RESULTS

Water Quality

During fiscal year 2002, water quality in approximately two-thirds of the Group 1 and Group 2 interstate streams continued to meet designated use classes and water quality standards (Table 9, Appendix D). Eleven out of the 30 sites had parameters exceeding water quality standards. The parameter that most frequently exceeded water quality standards was total iron (Table 10, Figure 5). Most of the samples in which total iron exceeded the standard were from the river sites. Only 25 out of 2,784 total observations exceeded water quality standards.

Biological Communities and Physical Habitat

RBP III biological data for New York-Pennsylvania, Pennsylvania-Maryland, river sites, and Group 3 streams are summarized in Tables 11 through 14, respectively. A high rapid bioassessment protocol score indicates a low degree of impairment and a healthy macroinvertebrate population. RBP III results for each site can be found in the "Bioassessment of Interstate Streams" section, beginning on page 44.

RBP III physical habitat data for New York-Pennsylvania, Pennsylvania-Maryland, river sites, and Group 3 streams are presented in Tables 15 through 18, respectively. A high score indicates a high-quality physical habitat. RBP III physical habitat and biological data are summarized in Figures 6 through 9.

New York-Pennsylvania streams

New York-Pennsylvania sampling stations consisted of nine sites located near or on the New York-Pennsylvania border. The biological community of one (11.1 percent) of these streams was nonimpaired. Six streams were slightly impaired (66.7 percent), and two streams were moderately impaired (22.2 percent). None of the streams were severely impaired. Seven of the New York-Pennsylvania sites had excellent habitats (77.8 percent). Two sites (22.2 percent) had supporting habitats, and no sites had partially supporting or nonsupporting habitat. Holden Creek, Cascade Creek, Little Snake Creek, North Fork Cowanesque River, and Trowbridge Creek were not sampled for macroinvertebrates during the summer due to drought conditions. Cascade Creek and Little Snake Creek were sampled quarterly throughout the rest of the year for water quality.

Pennsylvania-Maryland streams

The Pennsylvania-Maryland interstate streams included eight stations located on or near the Pennsylvania-Maryland border. Five (62.5 percent) streams were designated non-impaired, using RBP III protocol designations. Three sites (37.5 percent) were slightly impaired, and none of the sites were moderately impaired or severely impaired. Five (62.5 percent) of the Pennsylvania-Maryland border sites had excellent habitats. Two sites (25 percent) had supporting habitats, and one site (12.5 percent) had partially supporting habitat. None of the sites was designated nonsupporting in habitat. Scott Creek, which was not sampled for macroinvertebrates due to drought conditions, was sampled throughout the rest of the year for water quality. Island Branch is not sampled due to its small size.

River sites

River sites consisted of ten stations located on the Susquehanna, Chemung, Cowanesque, and Tioga Rivers. One station (SUSQ 10.0) is not sampled for macroinvertebrates due to deep water and a lack of riffle habitat at the site. The biological communities of four out of nine sites (44.4 percent) were nonimpaired, three sites (33.3 percent) were slightly impaired, and two sites (22.2 percent) were moderately impaired. Six of the nine sites (66.7 percent) had excellent habitats. The remaining three sites (33.3 percent) were supporting.

Table 9. Stream Classifications

Stream	Pa. Classification *	N.Y. Classification *
Apalachin Creek	CWF	C
Babcock Run	CWF	C
Beagle Hollow	WWF	C
Bentley Creek	WWF	C
Bill Hess Creek	WWF	C
Bird Creek	CWF	C
Biscuit Hollow	CWF	C
Briggs Hollow	CWF	C
Bulkley Brook	WWF	C
Camp Brook	WWF	C
Cascade Creek	CWF	C
Cayuta Creek	WWF	B
Chemung River	WWF	A
Choconut Creek	WWF	C
Cook Hollow	CWF	C
Cowanesque River	WWF	C
Deep Hollow Brook	CWF	C
Denton Creek	CWF	C
Dry Brook	WWF	C
Little Snake Creek	CWF	C
Little Wappasening Creek	WWF	C
North Fork Cowanesque River	CWF	C
Parks Creek	WWF	C
Prince Hollow Run	CWF	C
Russell Run	CWF	C
Sackett Creek	WWF	C
Seeley Creek	CWF	C (T)
Smith Creek	WWF	C
Snake Creek	CWF	C
South Creek	CWF	C
Strait Creek	WWF	C
Susquehanna River	WWF	B
Tioga River	WWF	C
Trowbridge Creek	CWF	C
Troups Creek	CWF	C
Wappasening Creek	CWF	C
White Branch Cowanesque River	WWF	C
White Hollow	WWF	C
Stream	**Pa. Classification**	**Md. Classification ***
Big Branch Deer Creek	CWF	III-P
Conowingo Creek	CWF	I-P
Deer Creek	CWF	III-P
Ebaughs Creek	CWF	III-P
Falling Branch Deer Creek	CWF	IV-P
Long Arm Creek	WWF	I-P
Octoraro Creek	WWF-MF	IV-P
Scott Creek	TSF	I-P
South Branch Conewago Creek	WWF	I-P
Susquehanna River	WWF	I-P

* See Appendix D for stream classification descriptions

Table 10. Water Quality Standard Summary

Parameter	Standard	Standard Value	Number of Observations	Number Exceeding Standards
Alkalinity	Pa. aquatic life	20 mg/l	87	4
pH	Pa. aquatic life N.Y. general	6.0-9.0 6.5-8.5	87 56	1 2
Dissolved Oxygen	Pa. aquatic life N.Y. trout waters	5.0 mg/l (CWF), 4.0 mg/l (WWF) 5.0 mg/l (trout), 4.0 mg/l (nontrout)	87 56	2 1
Dissolved Iron	Pa. aquatic life	0.3 mg/l	87	1
Total Iron	N.Y. aquatic (chronic)	300 µg/l	56	9
Total Aluminum	N.Y. aquatic (chronic)	100 µg/l	56	5

