

Biological and Water Quality Assessment of

Rice, Etonia, Simms, and Sixmile Creeks

Sampled January 11 and 12, 2011

Bureau of Assessment and Restoration Support

Standards and Assessment Section

June 2011

Executive Summary

As requested by the DEP Division of Water Resource Management, the DEP Standards and Assessment Section examined the water quality and biological health of Rice, Etonia, Simms, and Sixmile Creeks on January 11 and 12, 2011. Objectives of the study were to:

1) Measure existing water quality and biological health in Rice Creek, downstream of the Georgia-Pacific discharge, compared to a series of carefully selected control sites;
2) Determine if the Georgia-Pacific discharge caused or contributed to non-compliance with the biological integrity criterion (Chapter 62-302.530 (10) FAC); and
3) Assess the accuracy of recent biological data collected on behalf of the permittee.

The information generated by this study will be considered during future decisions associated with the facility's permit.

Stream Condition Index (SCI) scores for the three flowing control sites, which included Rice Creek at Bardin Road, Etonia Creek at Bardin Road, and Simms Creek near Comer Road, were all in the "exceptional" category (> 67 points), indicating the basin generally supports extraordinarily healthy biological communities. This suggests that recent SCI failures in Rice Creek at Bardin Road and Etonia Creek, which were associated with sampling reported in June 2010, on behalf of Georgia Pacific, were either atypical or erroneous and not consistent with current or prior sampling events conducted by DEP.

Due to differences in surface water specific conductance between Rice Creek at Bardin Road (262 µmhos/cm) and Rice Creek below the Georgia Pacific discharge (tidal test site, with 1324 µmhos/cm), the appropriateness of using the SCI downstream of the discharge was investigated. A tidal control site was established in the minimally disturbed Sixmile Creek (at an area with conductivity values very similar to the Rice Creek test site), to determine the effects of salinity on the SCI scores. SCI scores in Rice Creek downstream of the Georgia Pacific discharge (tidal test site, with 21 points) and Six Mile Creek (tidal control site, with 29 points) both scored in the "impaired" category. These results are inconclusive regarding the effects of the discharge, because the SCI failure at Rice Creek below the discharge could have been due to the tidal conditions there (salinity from the St. Johns River, in which case, the SCI would be an inappropriate tool) or could have been influenced from the elevated conductivity associated with the effluent.

However, the Shannon Weaver diversity score at the Rice Creek test site (0.11) was 96% lower than that of the Sixmile control site (2.76). This reduction in diversity is an exceedance of the Biological Integrity Criterion [Chapter 62-302.530(10)], which allows for maximum of a 25% reduction in diversity between control and test sites. Because the Sixmile Creek control site accounted for the effects of conductivity (tidal influences), this diversity reduction was clearly associated with the Georgia Pacific discharge, especially when considering that the diversity score at the Rice Creek flowing control site was 3.66. It should be noted that the extremely low diversity score in Rice Creek downstream of the Georgia Pacific discharge (0.11) was associated with dominance of the pollution tolerant organism, *Gammarus* sp. This finding also indicates that recent high diversity scores reported downstream of the effluent (in July, 2010, on behalf of the permittee) were atypical or in error.

Background

Georgia-Pacific currently owns and operates a bleached and unbleached kraft pulp and paper mill in Putnam County, Florida. The facility was built in the 1940's before the establishment of water quality standards. The Georgia Pacific mill currently discharges treated industrial wastewater into nearby Rice Creek, a small tributary of the St. Johns River. Rice Creek and the St. Johns River in the immediate vicinity are Class III waters. Due to evidence that the Georgia Pacific discharge has not fully complied with all applicable Class III water quality standards in Rice Creek (*i.e.*, chronic toxicity, conductivity, and transparency), a 2002 permit and DEP Administrative Order included a compliance schedule requiring Georgia-Pacific to apply for and construct a new discharge pipeline to the St. Johns River.

The DEP Division of Water Resource Management requested that the DEP Standards and Assessment Section examine the water quality and biological health of Rice Creek and nearby control streams to provide information relevant to these permitting decisions. Specifically, this study was designed to determine if the Georgia-Pacific discharge caused or contributed to non-compliance with the biological integrity criterion and to assess the accuracy of recent biological data collected on behalf of the permittee.

Study Sites

Land use in the watershed (based on year 2000 aerial photography) is predominantly natural with 81% of the basin consisting of forest and wetlands. Potentially adverse land uses, including urbanization and agriculture, comprised 7.15% and 2.22%, respectively, of the total.

