Measuring Change Toward Balanced Growth

Draft Indicator Fact Sheets

What is an indicator?

An indicator is something that helps you understand where you are, which way you are going, and how far you are from where you want to be. Indicators are like pieces of evidence, or clues that tell us about the condition of something of interest.

Environmental indicators provide useful information to assess the condition of and, when tracked over time, trends occurring in our surroundings. Performance measurements (or programmatic indicators) are the metrics used to monitor and report the progress and accomplishments of specific programs or projects, and can be used to gauge program or project performance. All indicators must be measurable so that changes can be compared over time and/or to an end point or a reference point (starting point).

Section 7.1 of the report entitled *Linking Land Use and Lake Erie: A Planning Framework for Achieving Balanced Growth in the Ohio Lake Erie Watershed* (Ohio Lake Erie Commission, 2004), calls for the development of three types of indicators to measure success of this important proposal to guide land development and conservation in the Lake Erie Basin. Specifically the indicators types called for are:

- Programmatic indicators – tracking whether the initiative is being implemented and whether it is changing policies at the state and local levels (e.g., measuring the extent of watershed plans, implementation steps for PCAs and PDAs, and shifts in state investment patterns);
- Land use changes – tracking whether the policy changes are actually changing patterns of land use (e.g., measuring the rate of land conversion within PCAs and PDAs, density of infrastructure, rate of change in impervious cover, and increased property values and tax base); and
- Water quality improvement – tracking whether the land use changes actually produce improvement in water quality (e.g., observing increased habitat benefits for aquatic, riparian, and upland areas).

Linking Land Use and Lake Erie: A Planning Framework for Achieving Balanced Growth in the Ohio Lake Erie Watershed can be accessed in its entirety at www.epa.state.oh.us/oleo/bgi/BGIPF.pdf.

The following proposed indicators have been developed by a multi-stakeholder Steering Committee over the past six months. This suite of indicators reflects the professional and scientific expertise of the Steering Committee to date. At the January 21, 2005 workshop, you will be joined by 50-60 colleagues representing state, regional and local agencies, academic institutions, and key stakeholder groups to discuss and evaluate the proposed indicators and recommend a final suite to the Ohio Lake Erie Commission that can be implemented.

Table of Contents

Definitions and Acronyms

(Please refer to this page for explanations of the fact sheet elements.)

Change Measured: *What change does the indicator measure? Does it measure a change within a specified area (e.g., Priority Development Area, Priority Conservation Area, watershed) or does it measure a change within a specified area as compared to another geographic area (e.g., Priority Development Area compared with neutral areas)?*

Purpose/BGI Objective: *Why is this measurement important to measuring changes from the Balanced Growth Initiative? What will this indicator help us to do better?*

Scale: *e.g., watershed, state, county, municipality*

Endpoint: *What is the desired outcome if the indicator is fully implemented? Some indicators may ot have a basin-wide endpoint. Indicator endpoints may differ throughout the Lake Erie basin based on local watershed circumstances. As such, endpoints may be established by local watershed planning partnerships.*

Data Location and Availability: *What agency/organization collects and/or maintains the data and how frequently is it updated?*

Features: *Describe necessary monitoring and data/information collection methods for this indicator, including any gaps/needs*.

Illustration*: How is the data/information best presented?*

Potential Limitations: *Are there inherent difficulties or limitations to data collection and analysis? Can Indicator changes be directly attributed to the Balanced Growth Initiative (BGI)?*

Relevancies: *Are other programs required to collect, assess and/or report on this data? To which other indicators in the suite does this indicator relate and how? Cross-referenced with other indicators, where appropriate.*

BGI: Balanced Growth Initiative

PCA: Priority Conservation Area

PDA: Priority Development Area

WPP: Watershed Planning Partnership

Natural Resource Indicators:

Measuring Changes in the condition of the resource or watershed health

Natural Resource Indicator

A: Change in Water Chemistry

Change Measured:

Water chemistry is used to measure change in ambient water quality. Specific water chemistry components may include: phosphorus, nitrate and nitrite, total chloride, suspended solids, metals, etc. associated with parameters of Ohio water quality standards or known stressors in the system. Indicator application should assess PDAs or PCAs compared to neutral areas.

Purpose/BGI Objective:

Improved water quality is an important desired outcome of implementation of the BGI. Water quality includes the chemical, physical, and biologic integrity of surface waters. Water chemistry will help us understand trends in watershed recovery and/or decline associated with changing land use patterns. If land use change differs significantly with implementation of PCAs and PDAs, the water chemistry of Lake Erie, large rivers, and their tributaries may reflect such changes - or confirm protection of resources.

Scale:

Water chemistry data collection is site specific, but may be aggregated at any scale.

Endpoint:

Achievement of Ohio water quality standards for all designated uses:

- Total Maximum Daily Load (TMDL) targets
- Biologic response

Of the three water chemistry parameters measured for the *Ohio State of the Lake Report: Lake Erie Quality Index*, phosphorus is the only parameter with a target value or "endpoint." Under the Great Lakes Water Quality Agreement, the phosphorus limit was set at 15 ppm for the western basin, and 10 ppm in the central basin. Models were used to calculate these concentrations as those that would prevent nuisance growths of algae and reduce the area of anoxia at the bottom of the central basin.

Data Location and Availability:

- The Ohio Environmental Protection Agency (EPA) collects water chemistry data within watersheds on a cyclic basis, which is currently linked to TMDL development. The Ohio Integrated Water Quality Report is developed on a two-year cycle.
- Water chemistry data is reported through the *Ohio State of the Lake Report: Lake Erie Quality Index* every 4 to 6 years.
- The Heidelberg College Water Quality Lab maintains a water chemistry database for specific Ohio rivers and part of their "Ohio Tributary Monitoring Program." See the following web site: www.heidelberg.edu/wql/surface.html for more explanation.
- Local watershed groups often collect water chemistry data as part of the watershed inventory process

Features:

See Ohio Integrated Water Quality Report online at:
www.epa.state.oh.us/dsw/tmdl/2004IntReport/2004OhioIntegratedReport.html
See *Ohio State of the Lake Report: Lake Erie Quality Index* online at:
www.epa.state.oh.us/oleo/reports/legi/legi2004/legiz.htm
See Ohio Tributary Monitoring Program (Heidelberg College Water Quality Lab) at:
www.heidelberg.edu/wql/surface.html
Ohio EPA "credible data" rules

Illustration:
Water chemistry data can be presented geographically within watershed assessment units to demonstrate spatial relationships. Bar graphs are also useful to demonstrate temporal trends and relationships.

Potential Limitations:
- Water chemistry sampling by Ohio EPA is currently timed with TMDL development. This schedule may not coincide with BGI implementation within specific watersheds. Early coordination with Ohio EPA will be essential to establishment baseline conditions.
- The cost of water chemistry analysis is a significant limitation for many watershed groups.
- Changes in water chemistry may be difficult to attribute to BGI activities/policies; linkage to BGI requires careful assessment.

Relevancies:
A variety of agencies and institutions collect water chemistry data to support specific research and programmatic needs. Some examples include:
- *Ohio State of the Lake Report: Lake Erie Quality Index* includes a water chemistry metric.
- The Ohio EPA utilizes water chemistry data to assess conformance with Ohio water quality standards, and to compile the Ohio Integrated Water Quality Report.
- Watershed groups collect water chemistry data on a limited basis, but are not required to do so.
- The Heidelberg College Water Quality Lab maintains a water chemistry database as a result of their Ohio Tributary Monitoring Program.
- Other local and regional units of government may collect water chemistry data for permit conformance and mandated planning activities.

Strong connections are likely to occur between change in water chemistry and change in the following: water clarity, stream morphology, biotic integrity, extent of riparian habitat, and aquatic habitat.

See also:
- Natural Resource Indicator B (Change in Water Quality)
- Natural Resource Indicator C (Change in Stream Morphology Characteristics)
- Natural Resource Indicator F (Change in Aquatic Habitat and Biotic Quality)
- Natural Resource Indicator G (Change in Extent and Condition of Riparian Corridors)
- Natural Resource Indicator H (Change in Extent and Condition of Riparian and Coastal Wetlands)

Last Revised: December 2004

Natural Resource Indicator

B: Change in Water Clarity

Change Measured:

Water clarity is used to measure turbidity. Water becomes turbid when particles, like silt or algae, become suspended in it. Excess turbidity is usually a result of poor land use practices, which leave soil exposed to erosion, or from activities that result in nutrient enrichment of the water. Water clarity in PDAs and PCAs can be compared to neutral areas across the watershed.