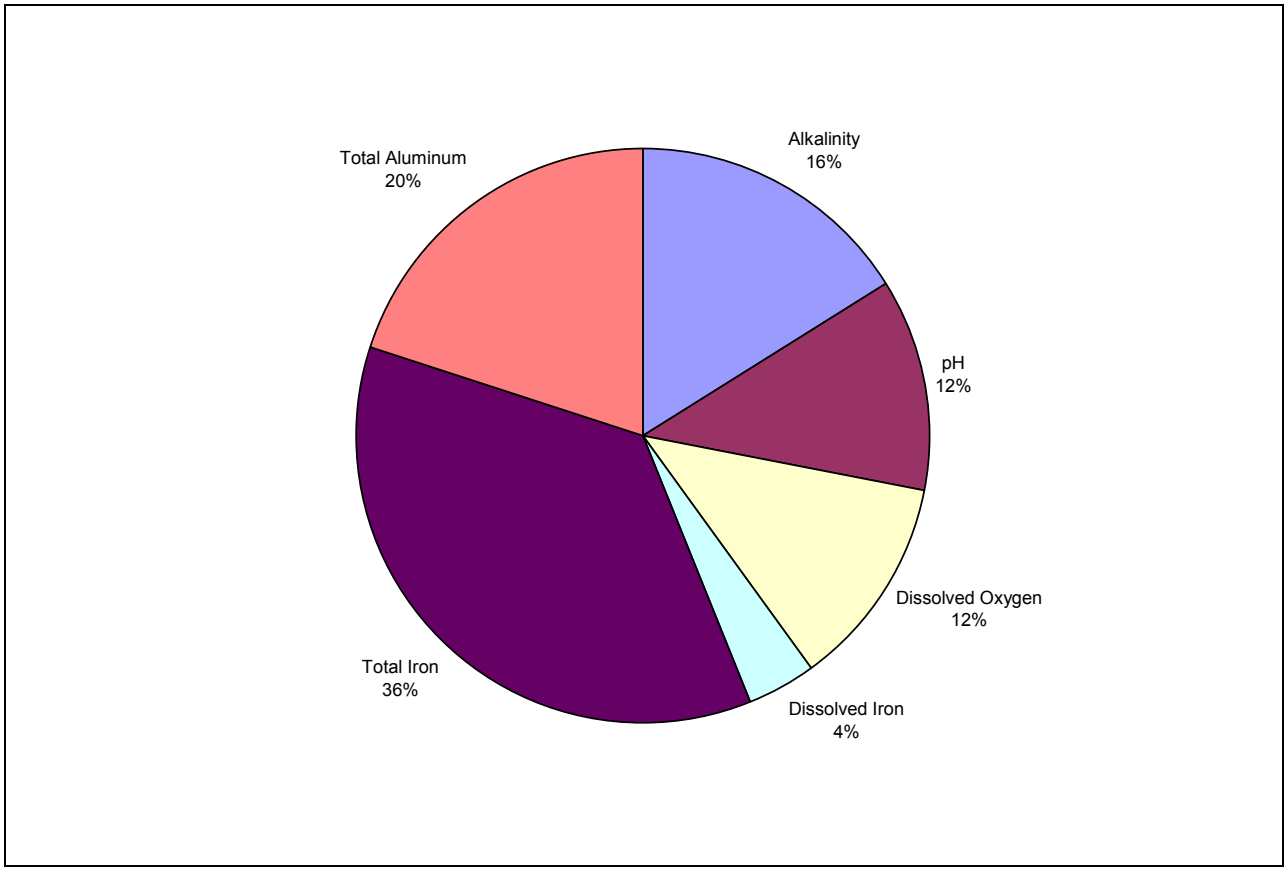

Figure 5. Parameters Exceeding Water Quality Standards

Table 11. Summary of New York-Pennsylvania Border RBP III Biological Data

	APAL 6.9	BNTY 0.9	CAYT 1.7	CHOC 9.1	SEEL 10.3	SNAK 2.3	SOUT 7.8	TRUP 4.5	WAPP 2.6
Raw Summary									
Number of Individuals	144	141	140	158	257	152	149	121	145
% Shredders	0	2.1	0	1.9	0.4	0.7	0.7	0	0
% Collector-Gatherers	16.7	54.6	15	41.1	72.8	38.8	21.5	11.6	57.9
% Filterer-Collectors	63.9	29.1	34.3	39.9	15.6	40.1	55.7	40.5	30.3
% Scrapers	18.8	7.1	47.9	13.3	2.3	14.5	21.5	34.7	6.9
% Predators	0.7	7.1	2.9	3.8	8.9	5.9	0.7	13.2	4.8
Number of EPT Taxa	6	9	7	10	6	16	9	5	12
Number of EPT Individuals	93	74	54	74	49	86	92	54	54
Metric Scores									
Taxonomic Richness	12	16	16	20	15	25	15	14	19
Shannon Diversity Index	1.8	2.0	2.3	2.1	1.3	2.6	2.1	2.2	1.7
Modified Hilsenhoff Biotic Index	4.5	5.0	4.5	4.6	5.3	4.2	4.5	4.6	5.0
EPT Index	6	9	7	10	6	16	9	5	12
Percent Ephemeroptera	3.5	22.0	9.3	8.9	6.6	18.4	5.4	0.8	8.3
Percent Chironomidae	15.3	36.2	10.0	39.2	68.9	25.0	14.8	10.7	55.2
Percent Dominant Taxa	44.4	36.2	25.0	39.2	68.9	25.0	30.2	22.3	55.2
Percent of Reference or Percentage Score									
Taxonomic Richness	48	64	64	80	60	100	60	56	76
Shannon Diversity Index	70.7	78.4	87.6	80.6	49	100	82.4	84.7	64
Hilsenhoff Index	93.3	83	92.8	90.7	79.3	100	92.5	90.6	83.6
EPT Index	37.5	56.3	43.8	62.5	37.5	100	56.3	31.3	75
Percent Ephemeroptera	3.5	22	9.3	8.9	6.6	18.4	5.4	0.8	8.3
Percent Chironomidae	15.3	36.2	10	39.2	68.9	25	14.8	10.7	55.2
Percent Dominant Taxa	44.4	36.2	25	39.2	68.9	25	30.2	22.3	55.2
Biological Condition Scores									
Taxonomic Richness	2	4	4	6	4	6	4	2	4
Shannon Diversity Index	4	6	6	6	2	6	6	6	4
Hilsenhoff Index	6	4	6	6	4	6	6	6	4
EPT Index	0	0	0	0	0	6	0	0	2
Percent Ephemeroptera	2	4	2	2	2	4	2	0	2
Percent Chironomidae	4	0	4	0	0	2	4	4	0
Percent Dominant Taxa	0	2	4	2	0	4	4	4	0
Total Biological Score									
Total Biological Score	18	20	26	22	12	34	26	22	16
Biological % of Reference	52.9	58.8	76.5	64.7	35.3	100	76.5	64.7	47.1

Table 12. Summary of Pennsylvania-Maryland Border RBP III Biological Data

	BBDC 4.1	CNWG 4.4	DEER 44.5	EBAU 1.5	FBDC 4.1	LNGA 2.5	OCTO 6.6	SBCC 20.4
Raw Summary								
Number of Individuals	151	135	173	156	131	162	117	119
% Shredders	12.6	3.7	1.7	0.6	11.5	4.3	3.4	17.6
% Collector-Gatherers	19.2	15.6	10.4	29.5	20.6	37.0	10.3	15.1
% Filterer-Collectors	21.9	23.0	33.5	43.6	15.3	27.2	73.5	26.9
% Scrapers	27.2	49.6	44.5	23.1	22.1	24.7	12.0	19.3
% Predators	19.2	8.1	9.8	3.2	30.5	6.8	0.9	21.0
Number of EPT Taxa	13	9	14	11	14	6	13	9
Number of EPT Individuals	78	55	76	104	53	71	93	60
Metric Scores								
Taxonomic Richness	22	18	25	19	29	17	23	17
Shannon Diversity Index	2.6	2.3	2.5	2.3	2.8	2.2	2.4	2.5
Modified Hilsenhoff Biotic Index	3.3	4.6	4.2	4.5	3.8	4.9	4.2	3.4
EPT Index	13	9	14	11	14	6	13	9
Percent Ephemeroptera	7.9	17.8	12.1	20.5	3.1	16.0	13.7	7.6
Percent Chironomidae	11.3	8.1	4.0	7.7	16.8	19.8	5.1	9.2
Percent Dominant Taxa	19.2	36.3	23.7	25.6	16.8	21.0	23.1	17.6
Percent of Reference or Percentage Score								
Taxonomic Richness	100	81.8	113.6	86.4	131.8	77.3	104.5	77.3
Shannon Diversity Index	100	85.1	93.9	87.7	105.6	84.6	92.6	93.9
Hilsenhoff Index	100	72.9	79.7	73.5	88	68	79.5	97.7
EPT Index	100	69.2	107.7	84.6	107.7	46.2	100	69.2
Percent Ephemeroptera	7.9	17.8	12.1	20.5	3.1	16	13.7	7.6
Percent Chironomidae	11.3	8.1	4	7.7	16.8	19.8	5.1	9.2
Percent Dominant Taxa	19.2	36.3	23.7	25.6	16.8	21	23.1	17.6
Biological Condition Scores								
Taxonomic Richness	6	6	6	6	6	4	6	4
Shannon Diversity Index	6	6	6	6	6	6	6	6
Hilsenhoff Index	6	4	4	4	6	2	4	6
EPT Index	6	0	6	4	6	0	6	0
Percent Ephemeroptera	2	4	4	4	2	4	4	2
Percent Chironomidae	4	4	6	4	4	4	4	4
Percent Dominant Taxa	6	2	4	4	6	4	4	6
Total Biological Score								
Total Biological Score	36	26	36	32	36	24	34	28
Biological % of Reference	100	72.2	100	88.9	100	66.7	94.4	77.8

