

Ohio 2010 Integrated Report

## **Section B**

# **Ohio's Water Resources**



---

## B1. Facts and Figures

Ohio is a water-rich state bounded on the south by the Ohio River and the north by Lake Erie. These water bodies, as well as thousands of miles of inland streams and rivers and thousands of acres of lakes and wetlands, contribute to the quality of life of Ohio's citizens. The size and scope of Ohio's water resources are outlined in Table B-1.

The larger water bodies included in Table B-1 comprise the major aquatic resources that are used and enjoyed by Ohioans for water supplies, recreation and other purposes. The quality of these perennial streams and other larger water bodies is strongly influenced by the condition and quality of the small feeder streams, often called the headwaters. Approximately 28,900 miles of the over 58,000 miles of stream channels digitally mapped in Ohio are headwater streams. However, the digital maps currently available for Ohio do not include the smallest of headwater channels. Results of a special study of primary headwater streams (drainage areas less than 1 mi<sup>2</sup>) place the estimate of primary headwaters between 146,000 to almost 250,000 miles (Ohio EPA, 2002). Some of these primary headwater streams are in fact perennial habitats for aquatic life that supply base flow in larger streams. This illustrates the importance of taking a holistic watershed perspective in water resource management.

Ohio is an economically important and diverse state with strong manufacturing and agricultural industries. Many of the historical patterns of environmental impact in Ohio are related to the geographical distribution of basic industries, land use, mineral resources, and population centers. Also important, however, is an understanding of Ohio's geology, land form, land use, and other natural features as these determine the basic characteristics and ecological potential of streams and rivers. Ohio EPA bases the selection, development, and calibration of ecological, toxicological, and chemical/physical indicators on these factors. These indicators are then used via systematic ambient monitoring to provide information about existing environmental problems, threats to existing high quality waters, and successes in abating water pollution problems in Ohio's surface waters.

Fourteen river systems in Ohio are included in the State Scenic Rivers Program, administered by the Ohio Department of Natural Resources (see Figure B-1). Between 1970 and 2008, a total of 674 miles were designated Scenic, 75 miles in three systems were designated Wild, and 79 miles in two systems were designated Recreational. Portions of three stream systems—the Little Miami, Little Beaver Creek, and Big and Little Darby Creek—are also included in the National Wild and Scenic System. The total Ohio stream miles included in the national designation is 207 miles. More information on Ohio's scenic rivers can be found at <http://ohiodnr.com/watercraft/scenicrivers/tabid/2310/Default.aspx>.

**Table B-1. Ohio's water resource statistics.**

	Value	Source	Scale
State population	11,353,140	2000 Census	
Land area	40,948 sq miles	2003 Census	
<b>Rivers and streams</b>			
Miles of named and designated streams	> 23,000	Ohio DNR <sup>1</sup>	1:24K
Total miles	58,343	NHD <sup>2</sup>	1:24K
Miles of perennial streams	29,412	NHD	1:24K
Miles of intermittent streams	28,931	NHD	1:24K
Miles of primary headwater streams	> 115,000	Ohio EPA <sup>3</sup>	
Miles of large rivers (draining more than 500 sq mi)	1,287	NHD	1:24K
Miles of principal streams (draining 50 to 500 sq mi)	4,474	NHD	1:24K
Border miles: Ohio River	451	USGS 7 <sup>1/2</sup> , Maps	1:24K
Border miles: Lake Erie shoreline	290	USGS 7 <sup>1/2</sup> , Maps	1:24K
<b>Lakes/reservoirs/ponds</b>			
Number of significant publicly owned lakes	447	Ohio DNR <sup>4</sup>	1:24K
Total acreage of significant publicly owned lakes	118,963	Ohio DNR <sup>4</sup>	1:24K
<b>Wetlands</b>			
Acreage	942,155	Ohio DNR <sup>4</sup>	30m x 30m <sup>6</sup>
% of original wetlands	20%	Ohio DNR <sup>4</sup>	

<sup>1</sup> Mileage figure for waters listed by Ohio Department of Natural Resources in *Gazetteer of Ohio Streams*, 2<sup>nd</sup> edition (Ohio DNR, 2001).

<sup>2</sup> An estimate prepared from a computer-digitized map of U.S. streams and rivers produced by the U.S. Geological Survey (USGS) known as the National Hydrography Dataset (NHD). The NHD is based upon the content of USGS Digital Line Graph (DLG) hydrography data integrated with reach-related information from the U.S. EPA Reach File Version 3 (RF3). <http://nhd.usgs.gov/index.html>.