Purpose/BGI Objective:

Increased clarity or reduced turbidity may reflect an increase of watershed protection practices. Increased protection and restoration within a PCA should result in less erosion and nutrient-enriching activities within the PCA. Alternatively, if development is focused within PDAs, other portions of the watershed will benefit from reduced erosion associated with land development.

Scale:

Secchi disk monitoring (which is used to measure how deep a person can see into the water) is conducted in lakes, bays, and similar bodies of water which lack fast moving water. Graduated tubes have been developed to measure clarity of fast moving streams and rivers. Relative to the BGI, water clarity will generally be monitored within the Lake Erie basin to help measure watershed-wide land use effects on Lake Erie.

Endpoint:

Secchi disk clarity measurement of 6 feet within Lake Erie is considered “excellent” according to the Lake Erie Quality Index.

Data Location and Availability:

- The Ohio Department of Natural Resources (DNR), Division of Wildlife, collects clarity data within Ohio waters of the western Lake Erie basin. Data is collected monthly, May to October. 40 sites are currently monitored.
- Data is utilized in the *Ohio State of the Lake Report: Lake Erie Quality Index*, which is updated every 4 to 6 years.

Features:

See the compilation of secchi disk monitoring methods provided by Kent State University at: http://dipin.kent.edu/secchi.htm

Illustration:

Water clarity data can be presented geographically within Lake Erie. Bar graphs are also useful to demonstrate temporal trends and relationships.

Potential Limitations:

Changes in water clarity may be difficult to attribute to BGI activities/policies; linkage to BGI requires careful assessment.

Relevancies:

Water clarity (or transparency) monitoring is a component of many volunteer monitoring programs because of its low cost and relative ease.

- *Ohio State of the Lake Report: Lake Erie Quality Index* includes a water clarity metric.
- Ohio Lake Management Society maintains clarity data for roughly 50 inland Ohio lakes.

- Dr. Bob Carlson, Kent State University, organizes a national volunteer clarity data gathering program, “The Great North-American Secchi Dip-in” (http://dipin.kent.edu/).

Last Revised: December 2004

Natural Resource Indicator

C: Change in Stream Morphology Characteristics

Change Measured:

Change in stream morphology characteristics will measure 1) how channels are adapting to changes in land use, and 2) whether BGI implementation influences the physical quality of stream channels. Changes can be compared across watersheds with attention on areas with established PDAs and PCAs.

Purpose/BGI Objective:

Stream morphology (including vertical stability; existence of connected floodplains; and channel pattern, plan and dimension) responds to changes within a watershed. Good stream morphology is also an objective of watershed restoration. A watershed may observe improving stream morphology in areas where passive recovery is able to occur (e.g., outside PDAs). Accelerated improvement will occur with investment in areas prioritized for active channel restoration (e.g., inside PCAs).

Scale:

Stream morphology can be characterized generally at the watershed scale; however, more intensive stream morphology measurements are collected at the stream reach scale. See the following component of the Draft Ohio Nonpoint Source Management Plan 2005-2010 for more information on a watershed approach to improving stream morphology: www.epa.state.oh.us/dsw/nps/NPSMP/SIwatershedapproachjumppage.html.

Endpoint:

The state of Ohio has four prioritized endpoints for good stream morphology: 1) vertical stability; 2) connected floodplains; 3) appropriate channel form (dimension, plan and profile); and 4) habitat function.

Data Location and Availability:

Although no single agency collects stream morphology data consistently throughout Ohio or within the Lake Erie Watershed, individual watershed groups conduct stream morphology assessments in order to develop state endorsed watershed action plans. Several counties within Ohio have been inventoried.

Features:

Stream morphology assessment techniques vary according to purpose and scale. See the following page of the Draft Ohio Nonpoint Source Management Plan 2005-2010: www.epa.state.oh.us/dsw/nps/NPSMP/SIwatershedapproachjumppage.html. The Ohio Department of Natural Resources, in cooperation with the Ohio Environmental Protection Agency (EPA), is currently developing stream morphology assessment methods for use by watershed planners and Total Maximum Daily Load (TMDL) program staff.

Illustration:

Basic stream morphology characteristics can be presented geographically within watershed assessment units to demonstrate spatial relationships. Site information is typically depicted with stream cross-sections, drawings, and maps.

Potential Limitations:

- Data are not consistently collected throughout Ohio or Lake Erie watersheds.
- Data collection requires a relatively high degree of technical knowledge.
- Intensive stream morphology data gathering methods can be time consuming and costly.

- Changes in stream morphology characteristics may be difficult to attribute to BGI activities/policies; linkage to BGI requires careful assessment.

Relevancies:

- In order to receive "state endorsement" a watershed action plan must include a characterization of stream morphology.
- Because good stream morphology increases a stream's pollutant assimilation capacity and resilience to stress, several other indicators are influenced by stream morphology including: water chemistry, water clarity, tributary biotic integrity, and habitat quality. Likewise, percent of impervious surfaces and extent of riparian habitat will influence stream morphology conditions as channels adapt to land use modification and protection.

See also:

- Natural Resource Indicator A (Change in Water Chemistry)
- Natural Resource Indicator B (Change in Water Clarity)
- Natural Resource Indicator F (Change in Aquatic Habitat and Biotic Quality)
- Natural Resource Indicator G (Change in Extent and Condition of Riparian Corridors)
- Natural Resource Indicator H (Change in Extent and Condition of Riparian and Coastal Wetlands)
- Land Use and Socioeconomic Indicator A (Change in Impervious Surface Cover)

Last Revised: December 2004

Natural Resource Indicator

D: Change in Volume of Water Withdrawn (Ground and Surface Waters)

Change Measured:

Measures ground and surface water withdrawals and is reported to the Ohio Department of Natural Resources (DNR) Division of Water, as required under Ohio's Water Withdrawal Facility Registration (WWFR) program.

Purpose/BGI Objective:

Will measure changes in demand for water resources and will assist with water supply planning for both PDAs and PCAs.

Scale:

Any

Endpoint:

Maintain sufficient water availability for human consumption and support of aquatic life. Allows for sustained use of the water supply resource.

Data Location and Availability:

The Ohio DNR Division of Water maintains a WWFR. Reports of use, withdrawal amounts, and return flows are submitted and compiled annually. http://ohiodnr.com/water/wwfr/aboutwwfr.htm

Features:

WWFR forms are provided online: http://ohiodnr.com/water/wwfr/forms.htm. Registrants are required to complete the annual report form for their facility (or facilities).

Illustration:

The data/information is stored in a Microsoft Access database. WWFR annual reports are available online: http://ohiodnr.com/water/wwfr/annual_rpts.htm. Data can be presented in tabular or geospatial (GIS) format.

Potential Limitations:

- Participation in the WWFR program is required of those facilities that have the capacity to withdraw 100,000 gallons per day or more. QA/QC of the annual data reported by the facility is limited.
- Minimum baseflow to support aquatic life has not been determined for Ohio surface waters.
- Changes in volume of water withdrawn may be difficult to attribute to BGI activities/policies; linkage to BGI requires careful assessment.

Relevancies:

Water withdrawals can affect water levels in streams, especially during drought conditions. Lack of sufficient baseflow can result in insufficient dilution of pollutants and thereby have an influence on the water chemistry and biology indicators.

See also:

- Natural Resource Indicator A (Change in Water Chemistry)
- Natural Resource Indicator F (Change in Aquatic Habitat and Biotic Quality)

Last Revised: December 2004

Natural Resource Indicator

E: Change in Number of Combined Sewer Overflow and Sanitary Sewer Overflow Events

Change Measured:
Measures number of Combined Sewer Overflow (CSO) and Sanitary Sewer Overflow (SSO) events.

Purpose/BGI Objective:
Investment in existing urban infrastructure, including separating combined sewers and upgrading sanitary sewer systems, should reduce CSO and SSO events within PDAs.

Scale:
Any

Endpoint:
In 1994, the U.S. Environmental Protection Agency (EPA) published the national CSO Control Policy, which became part of the Clean Water Act in 2000. Working from the national policy, Ohio EPA issued its CSO Control Strategy in 1995. The primary goals of Ohio's CSO program are to control CSOs so that they do not significantly contribute to violations of water quality standards or impairment of designated uses and to minimize the total loading of pollutants discharged during wet weather.

Data Location and Availability:
- The Ohio EPA maintains an "Ohio CSO Inventory" at www.epa.state.oh.us/dsw/cso/csoindex.html
- Municipalities and water treatment utilities

Features:
See Ohio EPA CSO Program: www.epa.state.oh.us/dsw/cso/csoindex.html

Illustration:
Tabular and/or maps. See Ohio CSO inventory at www.epa.state.oh.us/dsw/cso/csoindex.html

Potential Limitations:
- At this time, there is not a formal SSO control policy at the federal level or in Ohio.
- Reducing the number of CSO and SSO events may not yield observable improvements in water quality due to other wet weather sources of pollution.
- Changes in number of CSO and SSO events may be difficult to attribute to BGI activities/policies; linkage to BGI requires careful assessment.