Five sites were selected for inclusion in the study based on the hydrologic conditions at the time of the study and the available access. Rice Creek at Bardin Road, Etonia Creek at Bardin Road, and Simms Creek near Comer Road served as flowing control sites. Rice Creek downstream of the Georgia Pacific discharge was the test site for evaluating the effects of the effluent, however because this area is tidally influenced, another tidally influenced control site in Sixmile Creek, upstream of Highway 13, was selected for comparison purposes. An additional flowing control site in Mill Creek, above the tidal Sixmile control site, was originally selected, however, low water conditions in Mill Creek made this site inappropriate for the purposes of this study. An overview of all the sampling locations is shown in Figure 1. Figures 2-6 show photographs of the sites.

Table 1: Site Locations

Site	Latitude	Longitude
Etonia Creek @ Bardin Road	29.717167	-81.726972
Rice Creek @ Bardin Road	29.679722	-81.718056
Rice Creek Tidal	29.679	-81.69426
Simms Creek	29.73581	-81.7101
Six Mile Creek Tidal	29.94037	-81.62834



Figure 1: Study site locations.



Figure 2. Rice Creek at Bardin Rd., upstream of Georgia Pacific discharge (flowing control site).



Figure 3. Rice Creek downstream of Georgia Pacific discharge (tidally influenced test site).



Figure 4. Etonia Creek at Bardin Road (flowing control site).



Figure 5. Simms Creek above Rice Creek (flowing control site).



Figure 6. Sixmile Creek above Highway 13 (tidally influenced control site).

Methods

All field and laboratory biological methods followed DEP Standard Operating Procedures (SOPs, see http://www.floridadep.org/labs/qa/sops.htm for details) and met DEP quality assurance/quality control standards (see http://www.floridadep.org/labs/qa/index.htm).

Water Quality Measurements

Water was sampled according to the DEP field SOP FS 2100, Surface Water Sampling, for all parameters. The direct grab technique was used to collect water samples for nutrients, turbidity, color, total suspended solids, chlorophyll *a*, phaeophytin *a*, and biochemical oxygen demand. The nutrient suite included analysis of total Kjeldahl nitrogen, ammonia, nitrate/nitrite, organic carbon, and total phosphorus.

Habitat Assessment

Habitat quality was assessed using method FT 3100, Stream and River Habitat Assessment. Maps of a 100 meter stretch of the stream or river are created using the Stream/River Habitat Sketch Sheet (FD9000-04) to locate and quantify coverage of the major productive habitats (roots, rock, aquatic vegetation, woody debris, and leaf material). Habitat Assessment, using form FD9000-05, evaluates eight attributes known to have important effects on benthic macroinvertebrate

communities, including substrate diversity, substrate availability, water velocity, habitat smothering, artificial channelization, bank stability, riparian buffer zone width, and riparian vegetation quality. Twenty points are possible for each parameter. The total score is placed into one of four categories: Optimal (≥ 120), Suboptimal (81-119), Marginal (41-80), and Poor (≤ 40).

Macroinvertebrate Communities

Macroinvertebrate sampling was performed at all sites using the Stream Condition Index (SCI) methodology (FS 7420). The SCI procedure involves sampling productive habitats using 20 sweeps of a US 30 mesh D-framed dip net. The sweeps are apportioned across productive habitats identified during the Habitat Assessment (see above) leaving some sweeps to be taken in "minor" habitats (*e.g.*, sand, silt). Macroinvertebrates are then sub-sampled in the laboratory, and identified to lowest practical taxonomic level. Rice Creek (flowing control site and tidal test site) and Sixmile Creek (tidal control site) were also sampled with Hester-Dendy multi-plate artificial substrates that were incubated for 28 days, following FS 7430. Shannon Weaver diversity scores were calculated based on the taxa that colonized these Hester-Dendy samplers.