<sup>3</sup> An estimate prepared by Ohio State University for Ohio EPA and reported in "Field Evaluation Manual for Ohio's Primary Headwater Habitat Streams" (Ohio EPA, 2002).

<sup>4</sup> Acreage figure for significant publicly owned lakes (> 5 acres) listed by Ohio Department of Natural Resources in "Inventory of Ohio's Lakes" (Ohio DNR, 1980).

<sup>5</sup> Acreage figure for wetlands listed by Ohio Department of Natural Resources in "Ohio Wetland Restoration and Mitigation Strategy Blueprint" (Ohio DNR/Ohio EPA, 1999).

<sup>6</sup> LandSat Thematic Mapper Data.



**Figure B-1. Ohio Scenic River System (Ohio DNR 2009).**

Source: <http://ohiodnr.com/watercraft/scenic/tabid/2310/default.aspx> (last visited 12/10/2009)

## **B2. General Summary of Condition: Final Accounting of the “80 by 2010” Aquatic Life Use Goal**

In the early 1990s, Ohio EPA established a goal of fully attaining the designated aquatic life use<sup>1</sup> in 80% of Ohio’s streams and rivers by 2010. The purpose of the goal was not to supersede the Clean Water Act goal of 100% attainment for all uses, but rather to provide a reasonable target against which to track water quality improvements in Ohio. The 2010 Integrated Report marks the final accounting of “80 by 2010” goal progress and introduces new 2020 goals for the aquatic life beneficial use.

Since inception of the “80 by 2010” goal, the Agency has struggled to find an effective and meaningful method to report progress. At first, the measure consisted of the percentage of total monitored stream miles attaining the aquatic life use. While this was simple to understand, the increased focus on watersheds during the late 1990s made it necessary to incorporate a watershed component to the reporting. The 2002 and 2004 Integrated Reports included a

<sup>1</sup> Beneficial use designations describe existing or potential uses of water bodies. See Section D2 for additional description.

---

watershed score and a large river score<sup>2</sup>, matching the assessment unit types established for 303(d) reporting purposes (see Section D1). While the large river score continued to be useful, the watershed score has proven to be too abstract and not effective in communicating current conditions and trends<sup>3</sup>.

Therefore, the Agency sought to clarify and simplify the procedure used to determine goal status. The 2006 Integrated Report introduced an alternative approach to assessing progress toward the “80 by 2010” goal. This measure identifies the subset of perennial stream and river miles that drain watersheds of 50 mi<sup>2</sup> or greater. This subset (5,679 miles out of approximately 29,400 perennial miles) represents 254 principal streams and large rivers in Ohio. These are named streams and rivers that are readily recognized by the public. Ohio EPA has conducted monitoring with sufficient site coverage to provide rigorous linear extrapolations of aquatic life use status for many of these streams. Table B-2 provides a listing of the principal streams and large rivers by major Ohio watershed, and Figure B-2 graphically depicts the extent of these stream and river miles within Ohio.

Table B-3 provides a few simple statistics to illustrate the general condition of Ohio’s waterways and the degree of change over the past five reporting cycles (ten years). For continuity with prior reports, the HUC11 WAU and LRAU scores are shown along with the miles of principal streams and large rivers that fully meet their designated aquatic life uses. The current LRAU full attainment statistic now stands at 93.1% while the average HUC11 WAU score is 58.5 and the principal streams and large rivers statistic stands at 70.8% (Figure B-3).

The significant increase in full attainment across LRAUs between the 2008 and 2010 cycle is largely because of new 2007 and 2008 intensive assessments of the Little Miami River, Mohican River, Walhonding River, Great Miami River (upper LRAU), Licking River, and Cuyahoga River. All reflected considerable improvement over prior surveys conducted during the mid- to late-1990s and many more miles of full aquatic life attainment were identified. Tempering this highly positive trend was the fact that two large mainstem rivers used in the 2008 IR assessment were excluded because available data exceeded 10 years in age and were considered historical. These included the two lower LRAUs of the Great Miami River and the three LRAUs of the Maumee River; the most recent data from these LRAUs reflected 25% to 50% full attainment for monitored miles. If the most recent data from all 23 rivers comprising the LRAUs are used (including available data from historical LRAUs irrespective of age of data), the full attainment statistic stands at 79.6% full attainment, just short of but essentially achieving the “80 by 2010” goal (see Figure B-4). Using either statistic, the “80 by 2010” goal has been met for the large river assessment units in Ohio.