Relevancies:
CSO and/or SSO events affect water chemistry and biology. In addition, public health effects can result from CSO and SSO events, especially along the Lake Erie coast. Public health agencies monitor for bacteria and post beach advisories and/or closings if levels exceed standards.

See also:
- Natural Resource Indicator A (Change in Water Chemistry)
- Natural Resource Indicator B (Change in Water Clarity)
- Natural Resource Indicator F (Change in Aquatic Habitat and Biotic Quality)

Last Revised: December 2004

Natural Resource Indicator

F: Change in Aquatic Habitat and Biotic Quality

Change Measured:

Ohio incorporates measures of biologic community health into water quality standards (www.epa.state.oh.us/dsw/rules/index.html), and utilizes measures of habitat quality during water quality assessments. The following indices have been developed by Ohio EPA to measure changes in the quality of aquatic biologic communities and habitats:

- Qualitative Habitat Evaluation Index (QHEI): is composed of an array of metrics that evaluate stream substrate and gradient, in-stream cover, and stream channel, pool/riffle and riparian quality.
- Headwater Habitat Evaluation Index (HHEI): Similar to QHEI. Physical features are measured; however, salamanders are used as bio-indicators because headwater streams are too small to support fish.
- Invertebrate Community Index (ICI): Evaluation of water resource integrity based on sampling of macroinvertebrates.
- Index of Biological Integrity (IBI): Evaluation of water resource integrity based on sampling of fish communities.
- Modified Index of Well Being (Miwb): Evaluation of water resource integrity based on sampling of fish communities.

Purpose/BGI Objective:

Improved water quality is an important desired outcome of implementation of the BGI. Water quality includes the chemical, physical, and biologic integrity of surface waters. Aquatic, biologic, and habitat quality will help us understand trends in watershed recovery and/or decline associated with changing land use patterns. If land use change differs significantly with implementation of PCAs and PDAs, the aquatic biology of Lake Erie, large rivers and their tributaries may reflect such changes, or confirm protection of resources. Aquatic habitat quality can often explain declines in the biology of a water resource.

Scale:

Watershed

Endpoint:

- Achievement of Ohio water quality standards for all designated uses.
- Total Maximum Daily Load (TMDL) targets

Data Location and Availability:

- The Ohio Environmental Protection Agency (EPA) collects biologic and habitat quality data within watersheds on a cyclic basis, which is currently linked to TMDL development. The Ohio Integrated Water Quality Report is developed on a two-year cycle.
- Biotic and habitat quality data is reported through the *Ohio State of the Lake Report: Lake Erie Quality Index* every 4 to 6 years.
- Local watershed groups and units of government often collect biologic and habitat quality data as part of the watershed inventory process.

Features:

- See Ohio Integrated Water Quality Report online at:

www.epa.state.oh.us/dsw/tmdl/2004IntReport/2004OhioIntegratedReport.html

- See Ohio State of the Lake Report: Lake Erie Quality Index online at:

www.epa.state.oh.us/oleo/reports/legi/legi2004/legiz.htm

- Ohio EPA “credible data” rules

Illustration:
Water biology and habitat quality can be presented geographically within watershed assessment units to demonstrate spatial relationships. Bar graphs are also useful to demonstrate temporal trends and relationships.

Potential Limitations:
- Ohio EPA's monitoring program is currently timed with TMDL development. This schedule may not coincide with BGI implementation within specific watersheds. Early coordination with Ohio EPA will be essential to establishment of baseline conditions.
- Changes in aquatic habitat and biotic integrity may be difficult to attribute to BGI activities/policies; linkage to BGI requires careful assessment.

Relevancies:
A variety of agencies and institutions collect water chemistry data to support specific research and programmatic needs. Some examples include:
- *Ohio State of the Lake Report: Lake Erie Quality Index* includes biological and habitat indicators for Lake Erie.
- The Ohio EPA utilizes biologic and habitat quality data to assess conformance with Ohio water quality standards and to compile the Ohio Integrated Water Quality Report.
- Watershed groups collect biologic and habitat data on a limited basis, but are not required to do so.

Strong connections are likely to occur between change in biologic/habitat quality and change in the following: water chemistry, water clarity, stream morphology, and extent of riparian habitat.

See also:
- Natural Resource Indicator A (Change in Water Chemistry)
- Natural Resource Indicator B (Change in Water Clarity)
- Natural Resource Indicator C (Change in Stream Morphology Characteristics)
- Natural Resource Indicator G (Change in Extent and Condition of Riparian Corridors)
- Natural Resource Indicator H (Change in Extent and Condition of Riparian and Coastal Wetlands)

Last Revised: December 2004

Natural Resource Indicator

G: Change in Extent and Condition of Riparian Corridors

Change Measured:
Measures existence and quality of riparian corridors.

Purpose/BGI Objective:
Riparian corridors have long been regarded as essential components to healthy stream and river systems. Riparian corridors provide shade and nutrients necessary for high quality streams. Riparian corridors also aid in flood attenuation, pollutant assimilation, and other valuable stream services. The state of the riparian corridors is a key attribute of the suitability of tributaries for fish habitat and for their role in control of sediment and nutrient input. A watershed may observe improving riparian corridor in areas where passive recovery is able to occur (e.g., outside PDAs). Accelerated improvement will occur with investment in areas prioritized for active riparian restoration (e.g., inside PCAs). The measure will be more general than the PCA coverage and will permit the evaluation of PCA protection relative to the state of the entire watershed.

Scale:
Watershed

Endpoint:
The maximum value would be 100 percent intact and un-fragmented natural corridor. Additional work will be required to determine an acceptable range and widths appropriate to stream size.

Data Location and Availability:
Data for lower reaches of the major watersheds are available through the Ohio Environmental Protection Agency (EPA) Index of Watershed Health (IHW) indicators. Additional data are available from the U.S. Geological Survey (USGS) Land Use and Land Cover (LULC) database. The LULC databases are scheduled for updates every 10 years. The 1992 database is available; the 2002 database has been scheduled for release, but is still being fine-tuned. Watershed inventories and action plans are other potential data sources.

Features:
- Individual watershed groups have completed riparian corridor inventories; however, information is inconsistent throughout the Lake Erie watershed.
- Ohio EPA and USGS currently collect this information which can be obtained as needed.

Illustration:
Geographic Information System (GIS)-based maps

Potential Limitations:
- There is a lack of centralized data gathering in Ohio. Although data are available for this index, previous sampling lacks high resolution for the entire corridor. Initial maps using available GIS data will require some ground-truthing to ensure wooded areas are in fact directly adjacent to streams.
- The LULC database may not be updated as frequently as necessary.
- Changes in extent and condition of riparian corridors may be difficult to attribute to BGI activities/policies; linkage to BGI requires careful assessment.

Relevancies:

Strong connections are likely to occur between change in riparian corridor and change in the following: and biologic/habitat quality, water chemistry, water clarity, and stream morphology.

See also:

- Natural Resource Indicator A (Change in Water Chemistry)
- Natural Resource Indicator B (Change in Water Clarity)
- Natural Resource Indicator C (Change in Stream Morphology Characteristics)
- Natural Resource Indicator F (Change in Aquatic Habitat and Biotic Quality)

Last Revised: December 2004

Natural Resource Indicator

H: Change in Extent and Condition of Riparian and Coastal Wetlands

Change Measured:

Measures changes in condition, amounts and distribution of wetlands associated with the tributary network

Purpose/BGI Objective:

Wetlands have long been regarded as essential components of healthy watersheds. Wetlands provide habitat for wildlife, aid in flood attenuation, pollutant assimilation, groundwater recharge, and other valuable services. A watershed may observe improving riparian and coastal wetlands in areas where passive recovery is able to occur (e.g., outside PDAs). Accelerated improvement will occur with investment in areas prioritized for active riparian restoration (e.g., inside PCAs).

Scale:

Watershed

Endpoint:

The endpoint for amount and distribution of wetlands would have to be determined for each watershed. For the assessment of condition, endpoints already exist for classifying high quality wetlands.

