

JUNIATA RIVER MAINSTEM

Site conditions for the Juniata River mainstem are illustrated in both Figures 8 and 9. A total of seven sites were sampled on the Juniata River mainstem. Fifty percent of the sites had parameters that exceeded water quality standards or levels of concern. Seventy-four percent of the sites had elevated nitrogen and/or nitrate, and 28 percent had orthophosphate over levels of concern.

Three of the sites had higher water quality, and four sites had middle water quality. No sites had lower water quality. Three sites had nonimpaired benthic communities, including JUNR 17.3 near Millerstown, JUNR 84.6 near Mapleton, and JUNR 94 in Huntingdon. Three sites had slightly impaired communities. One site, JUNR 47.0 in Lewistown, had higher water quality but also had a moderately impaired benthic community, possibly because of its size and limited riffle habitat. All sites either had excellent or supporting habitat.

COMPARISON TO HISTORICAL DATA

The data collected from the Juniata River Subbasin in 2010 were compared against the data collected in 1995 and 2004. Approximately 68 percent more sites were sampled in 2010 and 2004 than in 1995, so overall watershed trends in biological condition categories, habitat condition categories, and water quality may not be directly comparable. However, while the 1995 dataset is smaller than the 2004 and 2010 datasets, it is robust enough that it is representative of the watershed and land use conditions at that time. Consequently, inferences about the biological, habitat, and chemical health can be generalized over the course of the three sampling periods. The results for biology, habitat, and water quality conditions for these three years are depicted in Figures 10 through 12.

BIOLOGY

The percent of sites with levels of impairment to benthic communities increased in 2010. Overall, the percentage of nonimpaired communities went from 54 percent in 2004 and 56 percent in 1995 to only 30 percent in 2010 (Figure 10). This increase in impaired communities corresponds to the number of sites with slightly impaired benthic communities (39 percent in 2010, compared to 32 and 31 percent in 2004 and 1995, respectively) and, more strikingly, in moderately impaired benthic communities (30 percent in 2010, compared to 10 and 14 percent in 2004 and 1995, respectively). Only one site was designated as severely impaired in 2010, which has improved from the 4 percent of sites that were designated the same in 2004. No sites were severely impaired in 1995.

Condition categories determined in 2010 were compared to those determined in the previous sampling event for each site (Table 3). Improvement in biological condition categories occurred in 3 to 33 percent of sites throughout the different sections of the Juniata basin, with the Frankstown Branch and Juniata mainstem sections seeing the most improvement, at 30 and 33 percent of their sites, respectively. All

sections experienced some moderate biological degradation, from 31 percent (Upper section) to 52 percent (Lower section) of sites. Many sites within the sections retained their previous biological condition categories, with the Juniata mainstem experiencing the least retention (17 percent of its sites) to the Upper section, which is the least developed of all sections, having the most retention (66 percent of its sites).

HABITAT

Similar patterns held true for the habitat data (Figure 11). In 2010, only about 59 percent of the sites had excellent habitat, as compared to the 2004 estimation of 81 percent. The 2010 findings, however, were similar to the estimation observed in 1995 of 54 percent. The 2010 decrease in excellent habitat conditions also corresponds to an increase in the number of sites with more degraded conditions. For example, supporting habitat increased to 39 percent in 2010, compared to 16 percent in 2004 and 29 percent in 1995. Sites that were noted to have partially supporting habitat in 2010 was 2 percent, which is similar to that observed in 2004, and lower than the 10 percent noted in 1995.

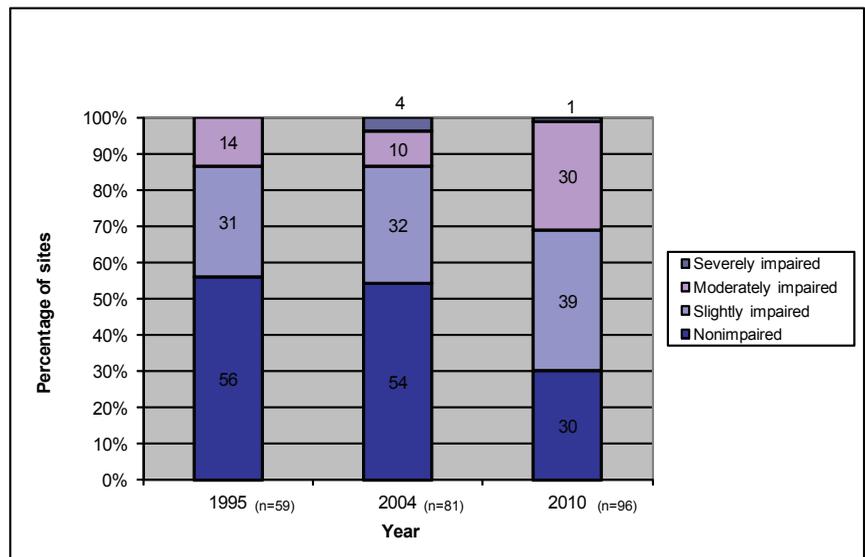


Figure 10. Historical Biological Condition Categories Documented in the Juniata Subbasin Studies