Much like the LRAU trend, the average HUC11 WAU score has steadily, albeit slowly, increased over the last five reporting cycles. While the final 2010 average WAU score of 58.5 fell well short of the “80 by 2010” goal, some positives can be seen in the steady progress of the statistic (about 2.5 points per reporting cycle). Also important to note is the fact that biological

---

<sup>2</sup> A detailed explanation of how data were aggregated and synthesized for this effort and results for 2002-2008 can be found at <http://www.epa.ohio.gov/dsw/bioassess/AquaticLifeGoal.aspx>.

<sup>3</sup> The score calculated for each monitored watershed used a combination of a spatial assessment of small watershed sites and a linear stream mile extrapolation assessment for larger stream sites. The score calculation formula incorporates a site weighting method that gives more importance to larger sites in the watershed when deriving the score (see Section G2 of the 2008 IR for details). This results in a score that is a dimensionless number (i.e., not a percentage). The statewide average of available WAU scores constitutes the watershed component of the “80 by 2010” Aquatic Life Use goal.

---

impairment in Ohio streams and rivers has been gradually shifting from non-attainment (where both indicator organism groups, fish and macroinvertebrates, are not meeting expectations) to partial attainment (where either one or the other indicator organism group is meeting expectations) to full attainment (where both indicator organism groups meet expectations), as depicted in Figure B-5. In fact, if the full and partial attainment scores are summed, reflecting the condition where both or one indicator organism groups meet biological expectations, the combined score increases from 72 (2002 IR cycle) to 79 (2010 IR cycle).

### **B3. New 2020 Aquatic Life Use Goals**

Aquatic life use goals to be achieved by and reported in the 2020 Integrated Report, with status updates in intervening IR years, are proposed as follows. Two primary goals relate to continuing progress in reporting full attainment status. For large rivers, the new goal is 100% attainment in all assessment units. The new watershed assessment unit goal is based on the new assessment methodology for HUC12 assessment units and will measure the progress of full attainment (as a percentage) at wading and principal stream and river sites. This will effectively provide a measuring stick for named Ohio streams and rivers at a scale that approximates the status at the outlet of the HUC12 and larger downstream drainages. Two secondary goals for the large river assessment units are to measure overall monitoring status and to redesignate the base aquatic life use (WWH) to a higher tier (EWH) in more large rivers.

#### **Primary Goals**

- **2020 Goal for Large River Assessment Units: 100% full aquatic life use attainment in all 38 LRAUs / 23 rivers / 1227 river miles**
  - 2010 Benchmark – 93.1% full aquatic life use attainment in 30 LRAUs covering 18 rivers and 852 river miles.
- **2020 Goal for Watershed Assessment Units: 80% full aquatic life use attainment at wading and principal stream and river sites (those draining watersheds > 20 mi<sup>2</sup> and < 500 mi<sup>2</sup>)**
  - 2010 Benchmark – 1538 Ohio stream and river sites with assessments based on data collected from 1999-2008; 943 sites in full aquatic life use attainment (**61.3%**).

#### **Secondary Goals**

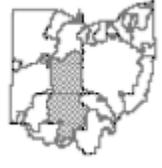
- **2020 Goal: Monitor and reassess all 38 LRAUs / 23 rivers between 2009 and 2018**
  - 2010 Benchmark – The current 2010 IR schedule reflects monitoring and reassessment for 27 segments covering 16 rivers between 2009 and 2018.
- **2020 Goal: Redesignation of an additional 75 miles of Warmwater Habitat (WWH) river miles to Exceptional Warmwater Habitat (EWH) river miles**
  - 2010 Benchmark - Current EWH designations promulgated in 10 LRAUs covering 9 rivers and 297.48 river miles.

**Table B-2. List of Ohio's principal streams and large rivers.** Not included are named wadeable streams (draining >20 mi<sup>2</sup> but less than 50 mi<sup>2</sup>), of which there are approximately 330 in Ohio.