Table 13. Summary of River RBP III Biological Data

	CHEM 12.0	COWN 1.0	COWN 2.2	COWN 5.0	SUSQ 289.1	SUSQ 340	SUSQ 365	SUSQ 44.5	TIOG 10.8
Raw Summary									
Number of Individuals	144	168	123	145	118	182	153	140	144
% Shredders	0	0.6	17.9	1.4	0	0	1.3	0.7	0.7
% Collector-Gatherers	16	47.6	28.5	17.2	9.3	10.4	19	11.4	25
% Filterer-Collectors	63.9	18.5	49.6	60.7	41.5	25.8	39.2	53.6	63.9
% Scrapers	16	29.8	0	17.9	44.9	52.2	28.1	33.6	4.9
% Predators	4.2	3.6	4.1	2.8	4.2	11.5	12.4	0.7	5.6
Number of EPT Taxa	12	5	2	8	13	8	12	11	9
Number of EPT Individuals	93	42	59	97	68	73	86	102	84
Metric Scores									
Taxonomic Richness	21	14	7	16	17	12	21	18	18
Shannon Diversity Index	2.5	1.7	1.3	2.1	2.2	1.9	2.4	2.3	2.2
Modified Hilsenhoff Biotic Index	4.5	5.2	5.5	4.2	4	4.3	4.1	4.5	4.9
EPT Index	12	5	2	8	13	8	12	11	9
Percent Ephemeroptera	24.3	5.4	0	20.7	25.4	7.1	20.3	26.4	10.4
Percent Chironomidae	13.2	42.3	28.5	16.6	0	7.7	13.1	0	22.9
Percent Dominant Taxa	16	42.3	47.2	19.3	36.4	44.5	19.6	24.3	22.9
Percent of Reference or Percentage Score									
Taxonomic Richness	100	66.7	33.3	76.2	81	57.1	100	85.7	85.7
Shannon Diversity Index	107	73.3	54.5	90.2	92.2	80.9	100	95.9	93.5
Hilsenhoff Index	90.6	78.1	73.6	97.8	101.6	95.6	100	91.4	82.2
EPT Index	100	41.7	16.7	66.7	108.3	66.7	100	91.7	75
Percent Ephemeroptera	24.3	5.4	0	20.7	25.4	7.1	20.3	26.4	10.4
Percent Chironomidae	13.2	42.3	28.5	16.6	0	7.7	13.1	0	22.9
Percent Dominant Taxa	16	42.3	47.2	19.3	36.4	44.5	19.6	24.3	22.9
Biological Condition Scores									
Taxonomic Richness	6	4	0	4	6	2	6	6	6
Shannon Diversity Index	6	4	4	6	6	6	6	6	6
Hilsenhoff Index	6	4	4	6	6	6	6	6	4
EPT Index	6	0	0	0	6	0	6	6	2
Percent Ephemeroptera	4	3	0	4	6	3	4	6	4
Percent Chironomidae	4	0	2	4	6	4	4	6	2
Percent Dominant Taxa	6	0	0	6	2	0	6	4	4
Total Biological Score									
Total Biological Score	38	15	10	30	38	21	38	40	28
Biological % of Reference	100	39.5	26.3	78.9	100	55.3	100	105.3	73.7

Table 14. Summary of Group 3 Sites RBP III Biological Data

	BABC	BEAG	BILL	BIRD	BISC	BRIG	BULK	CAMP	COOK	DEEP	DENT
Raw Summary											
Number of Individuals	131	128	148	120	130	130	144	117	140	112	135
% Shredders	19.1	50	16.2	10.8	25.4	2.3	26.4	31.6	17.9	14.3	2.2
% Collector-Gatherers	54.2	29.7	42.6	27.5	20.8	46.9	63.2	25.6	50.7	34.8	46.7
% Filterer-Collectors	4.6	7.8	1.4	0	28.5	2.3	0.7	11.1	0.7	32.1	40
% Scrapers	3.8	2.3	33.1	45	6.2	3.1	1.4	24.8	7.9	6.3	9.6
% Predators	18.3	10.2	6.8	16.7	19.2	45.4	8.3	6.8	22.9	12.5	1.5
Number of EPT Taxa	11	13	14	11	9	14	10	14	13	14	5
Number of EPT Individuals	87	114	85	78	84	125	100	78	73	57	46
Metric Scores											
Taxonomic Richness	16	20	21	14	15	18	16	21	20	24	13
Shannon Diversity Index	2.2	2.1	2.4	2	2.1	1.6	2.2	2.5	2.3	2.6	1.7
Modified Hilsenhoff Biotic Index	2.4	1.3	3.5	2.6	4.3	0.5	2.6	2.7	3.8	3.6	5.4
EPT Index	11	13	14	11	9	14	10	14	13	14	5
Percent Ephemeroptera	30.5	25.8	34.5	49.2	10.8	48.5	36.1	24.8	16.4	9.8	3
Percent Chironomidae	26.7	5.5	16.2	23.3	10	1.5	25.7	10.3	37.1	26.8	45.9
Percent Dominant Taxa	26.7	31.3	20.3	29.2	24.6	42.3	25.7	16.2	37.1	26.8	45.9
Percent of Reference or Percentage Score											
Taxonomic Richness	69.6	87	91.3	60.9	65.2	78.3	69.6	91.3	87	104.3	56.5
Shannon Diversity Index	83.3	79.6	88	73.3	78.9	57.5	81.5	94	85.6	96	61.9
Hilsenhoff Index	65.8	120.6	45.3	61.6	37.3	313.5	62.3	58.9	41.5	44	29.6
EPT Index	68.8	81.3	87.5	68.8	56.3	87.5	62.5	87.5	81.3	87.5	31.3
Percent Ephemeroptera	30.5	25.8	34.5	49.2	10.8	48.5	36.1	24.8	16.4	9.8	3
Percent Chironomidae	26.7	5.5	16.2	23.3	10	1.5	25.7	10.3	37.1	26.8	45.9
Percent Dominant Taxa	26.7	31.3	20.3	29.2	24.6	42.3	25.7	16.2	37.1	26.8	45.9
Biological Condition Scores											
Taxonomic Richness	4	6	6	4	4	4	4	6	6	6	2
Shannon Diversity Index	6	6	6	4	6	4	6	6	6	6	4
Hilsenhoff Index	2	6	0	2	0	6	2	2	0	0	0
EPT Index	0	4	4	0	0	4	0	4	4	4	0
Percent Ephemeroptera	6	6	6	6	4	6	6	4	4	2	2
Percent Chironomidae	2	4	4	2	4	6	2	4	0	2	0
Percent Dominant Taxa	4	2	4	4	4	0	4	6	2	4	0
Total Biological Score											
Total Biological Score	24	34	30	22	22	30	24	32	22	24	8
Biological % of Reference	60	85	75	55	55	75	60	80	55	60	20

Table 14. Summary of Group 3 Sites RBP III Biological Data—Continued

	DRYB	LWAP	PARK	PRIN	RUSS	SACK	SMIT	STRA	WBCO	WHIT
Raw Summary										
Number of Individuals	138	128	122	123	133	128	225	117	146	120
% Shredders	10.9	3.1	13.9	0	6	3.9	52.9	8.5	0	31.7
% Collector-Gatherers	67.4	51.6	43.4	88.6	53.4	62.5	24	34.2	44.5	18.3
% Filterer-Collectors	2.9	4.7	3.3	0	0	4.7	6.2	0.9	51.4	7.5
% Scrapers	0	10.2	4.1	5.7	0.8	11.7	1.8	53.8	2.7	5
% Predators	18.8	30.5	35.2	5.7	39.8	17.2	15.1	2.6	1.4	37.5
Number of EPT Taxa	4	15	18	8	11	11	8	8	6	16
Number of EPT Individuals	21	108	112	14	92	118	146	41	59	99
Metric Scores										
Taxonomic Richness	9	21	22	13	13	16	19	13	12	23
Shannon Diversity Index	1.3	2.4	2.2	0.8	1.9	1.9	2	1.6	1.7	2.7
Modified Hilsenhoff Biotic Index	5.2	2	1.2	5.4	2.3	0.8	3.2	3.7	5.7	1.6
EPT Index	4	15	18	8	11	11	8	8	6	16
Percent Ephemeroptera	5.1	53.1	41.8	8.1	25.6	71.9	2.7	24.8	1.4	18.3
Percent Chironomidae	62.3	5.5	3.3	83.7	28.6	1.6	21.3	9.4	42.5	4.2
Percent Dominant Taxa	62.3	25	32	83.7	30.1	50.8	38.2	52.1	42.5	14.2
Percent of Reference or Percentage Score										
Taxonomic Richness	39.1	91.3	95.7	56.5	56.5	69.6	82.6	56.5	52.2	100
Shannon Diversity Index	46.6	88	81.3	30.7	70.3	69.3	73.9	61.1	63.4	100
Hilsenhoff Index	30.5	81.2	132.1	29.2	70.6	199.7	49.2	43.5	28.1	100
EPT Index	25	93.8	112.5	50	68.8	68.8	50	50	37.5	100
Percent Ephemeroptera	5.1	53.1	41.8	8.1	25.6	71.9	2.7	24.8	1.4	18.3
Percent Chironomidae	62.3	5.5	3.3	83.7	28.6	1.6	21.3	9.4	42.5	4.2
Percent Dominant Taxa	62.3	25	32	83.7	30.1	50.8	38.2	52.1	42.5	14.2
Biological Condition Scores										
Taxonomic Richness	0	6	6	2	2	4	6	2	2	6
Shannon Diversity Index	2	6	6	2	4	4	4	4	4	6
Hilsenhoff Index	0	4	6	0	4	6	0	0	0	6
EPT Index	0	6	6	0	0	0	0	0	0	6
Percent Ephemeroptera	2	6	6	2	6	6	2	4	2	4
Percent Chironomidae	0	4	6	0	2	6	2	4	0	6
Percent Dominant Taxa	0	4	2	0	4	0	2	0	0	6
Total Biological Score										
Total Biological Score	4	36	38	6	22	26	16	14	8	40
Biological % of Reference	10	90	95	15	55	65	40	35	20	100