Data Location and Availability:

The Great Lakes Coastal Wetlands Inventory (www.glc.org/wetlands/inventory.html) completed in conjunction with U.S. Geological Survey (USGS) and the Great Lakes Commission can be used to provide baseline data for determining amount and distribution of wetlands. The Ohio Environmental Protection Agency (EPA) has developed wetland Indices of Biotic Integrity (IBIs) for vegetation and amphibians. These databases are also available and can be applied. Plans for updating this information have not been completed at this time. Other data sources include:

- Ohio Department of Natural Resources (DNR) Division of Real Estate and Land Management – “State Wetland Inventory”
- Ohio DNR Office of Coastal Management – “Coastal Atlas”

Ohio EPA Division of Surface Water Contact:
John J. Mack, (614) 644-3076, john.mack@epa.state.oh.us

Features:

For the condition measurements, data can be provided by Ohio EPA where available and as needed. Individual watershed groups (e.g., watershed planning partnerships) may also have completed riparian corridor inventories. Data on amount and distribution will need to be collected by an agency or organization with Geographic Information System (GIS) capabilities.

Illustration:

The patterns of indicator values are best illustrated in maps with reference to historical wetlands and buffers relative to their current state, size, and location.

Potential Limitations:

- For detailed applications, survey data may be sparse and not updated as frequently as desired. Data may not be consistently available throughout the Lake Erie watershed. Quality is difficult to discern with current data sources. Also, current data sources are from research and development efforts, not well-established programs.

- Changes in extent and condition of riparian and coastal wetlands may be difficult to attribute to BGI activities/policies; linkage to BGI requires careful assessment.

Relevancies:

The Wetlands Vegetative IBI is used by Ohio EPA and is part of the Lake Erie Quality Index. The amphibian IBI is used by Ohio EPA.

Last Revised: December 2004

Natural Resource Indicator

I: Change in Percent of Watershed Dominated by Non-Cultivated Lands

Change Measured:

Measures change in percentage of vegetated land that is not cultivated within a watershed.

Purpose/BGI Objective:

Much of the Lake Erie watershed is dominated by cultivated land. As of the most recent state-wide land use map produced by the Ohio Department of Natural Resources (DNR), 72 percent of the Lake Erie watershed is classified as agricultural. A slowing rate of land use change from agricultural to non-cultivated land use can indicate success of the BGI. This index provides a measure of the extent to which the entire watershed remains in a non-cultivated vegetation state. This can show the effectiveness of using PCAs to prevent the conversion of natural areas by comparing areas within a PCA to areas outside a PCA, and by comparing areas in PCAs that are non-cultivated with other land cover types in the PCA.

Scale:

Watershed

Endpoint:

An undisturbed watershed would have a score of 100 percent natural (non-cultivated) land cover. Additional work will be required to determine an acceptable range.

Data Location and Availability:

Geographic Information System (GIS) databases are available through the U.S. Geological Survey (USGS) Land Use and Land Cover (LULC) project. The LULC databases are scheduled for updates every 10 years. The 1992 database is available, and the 2002 database has been scheduled for release, but is still being fine-tuned.
Web site to order data: http://edc.usgs.gov/products/landcover/lulc.html
Also:

- Ohio DNR Division of Real Estate and Land Management – “State Land Use Inventory”
- Ohio DNR Office of Coastal Management – “Coastal Atlas”
- Counties

Features:

Data will need to be obtained from the USGS as it becomes available. Two time periods will need to be analyzed and compared to determine change. Data will need to be collected by an agency or organization with GIS capabilities.

Land cover data will be applied in two important and distinct ways:

1) to compare non-cultivated natural lands to cultivated lands within PCAs; and
2) to compare non-cultivated natural lands within in PCAs to areas outside PCAs.

Illustration:

The data should be displayed as a map showing the composition variability of the watershed.

Potential Limitations:

- Vegetation categories are restricted to the land cover categories used in the USGS LULC program. LULC Databases may not be updated as frequently as necessary. In addition, a workable index will need specification of a reasonable target range for success (e.g. 75-100%). GIS data for this indicator will require some ground-truthing.

- Compilation of land use data is costly and time-consuming. The most recent state-wide land use inventory was compiled in 1994.
- Changes in percent of watershed dominated by non-cultivated lands may be difficult to attribute to BGI activities/policies; linkage to BGI requires careful assessment.

Relevancies:

This index is similar to significant natural features inventories in many other indicator systems.

Last Revised: December 2004

Land Use and Socioeconomic Indicators:

Measuring Land Use and Socioeconomic Change

Land Use and Socioeconomic Indicator

A: Change in Impervious Surface Cover

Change Measured:

Amount and percent change in impervious surface in a priority conservation or priority development area established as part of the BGI compared with neutral areas outside the priority areas.

Purpose/BGI Objective:

Change in impervious surface in a geographic area would indicate success of BGI in directing development toward priority areas and away from priority conservation areas. It would also indicate increasing threat to water quality from stormwater run-off in areas of concentrated development, unless mitigation measures are implemented. However, concentrated development could result in less impervious cover per capita as concentrated development requires fewer roads, parking lots, and roof tops compared to sprawling development.

Scale:

Would be measured at a municipal level and then accumulated for developed areas within a county and then for the watershed by a Watershed Planning Partnership (WPP)

Endpoint:

The goal would be to limit amount of impervious surface in PCAs and in the remaining area outside of PDAs. Complete success means no, or very little, increased impervious surface in PCAs with all development occurring elsewhere.

Data Location and Availability:

These data would be available in some areas, not in others. Counties with a digitized land cover information system could provide updates on request. Metropolitan counties and the municipalities within them would be most likely to have digitized data within their Department of Planning or Department of Economic Development (see Summit County and Hamilton County, OH). There are no plans now for a consistent data set throughout the watershed on impervious surface cover. However, a good source for this information would be the Ohio Planning Conference, whose members are planning professionals in the municipalities and counties of the Lake Erie watershed. The Ohio Planning Conference can be reached at 614-552-1117. Impervious surface may also be estimated using the Impervious Surface Analysis Tool (ISAT) developed by the National Oceanic and Atmospheric Administration (NOAA) through their Coastal Services Center and used by the Non-Point Education for Municipal Officials (NEMO) programs in several states. Ohio NEMO can be contacted at 614-292-6538. More information on ISAT is available at: www.csc.noaa.gov/crs/cwq/isat.html.

Features:

A specialized list of municipal and county planning professionals in the watershed should be created and contacted regarding the importance of consistent land cover information, particularly impervious surface cover information. Current land cover information systems maintained by the Natural Resource Conservation Service (NRCS) of the U.S. Department of Agriculture (USDA) are at too large a scale for use in the PCAs or PDAs of the counties in the watershed.

Illustration:

Land cover information should be mapped using Geographic Information Systems (GIS) with a specific layer for impervious surface cover. GIS-based impervious surface maps exist in several Ohio counties.

Potential Limitations:

- Data on impervious surface cover are not generally available, though the technology to produce and display such data is available. There is a need to mobilize that capability and create the data

for purposes of evaluating the BGI and other uses in land use planning. A specific proposal for that data system is warranted.
- Changes in percent of impervious surface cover may be difficult to attribute to BGI activities/policies; linkage to BGI requires careful assessment.

Relevancies:

This data set would interface with Best Management Practice (BMP) information in that greater stormwater control through BMPs is needed in areas experiencing increases in impervious surface cover. Many counties estimate or measure impervious surface cover to respond to the Phase II requirements of the Clean Water Act.

See also:
- Programmatic Indicator G (Change in Number of Best Management Practices in Watershed and their Locations)

Last Revised: December 2004

Land Use and Socioeconomic Indicator

B: Change in Residential and Other Development Density (Dwelling Units per Acre, Building Square Footage per Acre) in PDAs vs. Outside PDAs

Change Measured:

Measures the change in the number of dwelling units on a per acre basis and the change in the amount of nonresidential building floor area on a per acre basis in PDAs compared to the rest of the watershed areas outside the PDAs.

Purpose/BGI Objective:

Measures the increase in development over time in PDAs (preferred outcome) compared to areas not in a PDA, equalized to a per acre basis. The BGI is designed to encourage development in PDAs rather than outside PDAs. As development occurs, the density of development in a given area increases (dwelling units for residential uses and building floor area for nonresidential uses), and greater increases in PDAs would indicate the success of incentives.

Scale:

Sub-watershed (PDAs) and watershed.

Endpoint:

PDAs would show a greater increase in development density than the remaining areas outside PDAs in the watershed, and the magnitude of this difference would increase over time.

Data Location and Availability:

Watershed Planning Partnerships (WPPs) would have information on the size of PDAs and the total acres within the watershed. This information could be obtained using county tax records and is also available from commercial sources like Metroscan. WPPs would need to update the information annually to document the changes; updated information could be gleaned from building permit information gathered from local building departments.

Features:

Each WPP or another appropriate agency would be needed to collect and analyze the data to determine the change in density over time both in the PDAs and in the non-PDA areas of the watershed. The current density of development [total number of dwelling units in an area (PDAs and total watershed)] divided by total acres in the same area and total building floor area of nonresidential uses divided by total acres in the same area would need to be calculated for baseline information. A Geographic Information System (GIS) would be a good tool for storing, analyzing the data, and presenting the data.