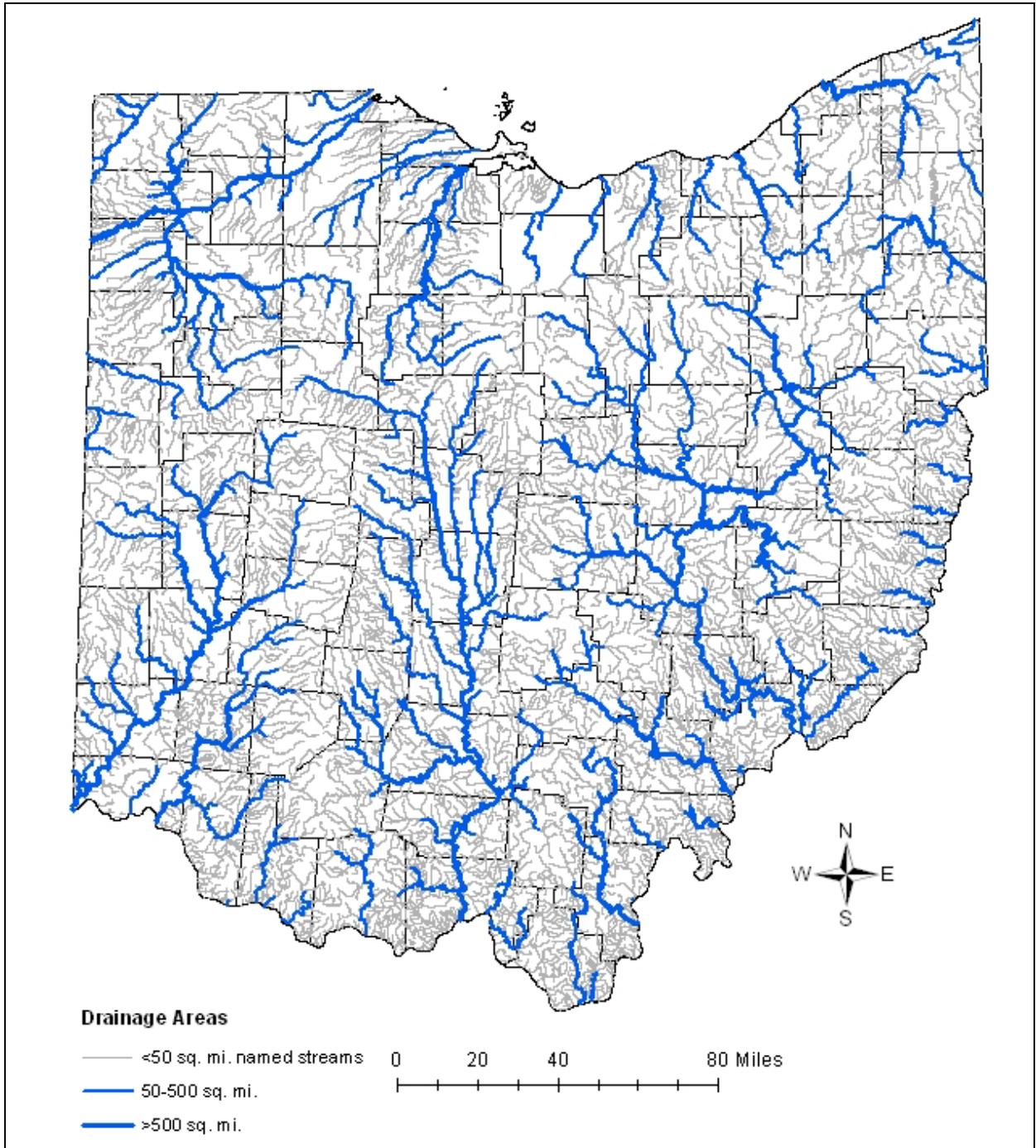
Basin	Large Rivers (draining >500 mi <sup>2</sup> )	Principal Streams (draining >50 mi <sup>2</sup> but less than 500 mi <sup>2</sup> )	
<i>Areas draining to Lake Erie</i>			
<p><b>Maumee Basin</b></p> 	<p>Maumee River Auglaize River Blanchard River Tiffin River</p>	<p>Swan Creek Beaver Creek Bad Creek South Turkeyfoot Creek North Turkeyfoot Creek Flatrock Creek Powell Creek North Powell Creek Blue Creek Little Auglaize River Prairie Creek West Branch Prairie Creek Dog Creek Riley Creek Ottawa Creek Eagle Creek Ottawa River</p>	<p>Sugar Creek Hog Creek Jennings Creek Ottawa River Tenmile Creek St. Joseph River Fish Creek Nettle Creek West Branch St. Joseph River East Branch St. Joseph River St. Marys River Black Creek Mud Creek Lick Creek Brush Creek Bean Creek</p>
<p><b>Portage Basin</b></p> 		<p>Portage River Sugar Creek North Branch Portage River Toussaint Creek</p>	<p>South Branch Portage River Middle Branch Portage River Rocky Ford</p>
<p><b>Sandusky Basin</b></p> 	<p>Sandusky River</p>	<p>Wolf Creek East Branch Wolf Creek Sycamore Creek Broken Sword Creek</p>	<p>Green Creek Honey Creek Muddy Creek Tymochtee Creek</p>
<p><b>Huron Basin</b></p> 		<p>Huron River East Branch Huron River West Branch Huron River</p>	