Table 15. Summary of New York-Pennsylvania Sites Physical Habitat Data

	APAL 6.9	BNTY 0.9	CAYT 1.7	CHOC 9.1	SEEL 10.3	SNAK 2.3	SOUT 7.8	TRUP 4.5	WAPP 2.6
Epifaunal Substrate	14	14	16	16	14	14	16	9	16
Instream Cover	12	9	14	11	9	14	11	11	12
Embeddedness/Pool Substrate	13	14	13	16	12	16	14	16	16
Velocity/Depth Regimes/Pool Variability	10	12	14	10	9	16	9	12	14
Sediment Deposition	14	9	13	16	9	15	14	12	16
Channel Flow Status	9	1	12	1	10	12	9	7	9
Channel Alteration	14	9	13	13	10	14	14	13	12
Frequency of Riffles/Channel Sinuosity	9	14	12	13	13	15	15	13	13
Condition of Banks	16	9	12	13	16	14	14	13	13
Left Bank	8	3	6	6	8	7	8	8	5
Right Bank	8	6	6	7	8	7	6	5	8
Vegetative Protective Cover	15	13	12	8	15	15	15	16	15
Left Bank	7	6	7	4	9	8	8	9	7
Right Bank	8	7	5	4	6	7	7	7	8
Riparian Vegetative Zone Width	4	6	7	4	12	6	4	6	8
Left Bank	2	3	6	2	8	3	2	3	4
Right Bank	2	3	1	2	4	3	2	3	4
Total Habitat Score									
Total Habitat Score	130	110	138	121	129	139	135	128	144
Habitat Percent of Reference	93.5	79.1	99.3	87.1	92.8	100	97.1	92.1	103.6

Table 16. Summary of Pennsylvania-Maryland Sites Physical Habitat Data

	BBDC 4.1	CNWG 4.4	DEER 44.5	EBAU 1.5	FBDC 4.1	LNGA 2.5	OCTO 6.6	SBCC 20.4
Epifaunal Substrate	16	16	15	14	15	12	16	16
Instream Cover	14	15	14	14	15	11	15	13
Embeddedness/Pool Substrate	15	13	13	12	13	10	13	13
Velocity/Depth Regimes/Pool Variability	13	16	14	13	10	12	16	14
Sediment Deposition	14	10	14	12	11	9	15	13
Channel Flow Status	12	12	13	14	12	13	14	13
Channel Alteration	14	15	15	14	15	14	15	15
Frequency of Riffles/Channel Sinuosity	16	14	12	16	13	10	16	15
Condition of Banks	15	14	12	16	15	9	16	16
Left Bank	7	6	6	8	8	5	8	8
Right Bank	8	8	6	8	7	4	8	8
Vegetative Protective Cover	16	16	9	16	16	12	16	16
Left Bank	8	8	6	8	8	6	8	8
Right Bank	8	8	3	8	8	6	8	8
Riparian Vegetative Zone Width	11	9	4	12	3	4	11	4
Left Bank	9	6	2	6	8	2	8	7
Right Bank	2	3	2	6	3	2	3	4
Total Habitat Score								
Total Habitat Score	156	150	135	153	138	116	163	148
Habitat Percent of Reference	100	96.2	86.5	98.1	88.5	74.4	104.5	94.9

Table 17. Summary of River Sites Physical Habitat Data

	CHEM 12.0	COWN 1.0	COWN 2.2	COWN 5.0	SUSQ 289.1	SUSQ 340	SUSQ 365	SUSQ 44.5	TIOG 10.8
Epifaunal Substrate	16	15	9	13	15	10	14	10	16
Instream Cover	14	13	9	13	13	13	16	13	15
Embeddedness/Pool Substrate	14	12	8	14	14	14	14	16	16
Velocity/Depth Regimes/Pool Variability	17	15	9	15	17	16	17	16	16
Sediment Deposition	14	14	14	14	14	13	13	14	14
Channel Flow Status	14	14	13	10	13	12	13	13	14
Channel Alteration	14	15	9	10	15	15	15	15	15
Frequency of Riffles/Channel Sinuosity	NA	13	9	11	16	10	15	13	16
Condition of Banks	17	15	17	14	16	15	16	16	16
Left Bank	9	8	9	7	8	8	8	8	7
Right Bank	8	7	8	7	8	7	8	8	9
Vegetative Protective Cover	15	16	17	15	15	16	16	13	18
Left Bank	8	9	9	6	8	9	8	5	9
Right Bank	7	7	8	9	7	7	8	8	9
Riparian Vegetative Zone Width	10	8	13	11	8	9	10	6	7
Left Bank	7	6	7	4	2	6	4	2	7
Right Bank	3	2	6	7	6	3	6	4	7
Total Habitat Score									
Total Habitat Score	145	150	127	140	156	131	159	145	163
Habitat Percent of Reference	91.2	94.3	79.9	88.1	98.1	82.4	100	91.2	102.5

Table 18. Summary of Group 3 Sites Physical Habitat Data

	BABC	BEAG	BILL	BIRD	BISC	BRIG	BULK	CAMP	COOK	DEEP	DENT
Epifaunal Substrate	18	18	18	18	9	19	18	18	18	16	17
Instream Cover	16	18	18	15	7	16	19	17	16	13	16
Embeddedness/Pool Substrate	16	17	15	17	11	18	14	11	16	14	14
Velocity/Depth Regimes/Pool Variability	15	18	16	11	15	16	18	9	16	11	18
Sediment Deposition	17	15	17	13	8	14	9	12	14	16	16
Channel Flow Status	13	15	17	16	16	9	13	15	15	15	9
Channel Alteration	14	18	15	16	16	10	19	16	12	18	13
Frequency of Riffles/Channel Sinuosity	18	18	18	18	5	18	18	17	18	17	18
Condition of Banks	11	10	19	11	14	8	16	11	11	16	16
Left Bank	3	5	10	2	10	3	9	8	4	7	8
Right Bank	8	5	9	9	4	5	7	3	7	9	8
Vegetative Protective Cover	17	12	19	11	15	10	18	14	11	15	16
Left Bank	9	6	10	2	8	5	9	7	5	7	8
Right Bank	8	6	9	9	7	5	9	7	6	8	8
Riparian Vegetative Zone Width	16	17	11	15	4	9	20	19	17	17	17
Left Bank	9	9	5	10	2	7	10	9	8	7	10
Right Bank	7	8	6	5	2	2	10	10	9	10	7
Total Habitat Score											
Total Habitat Score	162	176	183	161	120	147	172	159	149	168	170
Habitat Percent of Reference	91	98.9	102.8	90.4	67.4	82.6	96.6	89.3	83.7	94.4	95.5

Table 18. Summary of Group 3 Sites Physical Habitat Data – continued.