Results and Discussion

Results from this sampling effort are summarized in Table 2. Habitat Assessment scores at the flowing control sites ranged from 127 to 138 (optimal), while the tidal control and test sites, scored 93 and 108 respectively (sub-optimal), partially due to the zero velocity conditions observed at these sites. Specific conductance (µmhos/cm) at the flowing control streams was low, ranging from 56 µmhos/cm to 256 µmhos/cm. The conductivity in Rice Creek below the discharge (1,324 µmhos/cm) may have been affected by both the tidal influence from the St. Johns River and the discharge. The Sixmile tidal control site was established in an area with conductivity (1,343 µmhos/cm) similar to that of Rice Creek below the discharge. Dissolved oxygen was generally high at the sites, however, Dissolved Oxygen at Sixmile Creek tidal control site (4.1 mg/L) was naturally low, reflecting leaf litter decomposition associated the tidal swamp conditions. Temperature ranged from 10.1 to 12.5^{o} C. Chlorophyll *a* was low at all sites except for Rice Creek below the discharge, where it was 19 µg/L, likely due to phytoplankton exported from the facility's treatment ponds. Color and turbidity in Rice Creek below the discharge (310 PCU and 14 NTU, respectively) was higher than the remaining sites, which ranged from 29 to 71 PCU and 0.45 to 4.4 NTU.

Table 2. Physical/Chemical Water Quality Values for Georgia Pacific Sites and Reference Sites

	Rice Creek at Bardin Road (flowing control)	Etonia Creek at Bardin Road (flowing control)	Simms Creek (flowing control)	Rice Creek Tidal (tidal test site)	Six Mile Creek Tidal (tidal control)
SCI Score	76	74	82	21	29
Habitat Score	127	133	138	93	108
Shannon Weaver Diversity	3.66	Not sampled	Not sampled	0.11	2.76
Temp. °C	10.1	12.47	10.04	11.41	10.8
Specific Conductance (µmhos/cm)	262	170	56	1324	1343
Dissolved Oxygen (mg/L)	8.9	9.15	8.91	10.39	4.1
Total Kjeldahl Nitrogen (mg/L)	0.23	0.17	0.19	1.8	0.56
Total Phosphorous (mg/L)	0.048	0.074	0.02	0.28	0.17
Nitrate-Nitrite-N (mg/L)	0.004	0.067	0.004	0.18	0.011
Ammonia-N (mg/L)	0.01	0.01	0.012	0.28	0.018
Total Organic Carbon (mg/L)	6.4	3.5	2.8	31	11
Total Suspended Solids (mg/L)	11	4	4	13	4
Color (PCU)	71	30	29	310	54
Turbidity (NTU)	4.4	0.85	0.45	14	0.5
pH (SU)	7.3	7.4	5.87	7.72	7.1
Phaephyton *a* (mg/L)	0.4	0.4	0.4	12	0.42
Chlorophyll *a* Corrected (mg/L)	0.55	0.57	0.55	19	1.6

There were substantial differences in surface water specific conductance between Rice Creek at Bardin Road (262 µmhos/cm) and Rice Creek below the Georgia Pacific discharge (tidal test site, with 1324 µmhos/cm). Because the SCI was developed for use in freshwater streams and the SCI scores are influenced by salinity, a tidal control site was established in the minimally disturbed Sixmile Creek (at an area with conductivity values very similar to the Rice Creek test site), to determine the effects of salinity on the SCI scores. SCI scores in Rice Creek downstream of the Georgia-Pacific discharge (tidal test site, with 21 points) and Six Mile Creek (tidal control site, with 29 points) both scored in the "impaired" category. These results are inconclusive regarding the effects of the discharge, because the SCI failure at Rice Creek below the discharge could have been due to the tidal conditions there (affected by salinity from the St. Johns River, in which case, the SCI would be an inappropriate tool) or could have been associated with the elevated conductivity of the effluent.

However, the Shannon Weaver diversity score at the Rice Creek test site (0.11) was 96% lower than that of the Sixmile control site (2.76). This reduction in diversity is an exceedance of the Biological Integrity Criterion [Chapter 62-302.530(10)], which allows for maximum of a 25% reduction in diversity between control and test sites. Because the Sixmile Creek control site accounted for the effects of conductivity (tidal influences), this diversity reduction was clearly associated with the Georgia Pacific discharge, especially when considering that the diversity score at the Rice Creek flowing control site was 3.66. It should be noted that the extremely low diversity score in Rice Creek downstream of the Georgia Pacific discharge (0.11) was associated with dominance of the pollution tolerant organism, *Gammarus* sp. This finding also indicates that recent high diversity scores reported downstream of the effluent (in Rice Creek Water Quality Report, July, 2010, on behalf of the permittee) were atypical or in error.