Basin	Large Rivers (draining >500 mi <sup>2</sup> )	Principal Streams (draining >50 mi <sup>2</sup> but less than 500 mi <sup>2</sup> )
<b>Vermilion Basin</b> 		Vermilion River
<b>Black Basin</b> 		Black River East Branch Black River West Branch Black River
<b>Rocky Basin</b> 		Rocky River East Branch Rocky River West Branch Rocky River
<b>Cuyahoga Basin</b> 	Cuyahoga River	Tinkers Creek Breakneck Creek Little Cuyahoga River
<b>Chagrin Basin</b> 		Chagrin River Aurora Branch
<b>Grand Basin</b> 	Grand River	Mill Creek Rock Creek

Basin	Large Rivers (draining >500 mi <sup>2</sup> )	Principal Streams (draining >50 mi <sup>2</sup> but less than 500 mi <sup>2</sup> )	
<b>Ashtabula Basin</b> 		Ashtabula River Conneaut Creek	
<b>Areas draining to the Ohio River</b>			
<b>Mahoning Basin</b> 	Mahoning River	Meander Creek Mill Creek Mosquito Creek	Eagle Creek West Branch Mahoning River Pymatuning Creek
<b>Little Beaver Basin</b> 		Little Beaver Creek Bull Creek	North Fork Little Beaver Creek Middle Fork Little Beaver Creek West Fork Little Beaver Creek
<b>Central Ohio Tributaries</b> 		Captina Creek Cross Creek Duck Creek East Fork Duck Creek West Fork Duck Creek Little Muskingum River	McMahon Creek Short Creek Sunfish Creek Wheeling Creek Yellow Creek North Fork
<b>Muskingum Basin</b> 	Muskingum River Licking River Tuscarawas River Walhonding River Mohican River Wills Creek	Wolf Creek South Branch Wolf Creek West Branch Wolf Creek Olive Green Creek Conotton Creek Indian Fork Killbuck Creek Doughty Creek Apple Creek Rocky Fork Licking River South Fork Licking River Raccoon Creek North Fork Licking River Moxahala Creek Jonathan Creek Stillwater Creek Little Stillwater Creek	Wolf Creek Chippewa Creek Mill Creek Kokosing River Jelloway Creek North Branch Kokosing River Lake Fork Mohican River Muddy Fork Mohican River Jerome Fork Mohican River Black Fork Mohican River Rocky Fork Mohican River Clear Fork Mohican River Salt Fork Wills Creek Sugartree Fork Crooked Creek Leatherwood Creek