	DRYB	LWAP	PARK	PRIN	RUSS	SACK	SMIT	STRA	WBCO	WHIT
Epifaunal Substrate	14	19	18	16	18	18	17	18	11	16
Instream Cover	14	18	17	10	14	18	17	15	9	15
Embeddedness/Pool Substrate	11	18	16	15	19	18	9	13	6	18
Velocity/Depth Regimes/Pool Variability	9	15	11	17	9	17	8	9	18	17
Sediment Deposition	14	14	9	9	10	13	5	13	5	15
Channel Flow Status	15	15	11	12	8	15	10	15	18	16
Channel Alteration	6	16	18	11	12	9	18	11	12	17
Frequency of Riffles/Channel Sinuosity	14	19	17	9	18	16	15	18	11	16
Condition of Banks	15	9	4	5	7	10	18	18	16	14
Left Bank	7	4	2	3	3	5	9	9	10	6
Right Bank	8	5	2	2	4	5	9	9	6	8
Vegetative Protective Cover	14	12	9	6	12	12	17	9	15	14
Left Bank	7	6	5	4	6	6	9	5	7	7
Right Bank	7	6	4	2	6	6	8	4	8	7
Riparian Vegetative Zone Width	2	20	18	6	15	18	18	13	11	20
Left Bank	1	10	8	3	5	8	10	8	5	10
Right Bank	1	10	10	3	10	10	8	5	6	10
Total Habitat Score										
Total Habitat Score	128	175	148	116	142	164	152	137	132	178
Habitat Percent of Reference	71.9	98.3	83.1	65.2	79.8	92.1	85.4	77	74.2	100

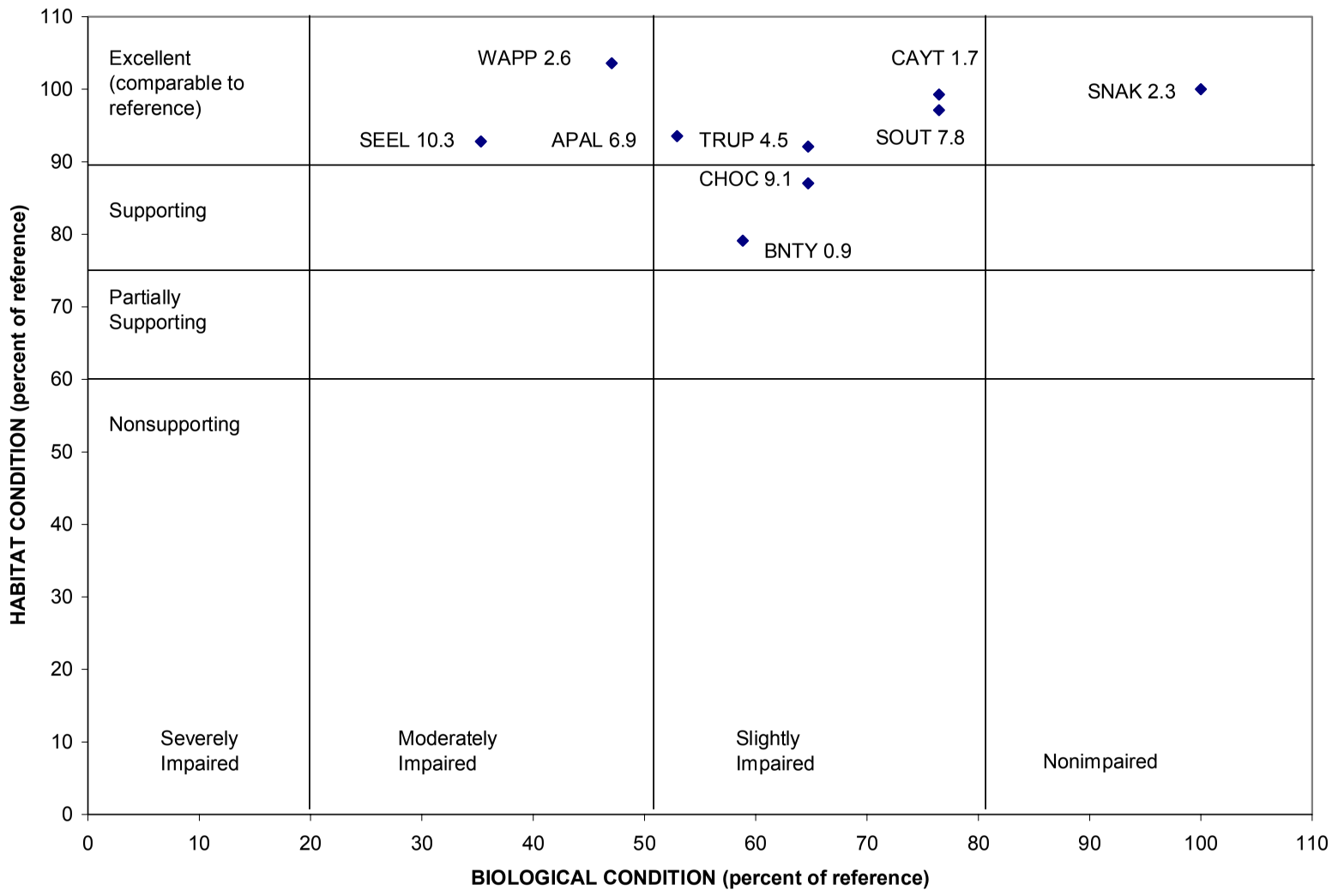

Figure 6. Summary of New York-Pennsylvania Border Streams Habitat and Biological Condition Scores

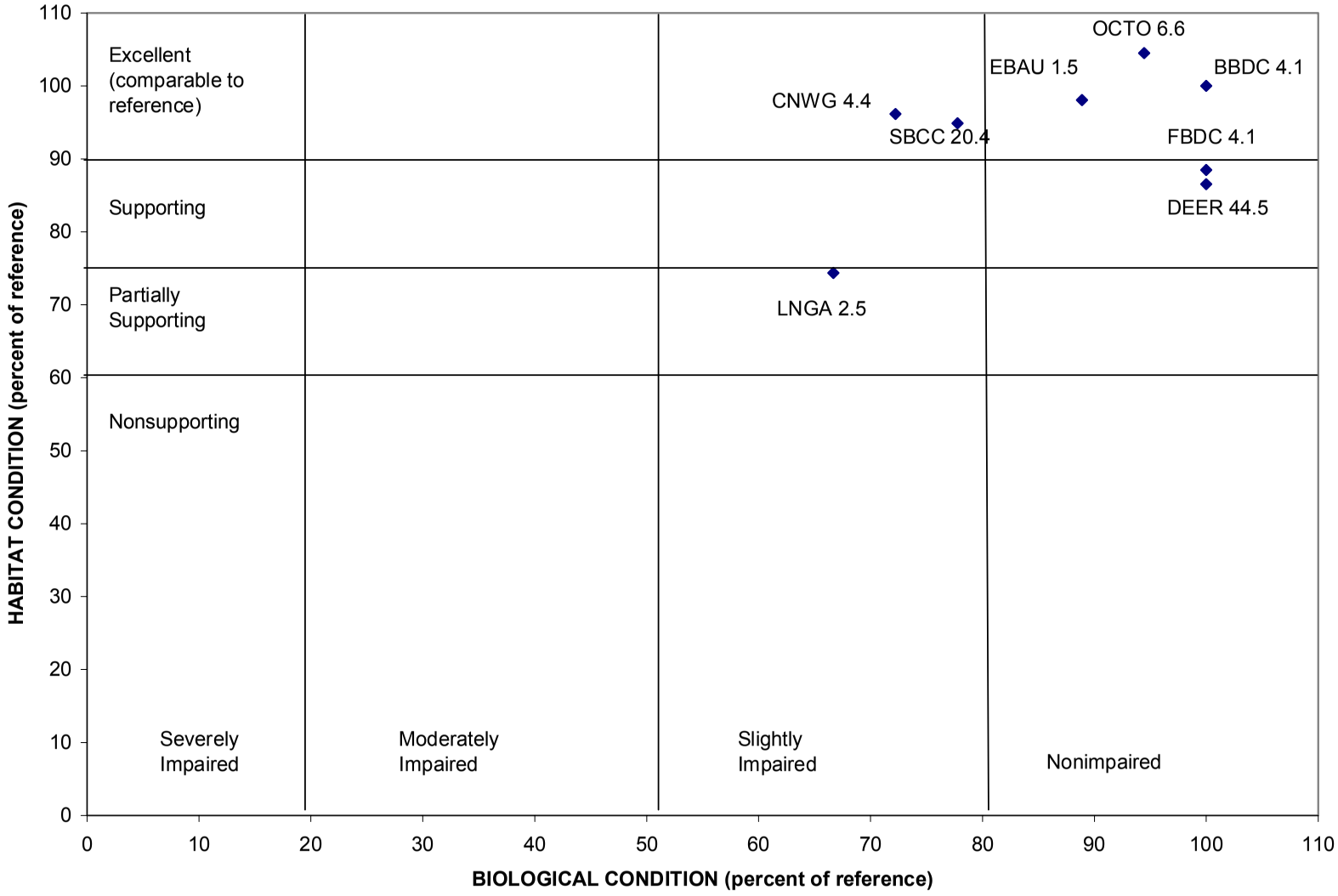

Figure 7. Summary of Pennsylvania-Maryland Border Streams Habitat and Biological Condition Scores