Conclusions

Water quality and biological health in Rice Creek and surrounding creeks were assessed in January 2011. Three freshwater control sites (Rice Creek at Bardin Road, Etonia Creek at Bardin Road, and Simms Creek at Comer Road) had exceptionally healthy biological communities. Rice Creek below the Georgia Pacific discharge and the Six Mile Creek tidal control site received SCI scores indicative of impaired macroinvertebrate communities, likely due to the elevated conductivity. The SCI results were inconclusive regarding effects of the discharge, because the SCI failure at Rice Creek below the discharge could have been due to the tidal conditions there (affected by salinity from the St. Johns River, in which case, the SCI would be an inappropriate tool) or could have been associated with the elevated conductivity of the effluent. The Shannon Weaver diversity score at the

Rice Creek test site (0.11) was 96% lower than that of the Sixmile control site (2.76). This reduction in diversity, which was attributable to the Georgia Pacific discharge, is an exceedance of the Biological Integrity Criterion [Rule 62-302.530(10), F.A.C.].

References

Stevenson, R. J., B. C. Bailey, M. C. Harass, C. P. Hawkins, J. Alba-Tercedor, C. Couch, S. Dyer, F. A. Fulk, J. M. Harrington, C. T. Hunsaker, and R. K. Johnson. 2004. Designing data collection for ecological assessments. In: M. T. Barbour, S. B. Norton, H. R. Preston, and K. W. Thornton, eds. Ecological Assessment of Aquatic Resources: Linking Science to Decision-Making. Pgs 55-84. Society of Environmental Toxicology and Chemistry, Pensacola, Florida. ISBN 1-880611-56-2.

APPENDIX A

Macroinvertebrate Community Results

Six Mile Creek Tidal Control SCI							
Sample Date: 1/13/2011							
Storet #: 20030196							
Sample ID #: 68945							
BenID	TaxonID	RankID	Rank Name	Rep Num	Number of Replicates	Scientific name	Qual NCounted
41616	81438	220	Species	1	2	Eupera cubensis	10
41616	10000427	220	Species	2	2	Goeldichironomus amazonicus	2
41616	10000080	220	Species	2	2	Polypedilum illinoense grp.	7
41616	10000081	220	Species	2	2	Polypedilum halterale grp.	5
41616	129522	180	Genus	2	2	Kiefferulus	1
41616	129564	180	Genus	2	2	Parachironomus	2
41616	10000101	220	Species	2	2	Tanytarsus sp. t epler	7
41616	10000136	220	Species	2	2	Dicrotendipes simpsoni	8
41616	129470	180	Genus	2	2	Endochironomus	2
41616	10001769	220	Species	2	2	Dero digitata complex	3
41616	68585	140	Family	2	2	Tubificidae	4
41616	69023	220	Species	2	2	Bratislavia unidentata	1
41616	102139	180	Genus	2	2	Argia	1
41616	76677	180	Genus	2	2	Physa	3
41616	69398	220	Species	2	2	Helobdella stagnalis	1
41616	103956	220	Species	2	2	Mesovelia mulsanti	3
41616	93773	180	Genus	2	2	Gammarus	1
41616	53963	30	Phylum	2	2	Platyhelminthes	3
41616	92348	220	Species	2	2	Cassidinidea ovalis	2
41616	94026	220	Species	2	2	Hyalella azteca	40
41616	70493	140	Family	2	2	Hydrobiidae	4

41616	76643	180	Genus	2	2	Micromenetus	13
41616	76568	140	Family	2	2	Ancylidae	3
41616	81438	220	Species	2	2	Eupera cubensis	7
41616	101478	180	Genus	2	2	Caenis	18
41616	10000098	220	Species	1	2	Tanytarsus sp. c epler	1
41616	10000427	220	Species	1	2	Goeldichironomus amazonicus	2
41616	129978	180	Genus	1	2	Tanytarsus	1
41616	128324	180	Genus	1	2	Tanypus	1
41616	129851	180	Genus	1	2	Pseudochironomus	1
41616	10000080	220	Species	1	2	Polypedilum illinoense grp.	1
41616	10000081	220	Species	1	2	Polypedilum halterale grp.	1
41616	129522	180	Genus	1	2	Kiefferulus	2
41616	129823	220	Species	1	2	Tribelos fuscicornis	1
41616	129564	180	Genus	1	2	Parachironomus	1
41616	10000101	220	Species	1	2	Tanytarsus sp. t epler	4
41616	128277	180	Genus	1	2	Procladius	1
41616	10000136	220	Species	1	2	Dicrotendipes simpsoni	8
41616	129470	180	Genus	1	2	Endochironomus	4
41616	10001769	220	Species	1	2	Dero digitata complex	1
41616	68639	220	Species	1	2	Limnodrilus hoffmeisteri	1
41616	68585	140	Family	1	2	Tubificidae	3
41616	69023	220	Species	1	2	Bratislavia unidentata	3
41616	68680	220	Species	1	2	Aulodrilus pigueti	2
41616	68915	220	Species	1	2	Dero vaga	3
41616	83051	180	Genus	1	2	Limnesia	1
41616	10008014	220	Species	1	2	Epicordulia princeps regina	1
41616	113929	180	Genus	1	2	Scirtes	1
41616	102102	180	Genus	1	2	Enallagma	1
41616	127917	140	Family	1	2	Chironomidae	1
41616	10000018	180	Genus	1	2	Palpomyia/bezzia grp.	1
41616	53963	30	Phylum	1	2	Platyhelminthes	5