Illustration:

This information could be presented either numerically or with maps showing the change in density (both residential and nonresidential) over time.

Potential Limitations:

- County tax records may not be available electronically in all counties within the Lake Erie Basin, which is needed in order to have baseline data. Municipalities are required to report building permit information to the Ohio Department of Development, Office of Strategic Research, so annual updates of number of building permits issued for new dwelling units and nonresidential building construction should be easily obtainable from local jurisdictions.
- Changes in residential and other development density may be difficult to attribute to BGI activities/policies; linkage to BGI requires careful assessment.

Relevancies:

This indicator is related to the change in number of acres converted from green areas and open land to urban uses, and the percentage of new commercial and industrial building floor area and new housing units going into PDAs. However, data for latter may be easier to obtain than the former, since it does not rely on acres related to a specific land use.

See also:

- Programmatic Indicator E (Change in Number of Acres Converted from Green Area/Open Land to Urban Uses)
- Land Use and Socioeconomic Indicator C (Change in Percentage of New Commercial and Industrial Building Floor Area and New Housing Units Going Into PDAs vs. Rest of the Watershed)

Last Revised: December 2004

Land Use and Socioeconomic Indicator

C: Change in Percentage of New Commercial and Industrial Building Floor Area and New Housing Units Going Into PDAs vs. Rest of the Watershed

Change Measured:

Measures the percentage of new development located within PDAs compared to the rest of the watershed. Data collected for this indicator could also be used to measure the percentage of development that occurs in neutral areas and in PCAs.

Purpose/BGI Objective:

The BGI is designed to encourage development in PDAs rather than outside PDAs. As new development occurs, the desire is that it will locate within PDAs at more than a proportional share.

Scale:

Sub-watershed (PDAs, PCAs, and neutral areas) and watershed.

Endpoint:

PDAs would show a higher percentage of new development than PCAs or neutral areas (remaining areas of the watershed).

Data Location and Availability:

Watershed Planning Partnerships (WPPs) would have information on the sizes of PDAs and PCAs and the total acres within the watershed. Baseline information would be the percent of the watershed area in PDAs, PCAs, and neutral. WPPs would need to obtain information about amount and location of new development annually to document the changes; updated information could be gleaned from building permit information gathered from local building departments.

Features:

Each WPP (or another appropriate agency) would be needed to collect and analyze the data to determine the percentages of residential and commercial/industrial development in each area. For example, in Watershed XYZ, PDAs might occupy 25 percent of the watershed area, neutral areas 50 percent, and PCAs the remaining 25 percent. A goal may be to have 75 percent of all new development in the watershed occur in the PDA, 25 percent in the neutral area, and none in the PCAs. Since residential development is generally tallied on a per unit basis, and commercial/industrial development tallied on a gross building floor area basis, both categories would be calculated. A Geographic Information System (GIS) would be a good tool for storing, analyzing and presenting the data.

Illustration:

This information could be presented either numerically or with maps showing the change in density (both residential and nonresidential) in PDAs compared to other areas over time.

Potential Limitations:

- Municipalities are required to report building permit information to the Ohio Department of Development, Office of Strategic Research, so annual updates of number of building permits issued for new dwelling units and nonresidential building construction should be easily obtainable from local jurisdictions.
- Some entity would need to be responsible for analyzing building permit files/data to develop a database based on square footage (floor area) which will provide a more accurate account than number of permits alone.

- Changes in percentage of new commercial and industrial building floor area and new housing units going into PDAs may be difficult to attribute to BGI activities/policies; linkage to BGI requires careful assessment.

Relevancies:

This indicator is related to the change in number of acres converted from green areas and open land to urban uses, and the change in residential and other development density, though data for the latter may be easier to obtain than the former, since it does not rely on acres related to a specific land use and does not require baseline information on the amount of current development.

See also:

- Programmatic Indicator E (Change in Number of Acres Converted from Green Area/Open Land to Urban Uses)
- Land Use and Socioeconomic Indicator B (Change in Residential and Other Development Density in PDAs vs. Outside PDAs)

Last Revised: December 2004

Land Use and Socioeconomic Indicator

D: Change in Property Values

Change Measured:

Assessed values of real property inside PDA and inside PCA, as well as surrounding designated areas, will be annually reviewed to identify change over time.

Purpose/BGI Objective:

Increased value of land is understood to be a desirable goal. Designated PDA and PCA areas, because of their "controlled" environment, should experience increases in value over time if the designation has a "market" value.

Scale:

The data is at the parcel level and aggregated to the designated boundaries of the PDA, PCA, and surrounding control areas.

Endpoint:

Designated PDAs and PCAs across the basin reflecting the positive value gain.

Data Location and Availability:

Assessed property values are maintained by each County Auditor. The Watershed Planning Partnership (WPP) will need to annually collect the values for the parcels within the PDAs and PCAs, analyze and publish the data.

Features:

WPPs will need to collect the data and will also need to establish standard reporting so that analytical data may be shared across watersheds.

Illustration:

Tables of summary property values for the PDA, PCA, and study control areas would be the base presentation. Maps and charts will illustrate change.

Potential Limitations:

- The size of the PDA, PCA, and the study area may encompass large numbers of individual parcels making data collection and analysis costly and difficult. Will require assistance of County Auditors to retrieve the relevant data**.**
- Changes in property values may be difficult to attribute to BGI activities/policies; linkage to BGI requires careful assessment.

Relevancies:

This analysis is specific to the PCAs and PDAs.

Last Revised: December 2004

Land Use and Socioeconomic Indicator

E: Change in Public Economic Development Investment in PDAs

Change Measured:

Collect financial information from identified public agencies on grants, bonds, and tax incentives for public infrastructure, allocated to companies and communities within a PDA. This would be an annual report of resources allocated to the area, which could be compared to areas outside the PDA and compared over time.

Purpose/BGI Objective:

The BGI is designed to encourage development in PDAs. If the PDA is deemed to be the area where intense land development is to be encouraged, then there should be an increase of public money to create a positive incentive for the development to occur.

Scale:

Watershed Planning Partnerships (WPPs) will need to collect data on a parcel basis to include within the PDA. Projects will need to be identified as part of PDA.

Endpoint:

The goal is to direct public economic development investment to PDAs over neutral areas, and exclude it from PCAs.

Data Location and Availability:

WPPs will need to collect the data from the multiple relevant governmental agencies, including city, county, and state offices of transportation, water, sewer, development, and local school districts, regarding investments made in PDAs. This should also include targeted development incentives such as property or income tax exclusions and other inducements for development. Data should be collected from private companies that provide water, gas and electric services to the PDA.

Features:

The WPP will need to establish what public agencies and activities should be monitored and what programs to include (e.g., would a training grant to a company be considered an investment?)

Illustration:

Data tables

Potential Limitations:

- The data are not presently centralized and will need to be collected by the WPP. WPPs will need to collect data from numerous sources, many of which make infrequent or once in twenty years investments (i.e., school buildings).
- Changes in public economic development investment in PDAs may be difficult to attribute to BGI activities/policies; linkage to BGI requires careful assessment.

Relevancies:

Each public program collects its own program data. The assembling and comparison of the combined data would be unique to the watershed.

Last Revised: December 2004

Land Use and Socioeconomic Indicator

F: Change in Public Conservation Investment in PCAs

Change Measured:

Collect financial information from identified public agencies on grants, bonds, tax incentives used for conservation purposes allocated to jurisdictions, land trusts, etc. within the PCA. This would be an annual report of resources allocated to the area and compared over time and to similar investments outside PCAs.

Purpose/BGI Objective:

If the PCA is deemed to be the area where land conservation is to be encouraged, then there should be an increase in the amount of public money invested for conservation purposes to create an incentive for conservation efforts or an increase in other monies to support conservation-oriented actions.

Scale:

Watershed Planning Partnerships (WPPs) will need to collect data on a parcel basis within PCAs.

Endpoint:

The goal is to direct state public monies for conservation activities into PCAs.

Data Location and Availability:

The WPPs will need to collect the data on investments in PCAs from the multiple relevant governmental agencies such as parks and natural/conservation areas.

Features:

WPPs will need to establish what public agencies and activities should be monitored and what programs to include (e.g., would a training grant to a land trust be considered an investment?)

Illustration:

Data tables

Potential Limitations:

- The data is not presently centralized and will need to be collected by the WPP. WPPs will need to collect data from numerous sources.
- Changes in public conservation investment in PCAs may be difficult to attribute to BGI activities/policies; linkage to BGI requires careful assessment.

