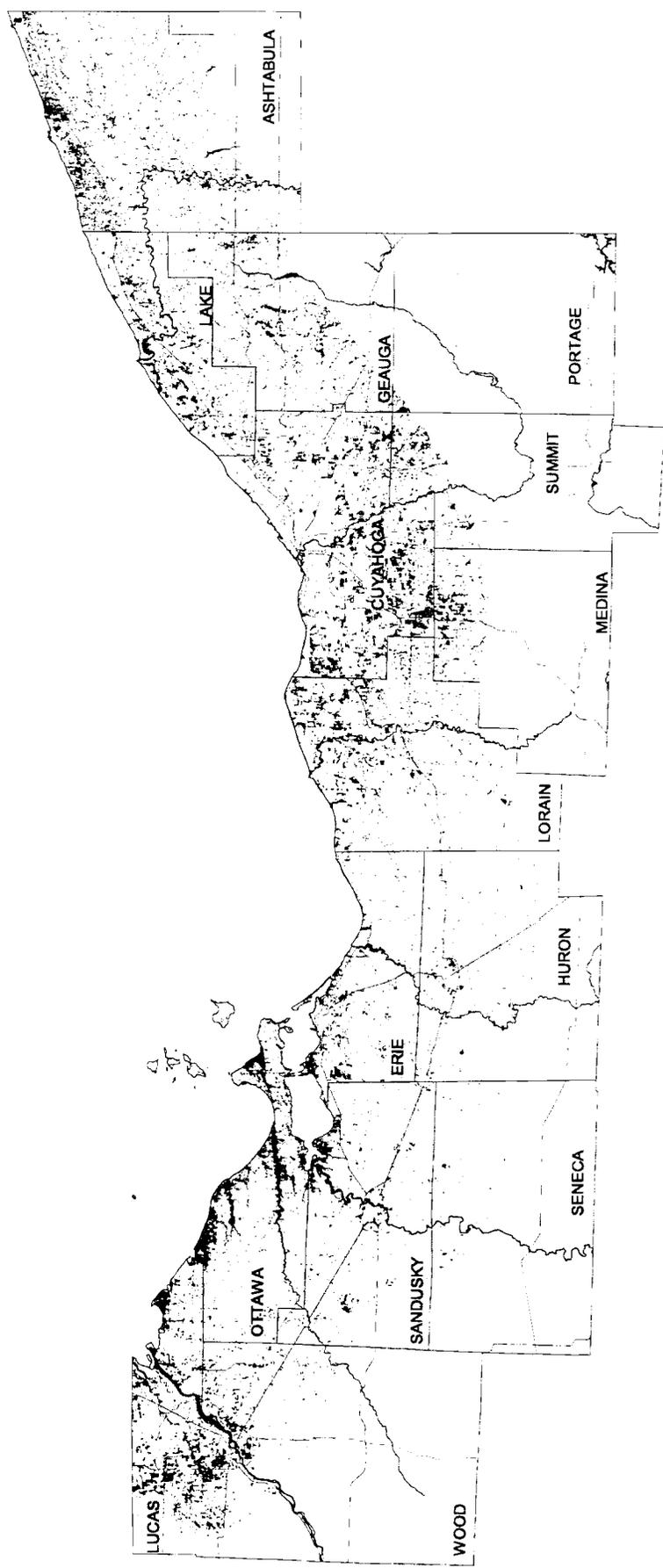
Gary Schaal Phone: 614.265.6769, or email: gary.schaal@dnr.state.oh.us

Bruce Motsch Phone: 614.265.6772, or email: bruce.motsch@dnr.state.oh.us

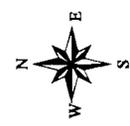
Fax: 614.267.2881

Mailing Address: 1952 Belcher Drive
 Building C-4
 Columbus, Ohio 43224 -1386

Urban Land Cover Within 20 Miles of the Lake Erie Shoreline



- Legend**
- Urban 236130.40 Acres
 - New Urban Areas from 1974 to 1994 44188.35 Acres
 - Water
 - Wetlands
 - US Routes
 - Interstate Routes
 - Major Rivers



Sources:
 Urban Land Cover from 1994 Landsat Thematic Mapper data
 and 1974 Landsat Multispectral Scanner data
 Roads data from USGS 1:100000 Digital Line Graph data
 Hydrology data from USGS 1:100000 Digital Line Graph data
 Wetlands data is from Ohio Wetlands Inventory (1985-1987 Landsat Thematic Mapper Data)
 Urban Land Cover includes open impervious surfaces: roads, buildings, parking lots and similar hard surface areas which are not obstructed from aerial view by tree cover.



Ohio Department of Natural Resources
 Division of Real Estate & Land Management
 GIS & Remote Sensing Services
 (614) 265-6789