41616	127278	180	Genus	1	2	Dasyhelea	1
41616	92348	220	Species	1	2	Cassidinidea ovalis	2
41616	94026	220	Species	1	2	Hyalella azteca	34
41616	70493	140	Family	1	2	Hydrobiidae	11
41616	76643	180	Genus	1	2	Micromenetus	19
41616	81390	140	Family	1	2	Sphaeriidae(mollusca)	2
41616	76568	140	Family	1	2	Ancylidae	3
41616	10000036	180	Genus	2	2	Procladius (holotanypus)	1
41616	101478	180	Genus	1	2	Caenis	17

Six Mile Creek Tidal Control HD								
Sample Date: 2/10/2011								
Storet #: 20030196								
Sample ID #: 69007								
BenID	**TaxonID**	**RankID**	**Rank Name**	**Rep Num**	**Number of Replicates**	**Scientific name**	**Quan NCounted**	**Quan Nind/m2**
41637	10000906	180	Genus	1	4	Neoporus	2	16
41637	10000101	220	Species	4	4	Tanytarsus sp. t epler	1	8
41637	128174	220	Species	4	4	Labrundinia becki	1	8
41637	10000027	220	Species	4	4	Ablabesmyia rhamphe grp.	1	8
41637	68854	140	Family	4	4	Naididae	3	24
41637	10001769	220	Species	4	4	Dero digitata complex	14	111
41637	10000906	180	Genus	4	4	Neoporus	3	24
41637	93773	180	Genus	4	4	Gammarus	1	8
41637	101095	140	Family	4	4	Leptophlebiidae	1	8
41637	116607	180	Genus	4	4	Oecetis	1	8
41637	53963	30	Phylum	4	4	Platyhelminthes	1	8
41637	101478	180	Genus	4	4	Caenis	9	71
41637	129254	180	Genus	3	4	Chironomus	1	8
41637	10000074	220	Species	3	4	Phaenopsectra punctipes grp.	1	8
41637	128097	220	Species	3	4	Ablabesmyia mallochi	2	16
41637	129483	180	Genus	3	4	Glyptotendipes	1	8
41637	128173	180	Genus	3	4	Labrundinia	1	8
41637	10000136	220	Species	3	4	Dicrotendipes simpsoni	10	79
41637	10001769	220	Species	3	4	Dero digitata complex	15	119
41637	93773	180	Genus	3	4	Gammarus	4	32
41637	10000906	180	Genus	3	4	Neoporus	1	8
41637	117043	140	Family	3	4	Polycentropodidae	1	8
41637	101199	220	Species	3	4	Paraleptophlebia volitans	1	8
41637	101095	140	Family	3	4	Leptophlebiidae	1	8
41637	101478	180	Genus	3	4	Caenis	13	103
41637	129483	180	Genus	2	4	Glyptotendipes	1	8

41637	10000136	220	Species	2	4	Dicrotendipes simpsoni	4	32
41637	128844	180	Genus	2	4	Nanocladius	1	8
41637	68854	140	Family	2	4	Naididae	6	48
41637	10001769	220	Species	2	4	Dero digitata complex	20	159
41637	128175	220	Species	2	4	Labrundinia johannseni	1	8
41637	93773	180	Genus	2	4	Gammarus	4	32
41637	76643	180	Genus	2	4	Micromenetus	1	8
41637	10000906	180	Genus	2	4	Neoporus	1	8
41637	70493	140	Family	2	4	Hydrobiidae	1	8
41637	76677	180	Genus	2	4	Physa	1	8
41637	101095	140	Family	2	4	Leptophlebiidae	2	16
41637	101478	180	Genus	2	4	Caenis	2	16
41637	10000094	220	Species	1	4	Tanytarsus sp. m epler	1	8
41637	129657	180	Genus	1	4	Polypedilum	1	8
41637	129483	180	Genus	1	4	Glyptotendipes	1	8
41637	10000136	220	Species	1	4	Dicrotendipes simpsoni	3	24
41637	68854	140	Family	1	4	Naididae	9	71
41637	10001769	220	Species	1	4	Dero digitata complex	19	151
41637	93773	180	Genus	1	4	Gammarus	7	56
41637	76643	180	Genus	1	4	Micromenetus	2	16
41637	10000136	220	Species	4	4	Dicrotendipes simpsoni	6	48
41637	101478	180	Genus	1	4	Caenis	9	71