Relevancies:

Each public program collects its own program data. The assembling and comparison of the combined data would be unique to the watershed.

Last Revised: December 2004

Land Use and Socioeconomic Indicator

G: Change in Population Density in PDAs

Change Measured:

Measures change of population density in a PDA designated as such by a Watershed Planning Partnership (WPP) compared to outside PDAs.

Purpose/BGI Objective:

Measures rate at which change in population density in a PDA is realized over time. The BGI is designed to encourage development in PDAs to maximize efficient use of existing buildings and infrastructure, thus, a change in population density in the PDA will indicate the success of economic incentives to do so.

Scale:

Sub-municipal, but established at the watershed level by WPPs.

Endpoint:

Positive change in population density would show a more dramatic increase in designated PDAs compared to outlying areas without economic incentives as planned by the WPPs.

Data Location and Availability:

WPPs would have information on the size of their respective PDAs and should be able to compile population estimates from area planning commissions, councils of government, or various outlets of on-line information such as Ohio State University Extension's Data Center at www.osuedc.org.

Features:

Each WPP (or another appropriate agency) would need to collect and analyze population estimates to determine change in density patterns in designated PDAs versus non-PDAs. A Geographic Information System (GIS) would be a proper tool for analyzing this information as well as various on-line information systems such as Ohio State University Extension's Data Center at www.osuedc.org.

Illustration:

This information could be presented either numerically or with maps showing density level change in PDAs.

Potential Limitations:

- Population estimates are typically compiled for municipalities, so unless the watershed encompasses whole municipalities, it may be difficult to break out population estimates for portions of municipalities. The WPPs would need to compile a GIS inventory and track changes in density patterns.
- Changes in population density in PDAs may be difficult to attribute to BGI activities/policies; linkage to BGI requires careful assessment.

Relevancies:

This indicator is related to changes in number of PCAs and PDAs and their locations, as well as changes in impervious cover and other changes in development density. The indicators listed below include more specific breakdowns of development and population density occurring within PDAs.

See also:

- Land Use and Socioeconomic Indicator A (Change in Impervious Surface Cover)
- Land Use and Socioeconomic Indicator B (Change in Residential and Other Development Density in PDAs vs. Outside PDAs)

- Land Use and Socioeconomic Indicator C (Change in Percentage of New Commercial and Industrial Building Floor Area and New Housing Units Going Into PDAs vs. Rest of the Watershed)
- Land Use and Socioeconomic Indicator E (Change in Public Economic Development Investment in PDAs)
- Programmatic Indicator D (Change in Number of PCAs and PDAs and their Location)

Last Revised: December 2004

Land Use and Socioeconomic Indicator

H: Change in Average Commuting Distance to Work for People Living in PDAs

Change Measured:

Measures change of commuting distance to work for people living in PDAs compared to those who do not live in a PDA.

Purpose/BGI Objective:

Through the establishment of PDAs, the BGI aims to produce a more efficient built environment that minimizes ecological degradation from development. Shorter commuting distances mean less demand for roads and road maintenance, less traffic congestion, and fewer vehicle emissions. It also means that more sustainable alternative transportation modes, such as walking or biking, are more likely to be utilized. Reduced air pollution will help improve surface water quality; reduced commute times is an indication of a concentration of population into PDAs.

Scale:

Sub-municipal, but established at the watershed level by Watershed Planning Partnerships (WPPs)

Endpoint:

Positive change in commuting to work time would be realized through higher population density in PDAs and taking advantage of pubic transportation alternatives, thus reducing traffic congestion, air and noise pollution.

Data Location and Availability:

WPPs would have information on the size of their respective PDAs and should be able to compile commuting time data from area planning commissions, councils of government, or various outlets of on-line information, such as Ohio State University Extension's Data Center at www.osuedc.org.

Features:

Each WPP (or another appropriate agency) would be need to collect and analyze land use data to determine change in average commuting distances to work in designated PDAs versus non-PDAs. A Geographic Information System (GIS) would be a proper tool for analyzing this information, as well as various on-line information systems such as Ohio State University Extension's Data Center at www.osuedc.org.

Illustration:

This information could be presented either numerically or with maps showing average commuting distance to work level change in PDAs.

Potential Limitations:

- There may not be data for all areas in the watershed. Compiling a GIS inventory and tracking change in average commuting time patterns could be labor intensive for WPPs.
- Changes in average commuting distance to work may be difficult to attribute to BGI activities/policies; linkage to BGI requires careful assessment.

Relevancies:

This indicator is closely related to changes in impervious surface cover since reduced need for roads may reduce overall impervious cover. It also relates to other changes in development density. The indicators listed below include more specific breakdowns of the development and population density within PDAs.

See also:

- Land Use and Socioeconomic Indicator A (Change in Impervious Surface Cover)
- Land Use and Socioeconomic Indicator B (Change in Residential and Other Development Density in PDAs vs. Outside PDAs)
- Land Use and Socioeconomic Indicator C (Change in Percentage of New Commercial and Industrial Building Floor Area and New Housing Units Going Into PDAs vs. Rest of the Watershed)
- Land Use and Socioeconomic Indicator E (Change in Public Economic Development Investment in PDAs)
- Land Use and Socioeconomic Indicator G (Change in Population Density in PDAs)

Last Revised: December 2004

Land Use and Socioeconomic Indicator

I: Change in Level of Awareness of BGI in Watershed

Change Measured:

Through random sampling, this indicator measures the proportion of residents/officials/stakeholders that are aware of the Balanced Growth Initiative in the watershed and are familiar with its purposes, institutional structure, and progress.

Purpose/BGI Objective:

The indicator shows how well the BGI is being advertised and communicated to the populace and to decision makers.

Scale:

Watershed scale in watersheds where there is a BGI initiative in progress

Endpoint:

A majority of a random sample of the adult population in the watershed will be aware of the BGI. *Or* A majority of a sample of the decision makers in the watershed will be aware of the BGI.

Data Location and Availability:

The data is currently unavailable but could be collected on a regular basis (benchmarked as BGI process starts; bi-annual basis thereafter) by the BGI Watershed Planning Partnerships (WPPs).

Features:

WPPs would need assistance from all participating agencies to identify respondents if the targeted sample was "decision makers." Standard methods for ensuring random sample would otherwise be used if the target respondents are the watershed's adult population. Some assistance from a local university might be warranted; it might also be useful to involve students in process. The data can be collected using a survey questionnaire administered by telephone, mail, or other mechanism deemed appropriate. If a less-than-scientific study is acceptable, the questionnaire could be distributed at other venues as well.

Illustration:

Results of the study should be distributed to the WPPs participants and posted on a web site.

Potential Limitations:

- Statewide or Lake Erie basin-wide coordination of survey development will be required. Not all WPPs may have adequate staff to design and implement questionnaire.
- No other programs are required to track this data, although other watershed-focused organizations or universities could "piggy back" a few questions for this purpose on their data collection.
- Changes in level of awareness of BGI in watershed may be difficult to attribute to BGI activities/policies; linkage to BGI requires careful assessment.

Relevancies:

This indicator relates to the other socioeconomic indicators, and with them, gives the WWP and the Ohio Lake Erie Commission an estimate of the effect that the BGI is having on the populace in a given watershed.

Last Revised: December 2004

Programmatic Indicators:

Measuring Changes in Actions Resulting
from the Balanced Growth Initiative

Programmatic Indicator

A: Change in Number of Watersheds that have a Balanced Growth Watershed Planning Partnership

Change Measured:
Measures the change in number of watersheds in the Lake Erie basin that have formed a Watershed Planning Partnership (WPP) or the number of existing watershed groups that have taken up the BGI tasks.

Purpose/BGI Objective:
Measures rate at which WPPs are being established. Establishment of WPPs is the first programmatic objective of the BGI. This indicator measures the overall rate at which the BGI is being implemented across the Lake Erie basin. Its measurement will help the Ohio Lake Erie Commission to track the territorial expansion of the BGI as well.

Scale:
The indicator is measured at the watershed scale, with results aggregated to the Ohio Lake Erie basin scale.

Endpoint:
In every watershed in the Lake Erie basin, a WPP would have been established and would be working on a Balanced Growth watershed plan with targets for PDAs and PCAs.

Data Location and Availability:
The Ohio Lake Erie Commission will collect this data, based on implementation of the BGI and activities of the Commission staff and WPP staff.

Features:
Each year the Ohio Lake Erie Commission will summarize the current status of WPPs in the basin and note the change.

Illustration:
The data will be included in annual reporting of the Ohio Lake Erie Commission staff to the Commission agencies and the governor.

Potential Limitations:
Ohio Lake Erie Commission staffing may not be adequate to collect data.