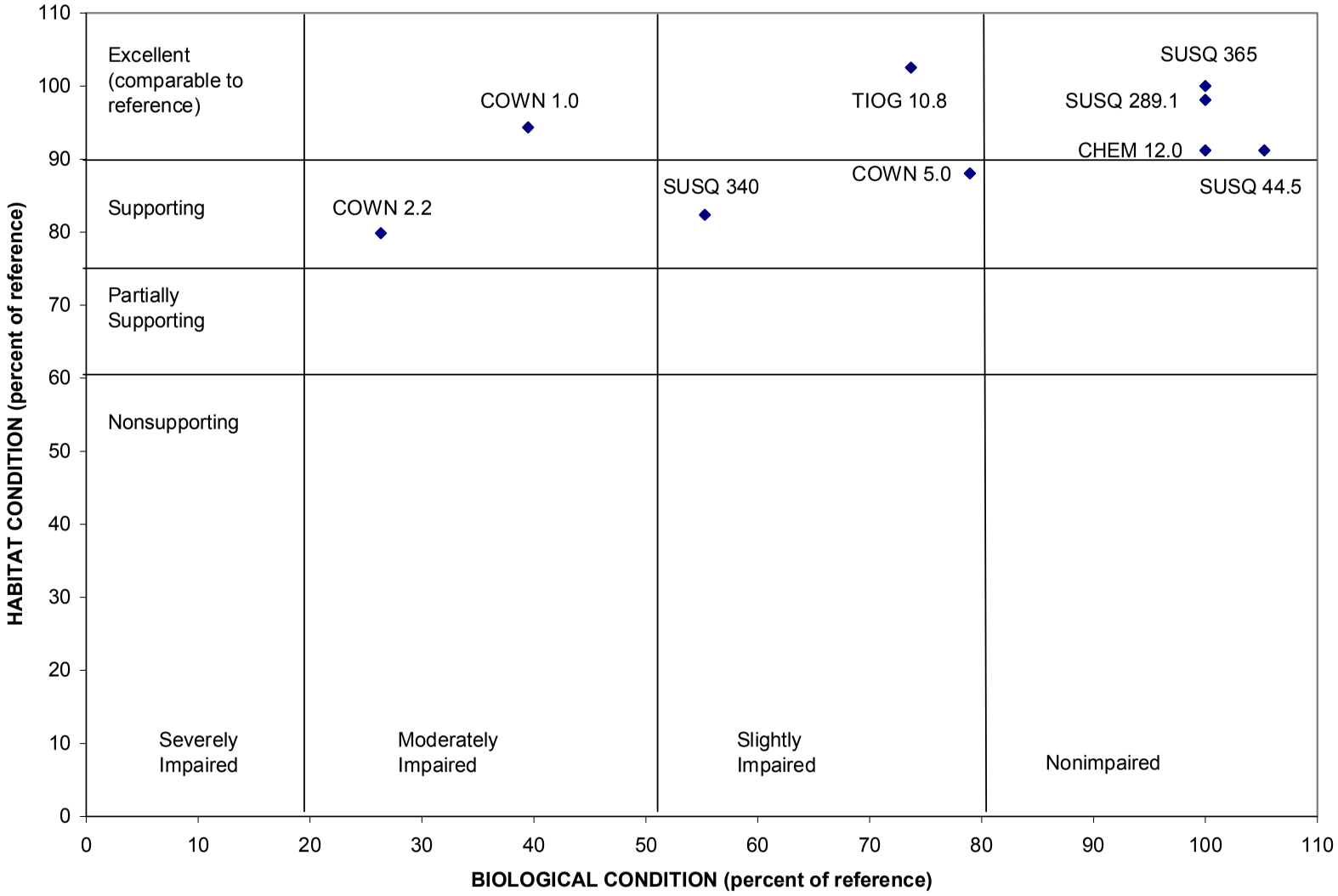

Figure 8. Summary of River Habitat and Biological Condition Scores

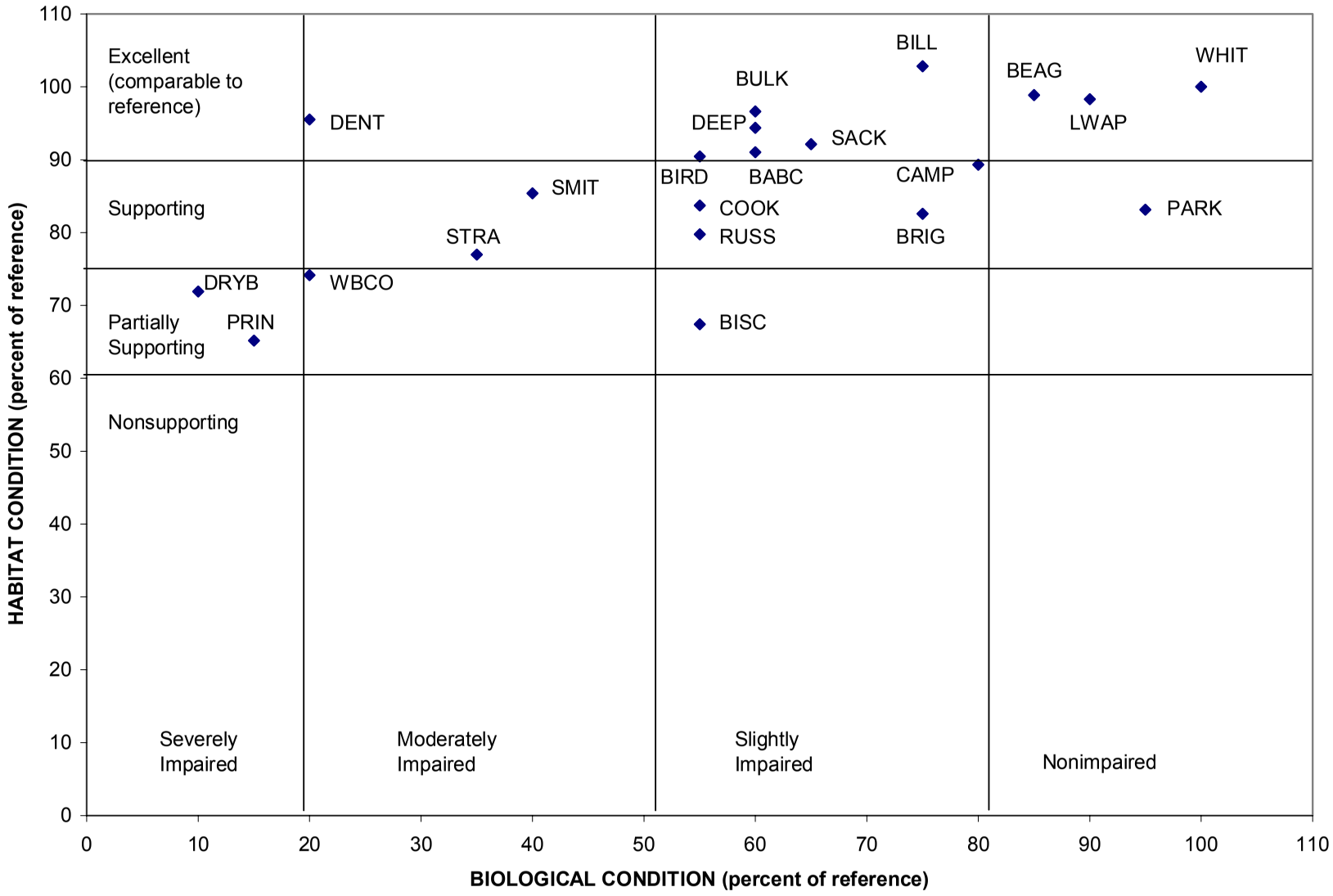

Figure 9. Summary of Group 3 Streams Habitat and Biological Condition Scores

Group 3 Sites

Group 3 sampling stations consisted of 21 sites on small streams located along the New York-Pennsylvania border. Four of the 21 sites sampled (19 percent) had nonimpaired biological conditions. Eleven sites (52.4 percent) were slightly impaired, four sites (19 percent) were moderately impaired, and two sites (9.5 percent) were severely impaired. Ten (47.6 percent) of the Group 3 sites had excellent habitat scores. Seven sites (33.3 percent) had supporting habitat conditions. Four sites (19 percent) were designated partially supporting.