Basin	Large Rivers (draining >500 mi <sup>2</sup> )	Principal Streams (draining >50 mi <sup>2</sup> but less than 500 mi <sup>2</sup> )	
<b>Muskingum Basin</b> (continued)		Brushy Fork Sugar Creek South Fork Sugar Creek Sandy Creek Nimishillen Creek Still Fork White Eyes Creek	Seneca Fork Buffalo Fork Little Hocking River Meigs Creek Salt Creek Wakatomika Creek Little Wakatomika Creek
<b>Hocking Basin</b> 	Hocking River	Margaret Creek Federal Creek Sunday Creek Monday Creek	Clear Creek Rush Creek Little Rush Creek
<b>Southeast Ohio Tributaries</b> 	Raccoon Creek	Indian Guyan Creek Leading Creek Little Scioto River Rocky Fork Little Scioto River Pine Creek Little Raccoon Creek	Elk Fork Shade River East Branch Shade River Middle Branch Shade River West Branch Shade River Symmes Creek Black Fork
<b>Scioto Basin</b> 	Scioto River Paint Creek	Big Beaver Creek Peepee Creek Walnut Creek Scippo Creek Walnut Creek Big Walnut Creek Mill Creek Alum Creek Blacklick Creek Bokes Creek Little Scioto River Rush Creek Big Darby Creek Little Darby Creek Deer Creek Sugar Run Olentangy River	Whetstone Creek North Fork Paint Creek Compton Creek Rocky Fork Paint Creek Rattlesnake Creek Lees Creek West Branch Rattlesnake Creek Sugar Creek East Fork Paint Creek Salt Creek Salt Lick Creek Middle Fork Salt Creek Laurel Run Scioto Brush Creek South Fork Scioto Brush Creek Sunfish Creek
<b>Southwest Ohio Tributaries</b> 		Bullskin Creek Eagle Creek West Fork Eagle Creek Ohio Brush Creek Baker Fork	West Fork Ohio Brush Creek Straight Creek White Oak Creek East Fork White Oak Creek North Fork White Oak Creek

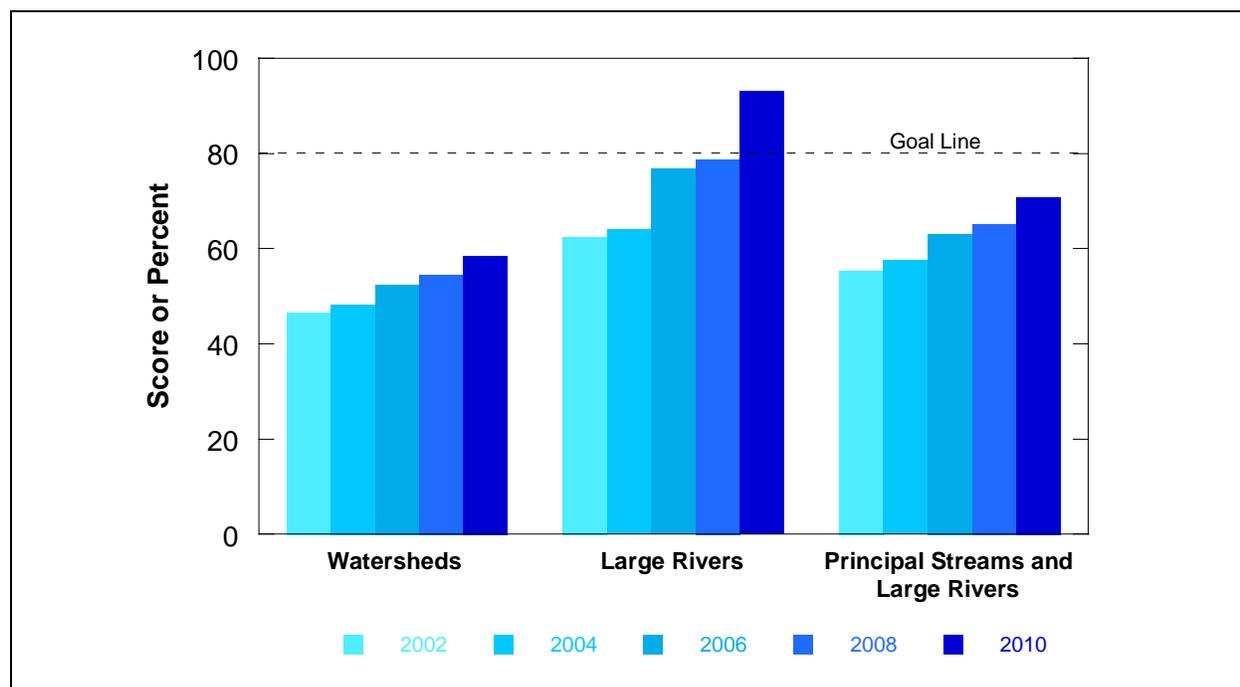
Basin	Large Rivers (draining >500 mi <sup>2</sup> )	Principal Streams (draining >50 mi <sup>2</sup> but less than 500 mi <sup>2</sup> )	
<b>Little Miami Basin</b> 	Little Miami River	O'Bannon Creek Turtle Creek East Fork Little Miami River Stonelick Creek Todd Fork	Cowan Creek Caesar Creek Anderson Fork Massies Creek
<b>Great Miami Basin</b> 	Great Miami River Mad River Stillwater River Whitewater River	Indian Creek Clear Creek Bear Creek Wolf Creek Honey Creek Lost Creek Tawawa Creek Stony Creek Buck Creek Ludlow Creek	Greenville Creek Swamp Creek Dry Fork Fourmile Creek Sevenmile Creek Twin Creek Loramie Creek Muchinippi Creek South Fork Great Miami River
<b>Mill Basin</b> 		Mill Creek	
<b>Wabash Basin</b> 		Wabash River Beaver Creek	