Table 3. Comparison of Condition Categories (1995, 2004, and 2010 Data)

	Percent of sites with a change in Condition Categories (1995, 2004, and 2010 data)								
	Biology			Habitat			Water Quality		
	Improved	Degraded	No Change	Improved	Degraded	No Change	Improved	Degraded	No Change
Frankstown Branch	30	40	30	9	36	55	45	18	36
Raystown Branch	4	44	52	4	28	68	12	0	88
Upper	3	31	66	14	24	62	10	16	73
Lower	4	52	44	12	36	52	33	0	67
Mainstem	33	50	17	17	33	50	43	0	57
Mean	15	43	42	11	31	57	29	7	64

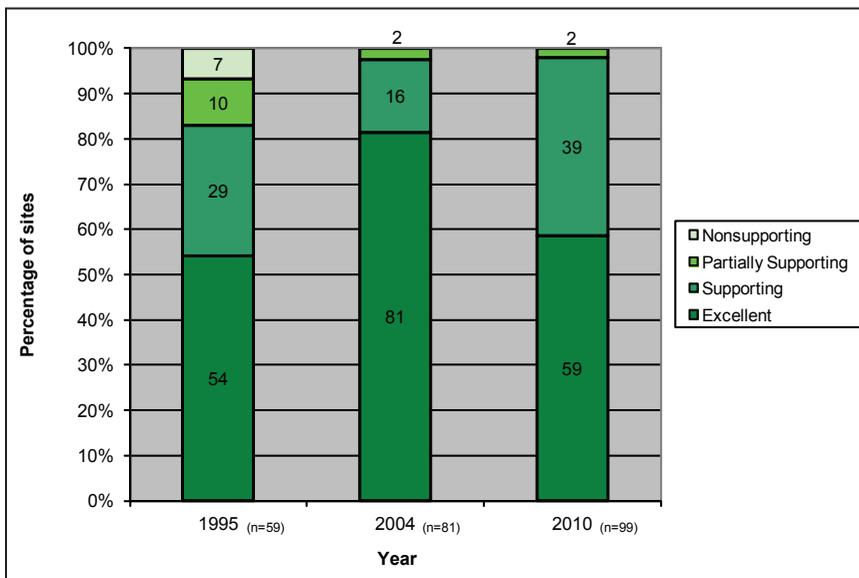


Figure 11. Historical Habitat Condition Categories Documented in the Juniata Subbasin Studies

Habitat can be a difficult variable to compare between sampling event years because its assessment is somewhat subjective. A slight majority of sites within the sections were noted to have retained the same habitat condition categories in 2010 compared to 2004 or 1995 data, ranging from 50 percent of sites within the Juniata mainstem section to 68 percent within the Raystown Branch section. Between 24 percent (Upper section) and 36 percent (in both the Frankstown Branch and Lower sections) of sites experienced degradation in habitat. Between 4 percent (Raystown Branch) and 17 percent (Juniata mainstem) of sites showed an improvement in habitat condition categories.

WATER QUALITY

Water quality trends are illustrated in Figure 12. Lower water quality conditions were observed at only 5 percent of sites in 2010, which is an improvement from the 2004 finding that was at 14 percent. The 2010 findings, however, were similar to the 5 percent observed in 1995. As a result of the improved findings in 2010, more sites were documented to have higher and middle water quality conditions than in 2004. Higher water quality was observed at 30 percent of sites in 2010, compared to 22 percent in 2004, and 23 percent in 1995. Stations with middle water quality were observed at 65 percent of sites in 2010 compared to 64 and 72 percent in 2004 and 1995, respectively.

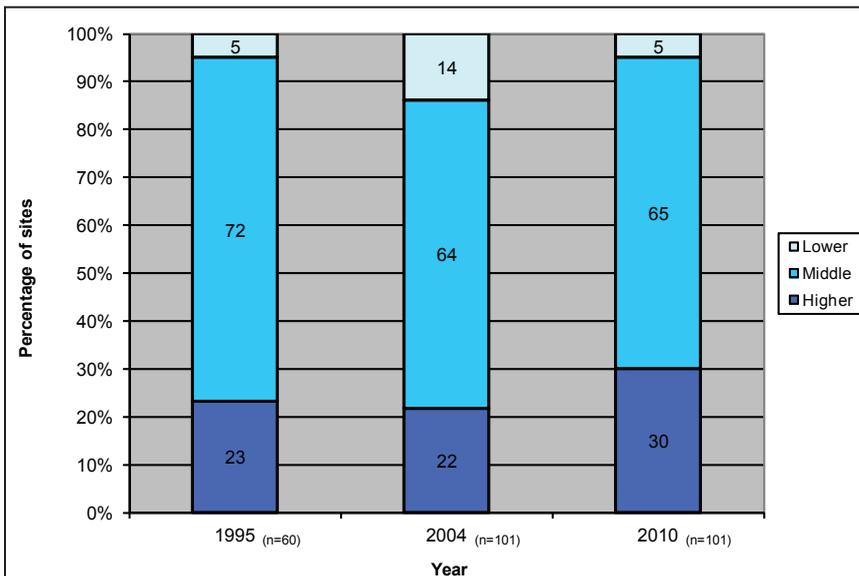


Figure 12. Historical Water Quality Condition Categories Documented in the Juniata Subbasin Studies