Relevancies:
No other programs are required to track this data currently, but as the pilot implementation phase of the BGI begins, data can be collected. Together with other programmatic indicators, we can measure the extent to which the BGI is being implemented, both territorially in the Lake Erie basin, and also describe characteristics of the BGI WPPs.

Last Revised: December 2004

Programmatic Indicator

B: Change in Number of Endorsed Watershed Plans

Change Measured:

Change in the number of watershed plans that have been endorsed by the U.S. and Ohio Environmental Protection Agencies (EPA) as having provisions that can help meet water quality standards by designating PCAs and PDAs. Watershed plans will have other purposes, as well, with reference to BGI.

Purpose/BGI Objective:

Number of endorsed watershed plans attributable to the BGI will indicate extent of "buy-in" to the BGI model of established PCAs and PDAs. The planning process itself will improve overall awareness of the importance of directed growth for water quality improvement and protection of open space. Comparison to the number of established Watershed Planning Partnerships (WPPs) will indicate further progress in implementation.

Scale:

Primary unit is the watershed. But actions by counties and municipalities within the watershed that are consistent with the watershed plan are the key impacts at the watershed level.

Endpoint:

Endorsed watershed plans in all watersheds of the Lake Erie basin.

Data Location and Availability:

Initial contact for plan endorsement information will be the Ohio EPA, Surface Water Division (614-644-2001) and from there maintained by the Ohio Lake Erie Commission and the U.S. EPA Great Lakes National Program Office. Response would also be available from each WPP for aggregation to the entire basin.

Features:

Each year the Ohio Lake Erie Commission will determine the number of additional endorsed watershed plans by contacting each WPP and the Ohio EPA.

Illustration:

A map of the Lake Erie basin will have watershed boundaries with a code indicating stage of plan development, from "WPP organized" to plan endorsement.

Potential Limitations:

Plans will likely be uneven in quality and content. Standards for endorsement must be developed and followed.

Relevancies:

This indicator relates to changes in the number of watersheds that have a balanced growth WPP.

See also:

- Programmatic Indicator A (Change in Number of Watersheds that have a Balanced Growth Watershed Planning Partnership)

Last Revised: December 2004

Programmatic Indicator

C: Change in Number of Local Comprehensive Land Use Plans in Watershed that Identify PCAs and PDAs to Guide Local Land Use Decisions

Change Measured:

Measures the change in the number of communities (cities, villages, and townships) within the Lake Erie basin that have prepared or updated a comprehensive land use plan in which the community has identified areas as PDAs and PCAs.

Purpose/BGI Objective:

This measures the rate at which communities understand and embrace identification of areas where growth is suitable (and therefore encouraged) and where conservation is appropriate (and encouraged). This is an indication that the principles and practices of the BGI are being adopted through the watershed, potentially adding to targeted development and conservation areas.

Scale:

This indicator is measured at the local scale (cities, villages, and townships), and the results will be aggregated to the watershed with a balanced growth Watershed Planning Partnership (WPP), and further to the Ohio Lake Erie basin scale.

Endpoint:

Every community in the Lake Erie basin will have gone through the planning process of assessing existing patterns of development, development trends, existing natural features, etc, and will have identified appropriate PDAs and PCAs and established policies for these areas to guide local land use decisions.

Data Location and Availability:

There is no organization or agency currently charged with collecting information on local comprehensive land use plans. Each county, regional and metropolitan planning organization/agency maintains a list of communities in its jurisdiction, and contact information.

The WPPs (or county, regional, or metropolitan planning organizations) could conduct a simple annual survey of all communities in the watershed requesting answers to:

1) Does the community have a comprehensive land use plan?
2) What is the date of the plan or plan update?
3) Are PDAs and PCAs (or similar areas) incorporated in the plan?

The WPPs (or county, regional, or metropolitan planning organizations) would then report their findings to the Ohio Lake Erie Commission. WPPs (or county, regional, or metropolitan planning organizations) would be encouraged to post such information on a web site.

Features:

Collection at the watershed level, or county, regional or metropolitan planning agency level, and then basin wide would be necessary to assess this indicator at the basin wide level. Smaller communities, especially townships, sometimes have only part-time staff, which may result in low response rates to the survey. Collecting the survey will likely require some effort (e.g., calling individual municipalities may be necessary in order to obtain a 100 percent response rate).

Illustration:

At a minimum, this could be a simple list of municipalities by county. Ideally, it would be useful to map the communities. Many county, regional, and metropolitan planning agencies have websites that

utilize interactive maps that identify the boundaries of townships, village, and cities. These maps could be used as base maps to color code those communities that, based on the responses to the survey, have: 1) prepared a comprehensive land use plan, and 2) identified PDAs and PCAs in their plan. The county maps would spatially illustrate the geographic location and distribution of communities (indicating where gaps exist), communities that have not yet prepared a comprehensive land use plan, and communities that have not incorporated PDAs and PCAs in a plan.

Potential Limitations:

- Comprehensive land use plans are not required by law in Ohio; therefore, the ability to use them to gauge how BGI elements are being incorporated throughout the Lake Erie basin may be compromised.
- Not all WPPs may have adequate incentives or staff to conduct the survey and collect the information. County, regional, and metropolitan planning organizations may be reluctant to take on this task. Thus, the information gathered may not reflect the actual number of municipalities with land use plans that incorporate the concept of PDAs and PCAs.

Relevancies:

No other programs are required to track this data.

Last Revised: December 2004

Programmatic Indicator

D: Change in Number of PCAs and PDAs and their Location

Change Measured:
Measures change in number of PCAs and PDAs established through the BGI.

Purpose/BGI Objective:
Over time, this indicator will measure the rate at which PDAs and PCAs are being established as part of the BGI planning process. Establishment of PDAs and PCAs are a core objective of the BGI. This indicator will tell us whether the BGI pilot programs are resulting in the establishment of these areas.

Scale:
The indicator is measured at the watershed scale, with results aggregated to the Ohio Lake Erie basin scale.

Endpoint:
Tracking the number of PCAs and PDAs that are being established indicates that the scheme is being accepted through the balanced growth Watershed Planning Partnerships (WPPs) and planning processes.

Data Location and Availability:
The data is not currently collected or maintained, but would be collected by the WPPs as part of the BGI.

Features:
Each WPP would have a list of the PCAs and PDAs within their watershed. Collection at the basinwide or state level by an appropriate agency would be necessary to assess this indicator at the basinwide level. Not all WPPs may publish this information, so calling individual WPPs may be necessary.

Illustration:
At a minimum, this could be a simple list of PCAs and PDAs by watershed. Ideally this could be presented spatially with maps, showing their geographic location and distribution.

Potential Limitations:
- The data is not currently collected or maintained, and would need to be collected by the WPPs as part of the BGI.
- Not all WPPs may have adequate staff to keep track of PCAs and PDAs or to put this information on a web site. Thus, the information gathered by the WPPs may not reflect the actual number of PCAs and PDAs.

Relevancies:
No other programs are required to track this data. The PDAs and PCAs are at the heart of the watershed planning process for the BGI, and are the basis for many of the indicators that compare changes in land use patterns “inside,” “outside,” or adjacent to them.

Last Revised: December 2004

Programmatic Indicator

E: Change in Number of Acres (within PDAs and PCAs) Converted From Green Area/Open Land to Urban Uses

Change Measured:
Measures the land use change in number of acres converted to urban uses within PDAs and PCAs.

Purpose/BGI Objective:
Measures rate at which land use is converting to urban uses in PDAs (preferred outcome) and PCAs (unintended outcome). The BGI is designed to encourage development in PDAs and conservation in PCAs, thus the change in acres will indicate the success of incentives.

Scale:
Sub-watershed (PDAs/PCAs) level established by Watershed Planning Partnerships (WPPs).

Endpoint:
Each PDA would show a more dramatic increase in land conversion, compared to PCAs, which would show little or no conversion (as planned by the WPPs).

Data Location and Availability:
WPPs would have information on the size of their PDAs and PCAs and should be able to compile land use data from area planning commissions and/or councils of government. WPPs should be encouraged to compile updated land use information to document changes in PDAs and PCAs.

Features:
Each WPP (or another appropriate agency) would need to collect and analyze land use data to determine change from green area/open land to urban uses in PDAs and PCAs. A Geographic Information System (GIS) would be a good tool for storing and analyzing this data.

Illustration:
This information could be presented either numerically or with maps showing the land use change.

Potential Limitations:
Land use data may not be compiled electronically or up-to-date in all areas. Maintaining an up-to-date GIS land use inventory can be labor intensive in many watersheds.

Relevancies:
This indicator is related to changes in residential and other development density, and changes in percentage of new commercial/industrial building floor area and new housing units in PDAs. The indicators listed below include more specific breakdowns of development within PDAs and PCAs.