**Figure B-2. Map of Ohio's principal streams and large rivers.**

**Table B-3. Final accounting of the “80 by 2010” aquatic life use goal based on the last five Integrated Report assessment cycles (2002-2010)<sup>4</sup>.**

Integrated Report Year (Years of Data Collection)	2002 (1991-2000)	2004 (1993-2002)	2006 (1995-2004)	2008 (1997-2006)	2010 (1999-2008)
<b>HUC11 Watershed Assessment Units (WAUs): 331 Total</b>					
WAUs Assessed (% of Total)	224 (68%)	225 (68%)	212 (64%)	218 (66%)	221 (67%)
No. Sites Assessed	3272	3620	3785	4030	4210
WAU Goal Status (Average HUC11 WAU Score)					
<b>% Full Attainment Score</b>	<b>46.6</b>	<b>48.3</b>	<b>52.5</b>	<b>54.7</b>	<b>58.5</b>
<b>Large River Assessment Units (LRAUs): 23 Rivers / 1227 Miles</b> (miles defined as those draining >500 mi <sup>2</sup> watersheds)					
LRAUs Assessed (% of Total)	22 (96%)	21 (91%)	17 (74%)	16 (70%)	18 (78%)
No. Sites Assessed	422	425	374	278	265
Miles Assessed (% of Total)	905 (70%)	918 (71%)	873 (68%)	850 (66%)	852 (69%)
LRAU Goal Status (% Monitored Miles in Full Attainment)					
<b>% Full Attainment</b>	<b>62.5</b>	<b>64.0</b>	<b>76.8</b>	<b>78.7</b>	<b>93.1</b>
<b>Principal Streams and Large Rivers: 254 Rivers and Streams / 5679 Miles</b> (miles defined as those draining >50 mi <sup>2</sup> watersheds)					
No. Sites Assessed	1444	1445	1312	1223	1243
Miles Assessed (% of Total)	3909 (68%)	3781 (66%)	3625 (63%)	3762 (65%)	3950 (70%)
Goal Status (% Monitored Miles in Full Attainment)					
<b>% Full Attainment</b>	<b>55.4</b>	<b>57.6</b>	<b>63.1</b>	<b>65.2</b>	<b>70.8</b>



**Figure B-3. Final accounting of the “80 by 2010” aquatic life use goal based on the last five Integrated Report assessment cycles (2002 – 2010).**

<sup>4</sup> Using the current construct based on the HUC11 watershed assessment unit statewide average full attainment score and the large river assessment unit percentage of assessed miles in full attainment, and the alternative measurement of goal progress using the percentage of miles in full attainment for principal streams and large rivers.