Between 36 percent (Frankstown Branch) and 88 percent (Raystown Branch) of sites sampled in 2010 retained water quality condition categories from the last time they were sampled. The Frankstown Branch and the Upper section

were the only two sections to experience degradation in water quality (16 and 18 percent, respectively), while no sites in the Raystown Branch, Lower section, and Juniata sections experienced water quality degradation. Between 10 percent (Upper section) and 45 percent (Frankstown Branch) of sites saw improvement in their water quality condition categories.

Overall, most sections experienced both improvements and degradation in the three condition categories among their sites, but a large percentage of condition categories remained stable compared to the last subbasin survey. On average, approximately 42 percent of all 2010 sites with historical data did not see a change in biological condition categories, with 43 percent of the sites showing degradation, and 15 percent showing improvement. Approximately 57 percent of all sites showed no condition category change for habitat, with 31 percent showing degradation, and 11 percent showing improvement. Approximately 64 percent of all sites showed no change in water quality condition categories, with 7 percent showing degradation, and 29 percent showing improvement.

Water quality data that were collected during the last three surveys in 1995, 2004, and 2010 were compared to determine what sites have chronic issues exceeding levels of concern and what parameters are involved (see Table 4). Consistent with patterns observed in the 2010 data, nitrate and total nitrogen were the parameters that were consistently elevated at many of the sites throughout the three surveys. Out of the 73 sites that had elevated parameters, a total of 53 sites had consistently elevated total nitrogen, and 45 sites had consistently elevated nitrate. The Lower section harbored the majority of these sites, followed closely by the Raystown Branch.

The next most common parameter seen at concerning levels was alkalinity, which was observed consistently at ten sites largely divided between the Upper section and Raystown Branch. Consistently elevated orthophosphate levels were found at seven sites, most of which were concentrated in the Frankstown Branch section.

Two sites in the Frankstown Branch had the highest number of parameters that consistently exceeded levels of concern. Burgoon Run (BURG 0.5) had a total of six parameters that were consistently problematic throughout the study periods, including high acidity, low pH, low alkalinity, and high aluminum, iron, and manganese. Halter Creek (HALT 0.6) had five parameters of issue, including elevated hardness, nitrate, total nitrogen, orthophosphate, and total phosphorus levels. Three other sites had four parameters at consistently problematic levels: FRNK 38.1 (nitrate, total nitrogen, orthophosphate, and sodium), LJUN 19.4 (nitrate, total nitrogen, orthophosphate, and phosphorus), and YELL 12.0 (hardness, magnesium, nitrate, and total nitrogen).

Two sites had consistently elevated hardness levels, YELL 12.0 and HALT 0.6. Magnesium was consistently elevated only at YELL 12.0, and consistently elevated sodium levels were only found at FRNK 32.5. Elevated levels of magnesium and hardness at YELL 12.0 are likely a natural result of the karst geology in the area. The sites SIXM 0.3 (Sixmile Run) and BURG 0.5 had consistently high iron levels, while BURG 0.5 and BVDB 5.0 (Beaverdam Branch) were the only sites to have consistently elevated manganese levels.

Table 4. List of Sites with Parameters Consistently Exceeding Levels of Concern (1995, 2005, and 2010 Data)

Variable	Number of Measurements	Minimum	Maximum	Median	Total Number of Sites with Consistent Issues	Number of sites with issues in each section*				
						Raystown Branch	Frankstown Branch	Upper	Lower	Mainstem
Total Nitrogen	146	1.05	12.27	2.4	53	15	8	8	18	4
Nitrate	128	1.04	11.9	2.3	45	13	7	7	16	2
Alkalinity	22	0	18.6	11.4	10	4	BURG 0.5	5		
Orthophosphate	38	0.052	0.463	0.1	7		5	LJUN 19.4	LLOS 0.5	
Aluminum	10	203	7177	300	4	2	2			
Hardness	6	305	382	324	2	YELL 12.0	HALT 0.6			
Iron	7	1550	5839	2060	2	SIXM 0.3	BURG 0.5			
Manganese	5	1080	7507	1800	2		2			
Total Phosphorus	27	0.103	0.471	0.2	2		HALT 0.6	LJUN 19.4		
Acidity	4	23	96	32	1		BURG 0.5			
pH	4	3.08	5.11	4.5	1		BURG 0.5			
Magnesium	4	35.3	39.6	39.3	1	YELL 12.0				
Sodium	15	20	146	33.7	1		FRNK 32.5			
TSS	4	26	44	31	0					

* The site name was reported when it was the only site having issues within the specific watershed.