Trends Analysis

A summary of trend statistics is presented in Table 19. The statistical trends were simplified into trend categories: a highly significant ($p<0.05$) trend that was increasing (INC) or decreasing (DEC); a significant ($p<0.10$) trend that was increasing (inc) or decreasing (dec); or no trend (0). The trend categories are presented for both the concentration and the flow-adjusted concentrations. In Tables 20 and 21, weighted values were assigned for each station, and an average weighted value was calculated to indicate the strength of an overall trend for each variable. Each category was given a value: -2 for DEC, -1 for dec, 0 for 0, +1 for inc, and +2 for INC. An average value was calculated for each parameter. An analysis of "strong decreasing trend" required an average weighted value of less than –1.50. An analysis of "decreasing trend" required an average value between –1.00 and –1.50. Conversely, an average weighted value of greater than +1.50 represented a "strong increasing trend" and an average weighted value between +1.00 and +1.50 represented an "increasing trend." An analysis of no trend was indicated by a value of –1.00 to +1.00.

Detailed results of the Seasonal Kendall Test are presented in Appendix E, Tables E1-E8. The statistics include the probability, (P), slope estimate (b), Kendall's Tau median, and percent slope. The median was calculated from the median of the entire quarterly time series. The percent slope was expressed in percent of the median concentration per year and was calculated by dividing the slope (b) by the median and multiplying by 100. The percent slope identifies those stations for which trend slope (b) is large with respect to the median value. Table 55 provides a summary of detected trends and overall direction.

Total suspended solids

Trend analysis results for total suspended solids are presented in Appendix E, Table E1. Concentration values at the stations showed strong, increasing trends at Cowanesque River and Deer Creek, and increasing trends at Chemung River, Susquehanna River sites 44.5, 340, 365, and Troups Creek. Only one decreasing trend was calculated at Tioga River for concentration analysis, and no decreasing trends were calculated for flow-adjusted concentration analysis. Two strong, increasing trends at Deer Creek and Susquehanna River 365 and one increasing trend at Octoraro Creek were calculated for flow-adjusted concentration analysis (Table 19). There were no overall trends for unadjusted concentrations or flow-adjusted concentrations, indicated by weighted average values of 0.53 and 0.33 (Tables 20 and 21, respectively).

Total ammonia

Total ammonia trend analysis results are presented in Appendix E, Table E2. Concentration values showed strongly decreasing values at all sites except Scott Creek and Troups Creek, which had values of zero (Table 19). Flow-adjusted concentrations indicated strongly decreasing trends at Cayuta Creek, Chemung River, Ebaughs Creek, Tioga River, and Susquehanna River sites 44.5, 289.1, 340, and 365, and decreasing trends at Cowanesque River, Deer Creek, and Susquehanna River site 10.0 (Table 19). There was an overall strong decreasing trend in concentration with a weighted value of –1.73 (Table 20), and a decreasing trend with a weighted value of –1.27 in flow-adjusted concentrations (Table 21).

Total nitrogen

The results of trend analysis for total nitrogen are presented in Appendix E, Table E3. Concentration values at the Group 1 stations showed strongly decreasing trends at Chemung River, Cowanesque River, Tioga River, Troups Creek, and Susquehanna River sites 10.0, 289.1, 340, and 365, decreasing trends at Cayuta Creek, a strongly increasing trend at Conowingo Creek, and an increasing trend at Deer Creek (Table 19). Flow-adjusted concentrations indicated strongly decreasing trends at Cayuta Creek, Chemung River, Cowanesque River, Tioga River, and Susquehanna River sites 10.0, 289.1, 340, and 365. A decreasing trend was found at Scott Creek. A strongly increasing trend occurred at Conowingo Creek (Table 19). Overall, there was no trend in concentration, and a decreasing trend in flow-adjusted concentrations, with average weighted values of –0.93 and –1.00, respectively (Tables 20 and 21). Note that a strong increasing trend for total nitrogen in both concentration and flow-adjusted concentration was found in Conowingo Creek, which is a Pennsylvania-Maryland border stream heavily influenced by agriculture.

Total phosphorus

Trend analysis results for total phosphorus are presented in Appendix E, Table E4. Concentration values showed strongly decreasing trends at all sites except Chemung River, which had a decreasing trend, and Ebaughs Creek and Scott Creek, which had no trend (Table 19). Flow-adjusted concentrations showed strongly decreasing trends at Cayuta Creek, Chemung River, Conowingo Creek, Deer Creek, Octoraro Creek, Tioga River, and Susquehanna River sites 10.0, 44.5, 289.1, 340, and 365. Decreasing trends were found at Cowanesque River and Scott Creek, and an increasing trend at Troups Creek (Table 19). Overall, there were strong decreasing trends in unadjusted phosphorus concentrations (average value = -1.67) and flow-adjusted concentrations (average value = -1.53) (Tables 20 and 21). The decreasing trend may be due to a decrease of phosphates in detergents, to the application of agricultural Best Management Practices (BMPs), and to the upgrade of wastewater treatment plants.

Total chloride

The results of trend analysis for total chloride are presented in Appendix E, Table E5. Concentration values showed strongly increasing trends in all sites, except Scott Creek and Tioga River, which had no trends (Table 19). Flow-adjusted concentrations indicated strongly increasing trends at Chemung River, Conowingo Creek, Deer Creek, Octoraro Creek, and Susquehanna River sites 10.0, 44.5, 289.1, 340, and 365, and an increasing trend at Ebaughs Creek (Table 19). Overall, there was a strong, increasing trend in concentration (average weighted value = 1.73) and an increasing trend in flow-adjusted concentrations, (average weighted value = 1.27) (Tables 20 and 21).

Total sulfate

Trend analysis results for total sulfate are presented in Appendix E, Table E6. Concentration values at the stations showed strongly decreasing trends at Cayuta Creek, Chemung River, Cowanesque River, and Tioga River, a decreasing trend at Troups Creek, and strongly increasing trends at Deer Creek and Ebaughs Creek (Table 19). Strongly decreasing trends were found at Cayuta Creek, Chemung River, Cowanesque River, Susquehanna River site 44.5, and Tioga River, decreasing trends at Scott Creek and Troups Creek, and increasing trends at Deer Creek and Ebaughs Creek indicated by flow-adjusted concentrations (Table 19). There were no overall trends in concentrations and flow-adjusted concentrations, with weighted values of -0.33 and –0.67, respectively (Tables 20 and 21).

Total iron

Total iron trend analysis results are found in Appendix E, Table E7. Group 1 concentration values showed strongly decreasing trends at all sites, except Cowanesque River, Scott Creek, and Troups Creek, which had no significant trends (Table 19). Flow-adjusted concentrations indicated strongly decreasing trends at Chemung River, Conowingo Creek, Deer Creek, Ebaughs

Creek, and all Susquehanna River sites, and decreasing trends at Octoraro Creek and Scott Creek (Table 19). Overall, there was a strongly decreasing trend in unadjusted concentrations (average value = -1.60), and a decreasing trend in flow-adjusted concentrations for iron (average value = -1.33) (Tables 20 and 21).