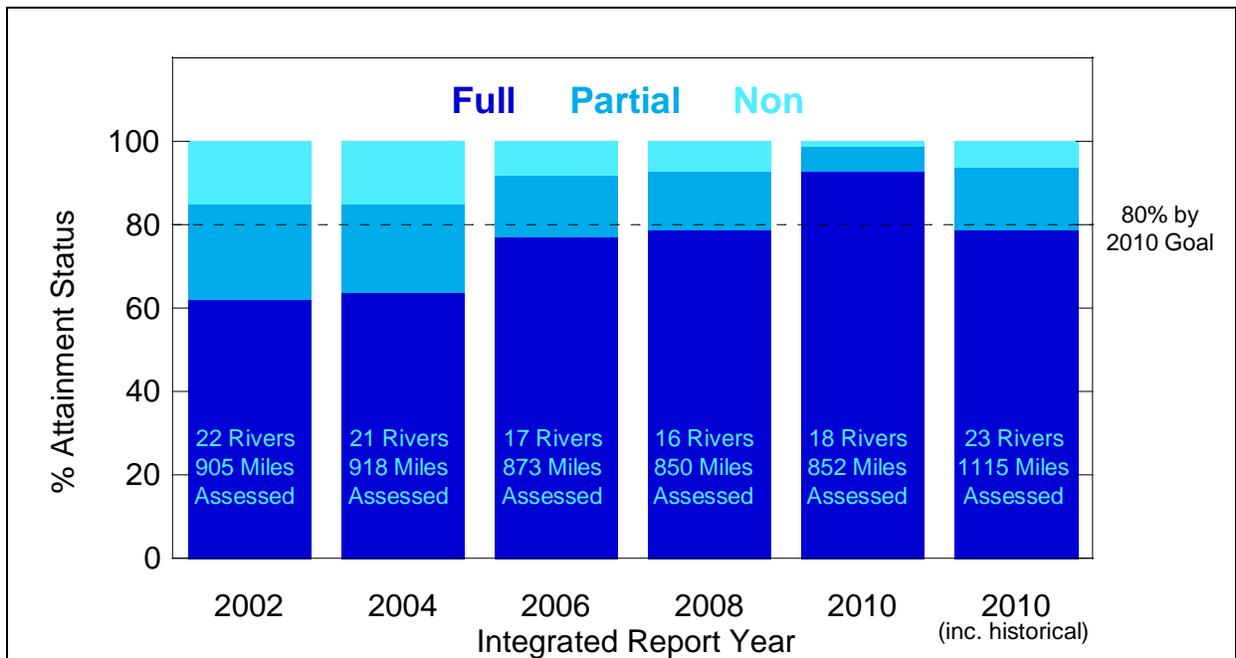


Figure B-4. Breakdown of average LRAU scores by full, partial and non-attainment over the last five Integrated Report assessment cycles (2002-2010); the bar on the far right includes historical data (collected prior to 1999).

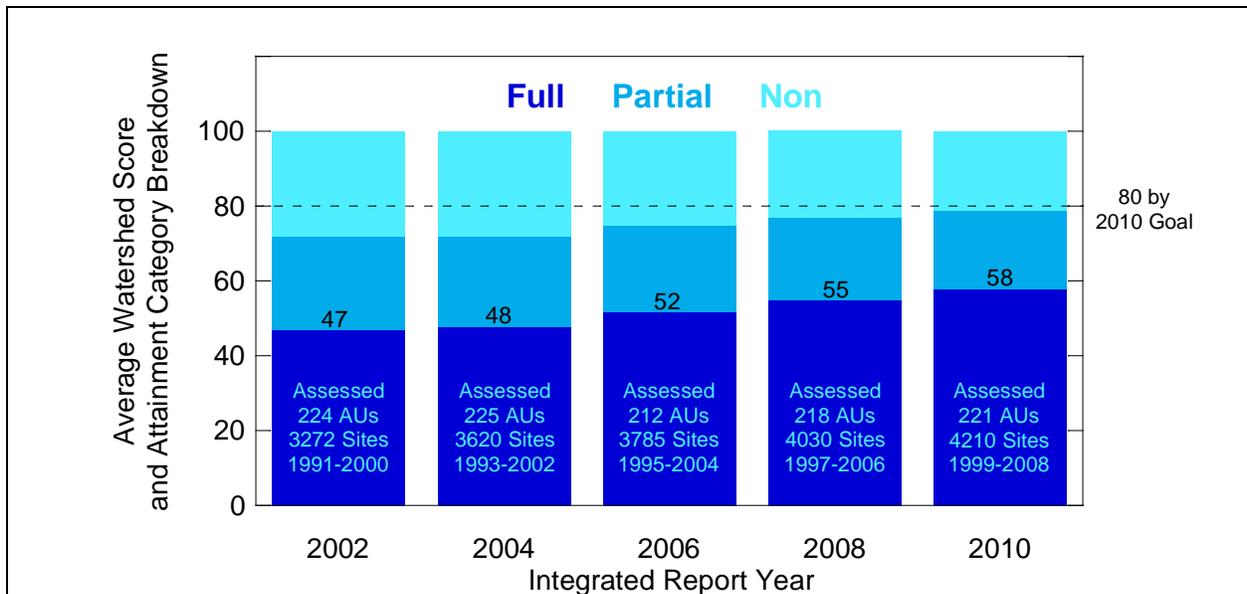


Figure B-5. Breakdown of average HUC11 WAU scores by full, partial, and non-attainment over the last five Integrated Report assessment cycles (2002-2010).