See also:

- Land Use and Socioeconomic Indicator B (Change in Residential and Other Development Density in PDAs vs. Outside PDAs)
- Land Use and Socioeconomic Indicator C (Change in Percentage of New Commercial and Industrial Building Floor Area and New Housing Units Going Into PDAs vs. Rest of the Watershed)

Last Revised: December 2004

Programmatic Indicator

F: Change in Number of Acres of Land in Conservation/Protected Status in PCAs

Change Measured:
Measures the change in number of acres utilizing conservation practices or having a protected status in a PCA, as compared to areas outside the PCA or to the entire watershed.

Purpose/BGI Objective:
Measures rate at which acreage within PCAs is converted to conservation compared to areas outside of the PCA. A priority of the BGI is to increase the acreage of land in conservation within PCAs, thus the change in acres will indicate the success of incentives.

Scale:
Sub-watershed (PCA) level established by Watershed Planning Partnerships (WPPs)

Endpoint:
PCAs would show a more dramatic increase in land converted to conservation compared with the rest of the watershed (as planned by the WPPs).

Data Location and Availability:
WPPs would have information on the size of their PDAs and PCAs and should be able to compile land use data from area planning commissions and/or councils of government. WPPs should be encouraged to compile updated land use information to document changes in PDAs and PCAs.

Features:
Each WPP or another appropriate agency would need to collect and analyze land use data to determine change to conservation PCAs. A Geographic Information System (GIS) would be a good tool for storing and analyzing this data.

Illustration:
This information could be presented either numerically or with maps showing the land use change.

Potential Limitations:
Land use data may not be compiled electronically or up-to-date in all areas. Maintaining an up-to-date GIS land use inventory can be labor-intensive in many watersheds.

Relevancies:
This indicator is related to changes in the number of acres converted from green areas and open land to urban uses, and changes in the number of best management practices (BMPs) in watersheds. Through the BGI encouraging conservation in PCAs, the number of BMPs should increase in those areas. Data for the number of BMPs would be a component of the data needed for this indicator.

See also:

- Programmatic Indicator E (Change in Number of Acres Converted from Green Area/Open Land to Urban Uses)
- Programmatic Indicator G (Change in Number of Best Management Practices in Watershed and their Locations)

Last Revised: December 2004

Programmatic Indicator

G: Change in Number of Best Management Practices in Watershed and their Locations

Change Measured:
Measures the change in the number and location of Best Management Practices (BMPs) in the watershed.

Purpose/BGI Objective:
The number of BMPs installed following initiation of BGI is an indicator of potential water quality improvement attributable to the initiative. The location of the BMPs will indicate relative success in the PCAs and PDAs and areas outside of those priority areas.

Scale:
BMPs may be located by county and by municipality within the watershed. All three levels are important for tracking the impact of the BGI. The impacts on water quality are most relevant at the watershed level.

Endpoint:
The goal is to have BMPs in place for all development sites in the PDAs, and agricultural or forestry activities in the PCAs. These practices are an intermediate indicator of water quality improvement, and demonstration of landowner commitment to improved water quality.

Data Location and Availability:
Soil and Water Conservation Districts in the counties of the watershed will have information on agricultural BMPs that have been installed. Contact information for specific counties is available from the Soil and Water Conservation Division of Ohio Department of Natural Resources (DNR), 614-265-6610. Data sources for urban BMPs are uncertain.

Features:
Mapping existing BMPs in the watershed should probably start with the Ohio DNR Soil and Water Division, and then spread to the relevant counties.

Illustration:
Geographic Information Systems (GIS) can provide valuable means for linking BMP location to watershed characteristics such as land slope, proximity to urban areas, municipal boundaries, and population concentration. To ascertain the impact of BMPs on water quality, monitoring will be necessary.

Potential Limitations:
- Staffing limitations often challenge the collection of detailed information on BMP location by farm and geographic unit.
- Data collected by municipalities or counties will need to be configured to examine trends at the watershed scale.
- Sources for data on urban BMPs are not as consistent as are those for rural and agricultural BMPs.

Relevancies:
Soil and Water Conservation Districts generally keep records of BMP installations, though special priority on this information may be required for the BGI.

Last Revised: December 2004

Programmatic Indicator

H: Change in Percent of Agricultural Fields with Nutrient Management Plans

Change Measured:

Measures change in percent of agricultural fields with nutrient management plans within a PCA, PDA, or watershed.

Purpose/BGI Objective:

Much of the Lake Erie watershed is dominated by cultivated land. As of the most recent state-wide land use map produced by the Ohio Department of Natural Resources (DNR), 72 percent of the Lake Erie watershed is classified as agricultural. A slowing rate of land use change from agricultural to non-cultivated land use within a watershed that has implemented the BGI, can indicate success. Nutrient management planning is an effective means of promoting the implementation of nonpoint source controls and reducing nutrient inputs into surface and ground waters from farmland cultivation. Nutrient management planning may be emphasized within PCAs; therefore, an increase of such planning may indicate success. A decreasing number of nutrient management plans in areas outside of PDAs may indicate land use change to non-agricultural uses and indicate a lack of success.

Scale:

Watershed or county

Endpoint:

- Up to date nutrient management plans developed and implemented on all agricultural acreage within a watershed.
- Increasing number of acres covered by nutrient management plans within PCAs.

Data Location and Availability:

U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) field offices and Soil and Water Conservation Districts (SWCDs)

Features:

Nutrient management planning is conducted according to Ohio NRCS Standard 590 with assistance from SWCD staff. The NRCS utilizes a combination of software applications, “Toolkit” and “Performance Review System”, to track and analyze local conservation planning and implementation. The Ohio DNR Division of Soil and Water Conservation is also developing a web-based application, Soil and Water Information Management Systems (SWIMS), which will enable additional tracking of local planning and implementation by SWCDs and the Ohio DNR.

Illustration:

Maps

Potential Limitations:

The development of a baseline may be difficult until tracking and retrieval systems are fully developed and populated. Software applications are currently being developed and/or improved to facilitate the tracking of nutrient management planning and implementation; however, retrieval of archival data may be difficult because older plans may only be available in hardcopy files. Some information within individual nutrient management plans may be regarded as “proprietary” and therefore confidential.

Relevancies:

This indicator is closely related to changes in percent of watershed dominated by non-cultivated lands, the change in number of acres converted from green area / open land to urban uses, and the change in number of best management practices in the watershed and their locations.

See also:

- Natural Resource Indicator I (Change in Percent of Watershed Dominated by Non-Cultivated Lands)
- Programmatic Indicator E (Change in Number of Acres Converted from Green Area/Open Land to Urban Uses)
- Programmatic Indicator G (Change in Number of Best Management Practices in Watershed and their Locations)

Last Revised: December 2004

Programmatic Indicator

I: Change in Number of New Home Sewage Treatment System Permits per Year

Change Measured:

Measures change in number of new Home Sewage Treatment System (HSTS) permits per year within watersheds or PCAs.

Purpose/BGI Objective:

Residential development outside urban areas is often likely to occur in areas lacking centralized sewer treatment. The most common alternative for these new residential properties is to install an individual HSTS. County health departments are responsible for regulating these systems, typically through a local permitting program. One would expect to see a declining number of new HSTS permits annually outside PDAs, and an even greater decline within PCAs.

Scale:

County

Endpoint:

Declining number of HSTS permits outside PDAs and within PCAs.

Data Location and Availability:

- Local health departments
- Starting in 2006, the Ohio Department of Health will begin collecting and housing permit information

Features:

Determined locally by individual county health departments

Illustration:

Maps; tables with figures by county

Potential Limitations:

Some local health departments have developed Geographic Information Systems (GIS) to maintain and track HSTS permit information. However, development of such systems is not consistent throughout the Ohio Lake Erie watershed. Individual health departments may only be able to provide access to hard copy files.

Relevancies:

This indicator is closely related to the following indicators: change in residential and other development density; new commercial, industrial, and housing units going into PDAs vs. rest of watershed; change in public economic development investment in PDA; change in population density; and change in number of acres (within PDAs and PCAs) converted from green area / open land to urban uses.

See also:

- Land Use and Socioeconomic Indicator B (Change in Residential and Other Development Density)
- Land Use and Socioeconomic Indicator C (Change in Percentage of New Commercial and Industrial Building Floor Area and New Housing Units Going Into PDAs)

- Land Use and Socioeconomic Indicator E (Change in Public Economic Development Investment in PDAs)
- Land Use and Socioeconomic Indicator G (Change in Population Density in PDAs)
- Programmatic Indicator E (Change in Number of Acres Converted from Green Area/Open Land to Urban Uses)

Last Revised: December 2004