Total aluminum

The results of trend analysis for total aluminum are presented in Appendix E, Table E8. Concentration values at the Group 1 stations showed strongly decreasing trends at Conowingo Creek, Octoraro Creek, and Susquehanna River sites 10.0 and 44.5, a decreasing trend at Susquehanna River site 289.1, and an increasing trend at Scott Creek (Table 19). Flow-adjusted concentration values showed strongly decreasing trends at Conowingo Creek, and Susquehanna River sites 10.0, 44.5, and 289.1, a decreasing trend at Susquehanna River site 365.0, and a strongly increasing trend at Tioga River (Table 19). There was no overall trend in either concentrations or flow-adjusted concentrations, indicated by a weighted value of -0.53 and -0.47, respectively (Tables 20 and 21).

Total manganese

Trend analysis results for total manganese are presented in Appendix E, Table E9. Concentration values showed strongly decreasing trends at Cayuta Creek, Chemung River, Conowingo Creek, Deer Creek, Octoraro Creek, Scott Creek, Tioga River, and Susquehanna River sites 10.0, 44.5, 289.1, and 365. The only increasing trend was a strongly increasing trend at Cowanesque River (Table 19). Flow-adjusted concentrations showed strongly decreasing tends at Cayuta Creek, Chemung River, Deer Creek, Tioga River, and Susquehanna River sites 10.0, 44.5, and 289.1, and decreasing trends at Conowingo Creek, Ebaughs Creek, and Scott Creek (Table 19). Overall, there were decreasing trends in unadjusted and flow-adjusted manganese concentrations with average values of -1.33 and -1.13, respectively (Tables 20 and 21).

Water quality index

Trend analysis results for the WQI are presented in Appendix E, Table E10. Only a few strongly increasing trends were calculated for WQI. Concentration values showed a strongly increasing trend at Ebaughs Creek, and flow-adjusted concentrations had strongly increasing trends at Deer Creek, Ebaughs Creek, and Troups Creek (Table 19). There were no overall trends for WQI values with an average weighted value of 0.13 for concentrations and an average weighted value of 0.4 for flow-adjusted concentrations (Tables 20 and 21).

Table 19. Trend Summary of Selected Parameters for Group 1 Streams, 1986-2002

Site	Total Solids		Total Ammonia		Total Nitrogen		Total Phosphorus		Total Chloride		Total Sulfate		Total Iron		Total Aluminum		Total Manganese		WQI	
	CONC	FAC	CONC	FAC	CONC	FAC	CONC	FAC	CONC	FAC	CONC	FAC	CONC	FAC	CONC	FAC	CONC	FAC	CONC	FAC
Cayuta Creek	0	0	DEC	DEC	dec	DEC	DEC	DEC	INC	0	DEC	DEC	DEC	0	0	0	DEC	DEC	0	0
Chemung River	inc	0	DEC	DEC	DEC	DEC	dec	DEC	INC	INC	DEC	DEC	DEC	DEC	0	0	DEC	DEC	0	0
Conowingo Creek	0	0	DEC	0	INC	INC	DEC	DEC	INC	INC	0	0	DEC	DEC	DEC	DEC	DEC	dec	0	0
Cowanesque River	INC	0	DEC	dec	DEC	DEC	DEC	dec	INC	0	DEC	DEC	0	0	0	0	INC	0	0	0
Deer Creek	INC	INC	DEC	dec	inc	0	DEC	DEC	INC	INC	INC	inc	DEC	DEC	0	0	DEC	DEC	0	INC
Ebaughs Creek	0	0	DEC	DEC	0	0	0	0	INC	inc	INC	inc	DEC	DEC	0	0	0	dec	INC	INC
Octoraro Creek	0	inc	DEC	0	0	0	DEC	DEC	INC	INC	0	0	DEC	dec	DEC	0	DEC	0	0	0
Scott Creek	0	0	0	0	0	dec	0	dec	0	0	0	dec	0	dec	inc	0	DEC	dec	0	0
Susquehanna River 10.0	0	0	DEC	dec	DEC	DEC	DEC	DEC	INC	INC	0	0	DEC	DEC	DEC	DEC	DEC	DEC	0	0
Susquehanna River 44.5	inc	0	DEC	DEC	0	0	DEC	DEC	INC	INC	0	DEC	DEC	DEC	DEC	DEC	DEC	DEC	0	0
Susquehanna River 289.1	0	0	DEC	DEC	DEC	DEC	DEC	DEC	INC	INC	0	0	DEC	DEC	dec	DEC	DEC	DEC	0	0
Susquehanna River 340	inc	0	DEC	DEC	DEC	DEC	DEC	DEC	INC	INC	0	0	DEC	DEC	0	0	0	0	0	0
Susquehanna River 365	inc	INC	DEC	DEC	DEC	DEC	DEC	DEC	INC	INC	0	0	DEC	DEC	0	dec	DEC	0	0	0
Tioga River	dec	0	DEC	DEC	DEC	DEC	DEC	DEC	0	0	DEC	DEC	DEC	0	0	INC	DEC	DEC	0	0
Troups Creek	inc	0	0	0	DEC	0	DEC	inc	INC	0	dec	dec	0	0	0	0	0	0	0	INC

INC Strong, Significant Increasing Trend; Probability < 5 %
inc Significant Increasing Trend; 5 % < Probability < 10 %
O No Significant Trend; Probability > 10%
dec Significant Decreasing Trend; 5 % < Probability < 10 %
DEC Strong, Significant Decreasing Trend; Probability < 5 %
CONC Concentrations
FAC Flow-Adjusted Concentrations

Table 20. Trend Category Counts and Weighted Values of Concentrations for Group 1 Streams

Concentration	Trend Category Count						Weighted Values						
	DEC	dec	0	inc	INC	Total	DEC	dec	0	inc	INC	SUM	Average Value*
Total Solids	0	1	7	5	2	15	0	-1	0	5	4	8	0.53
Total Ammonia	13	0	2	0	0	15	-26	0	0	0	0	-26	-1.73
Total Nitrogen	8	1	4	1	1	15	-16	-1	0	1	2	-14	-0.93
Total Phosphorus	12	1	2	0	0	15	-24	-1	0	0	0	-25	-1.67
Total Chlorides	0	0	2	0	13	15	0	0	0	0	26	26	1.73
Total Sulfate	4	1	8	0	2	15	-8	-1	0	0	4	-5	-0.33
Total Iron	12	0	3	0	0	15	-24	0	0	0	0	-24	-1.6
Total Aluminum	4	1	9	1	0	15	-8	-1	0	1	0	-8	-0.53
Total Manganese	11	0	3	0	1	15	-22	0	0	0	2	-20	-1.33
Water Quality Index	0	0	14	0	1	15	0	0	0	0	2	2	0.13

DEC = -2 each
dec = -1 each
0 = 0 each
inc = 1 each
INC = 2 each

*Average Value	
< - 1.50	Strong Decreasing Trend
-1.5 to -1.00	Decreasing Trend
-1.00 to 1.00	No Trend
1.00 to 1.50	Increasing Trend
>1.50	Strong Increasing Trend

Table 21. Trend Category Counts and Weighted Values of Flow-Adjusted Concentrations for Group 1 Streams

Concentration	Trend Category Count						Weighted Values						
	DEC	dec	0	inc	INC	Total	DEC	dec	0	inc	INC	SUM	Average Value*
Total Solids	0	0	12	1	2	15	0	0	0	1	4	5	0.33
Total Ammonia	8	3	4	0	0	15	-16	-3	0	0	0	-19	-1.27
Total Nitrogen	8	1	5	0	1	15	-16	-1	0	0	2	-15	-1.00
Total Phosphorus	11	2	1	1	0	15	-22	-2	0	1	0	-23	-1.53
Total Chlorides	0	0	5	1	9	15	0	0	0	1	18	19	1.27
Total Sulfate	5	2	6	2	0	15	-10	-2	0	2	0	-10	-0.67
Total Iron	9	2	4	0	0	15	-18	-2	0	0	0	-20	-1.33
Total Aluminum	4	1	9	0	1	15	-8	-1	0	0	2	-7	-0.47
Total Manganese	7	3	5	0	0	15	-14	-3	0	0	0	-17	-1.13
Water Quality Index	0	0	12	0	3	15	0	0	0	0	6	6	0.4

DEC = -2 each
dec = -1 each
0 = 0 each
inc = 1 each
INC =2 each

*Average Value	
< - 1.50	Strong Decreasing Trend
-1.5 to -1.00	Decreasing Trend
-1.00 to 1.00	No Trend
1.00 to 1.50	Increasing Trend
>1.50	Strong Increasing Trend