Rice Creek @ Bardin Road Hester Dendy								
Sample Date: 2/9/2011								
Storet #: 20030254								
Sample ID #: 69009								
BenID	**TaxonID**	**RankID**	**Rank Name**	**Rep Num**	**Number of Replicates**	**Scientific name**	**Quan NCounted**	**Quan Nind/m2**
41639	129190	220	Species	4	4	Thienemanniella xena	1	8
41639	10006272	220	Species	4	4	Thienemanniella lobapodema	1	8
41639	10000094	220	Species	4	4	Tanytarsus sp. m epler	3	24
41639	10000098	220	Species	4	4	Tanytarsus sp. c epler	1	8
41639	129676	220	Species	4	4	Polypedilum fallax	1	8
41639	129959	220	Species	4	4	Rheotanytarsus pellucidus	11	87
41639	128563	180	Genus	4	4	Corynoneura	1	8
41639	129102	220	Species	4	4	Rheocricotopus robacki	5	40
41639	128216	220	Species	4	4	Pentaneura inconspicua	1	8
41639	10002651	220	Species	4	4	Polypedilum flavum	25	198
41639	10000084	220	Species	4	4	Rheotanytarsus exiguus grp.	29	230
41639	68872	220	Species	4	4	Stylaria lacustris	1	8
41639	117098	220	Species	4	4	Neureclipsis crepuscularis	2	16
41639	115095	100	Order	4	4	Trichoptera	1	8
41639	117104	180	Genus	4	4	Nyctiophylax	6	48
41639	10000018	180	Genus	4	4	Palpomyia/bezzia grp.	1	8
41639	115408	180	Genus	4	4	Cheumatopsyche	7	56
41639	127917	140	Family	4	4	Chironomidae	1	8
41639	10000312	220	Species	4	4	Acerpenna pygmaea	3	24
41639	57577	180	Genus	4	4	Prostoma	1	8
41639	116607	180	Genus	4	4	Oecetis	1	8
41639	10010891	180	Genus	4	4	Maccaffertium	3	24
41639	100714	220	Species	4	4	Stenacron interpunctatum	2	16
41639	100713	180	Genus	4	4	Stenacron	1	8
41639	114213	220	Species	4	4	Macronychus glabratus	3	24
41639	114131	220	Species	4	4	Dubiraphia vittata	1	8

41639	126774	180	Genus	4	4	Simulium	3	24
41639	136327	180	Genus	4	4	Hemerodromia	5	40
41639	128563	180	Genus	3	4	Corynoneura	1	8
41639	129959	220	Species	3	4	Rheotanytarsus pellucidus	5	40
41639	129102	220	Species	3	4	Rheocricotopus robacki	8	63
41639	10002651	220	Species	3	4	Polypedilum flavum	17	135
41639	10000084	220	Species	3	4	Rheotanytarsus exiguus grp.	29	230
41639	102148	220	Species	3	4	Argia tibialis	1	8
41639	117043	140	Family	3	4	Polycentropodidae	1	8
41639	115373	180	Genus	3	4	Cernotina	1	8
41639	117098	220	Species	3	4	Neureclipsis crepuscularis	3	24
41639	117104	180	Genus	3	4	Nyctiophylax	1	8
41639	114147	220	Species	3	4	Microcylloepus pusillus	3	24
41639	10000312	220	Species	3	4	Acerpenna pygmaea	3	24
41639	100714	220	Species	3	4	Stenacron interpunctatum	1	8
41639	10010891	180	Genus	3	4	Maccaffertium	2	16
41639	115408	180	Genus	3	4	Cheumatopsyche	5	40
41639	126774	180	Genus	3	4	Simulium	1	8
41639	127917	140	Family	3	4	Chironomidae	1	8
41639	136327	180	Genus	3	4	Hemerodromia	2	16
41639	101647	220	Species	3	4	Boyeria vinosa	1	8
41639	129952	180	Genus	2	4	Rheotanytarsus	2	16
41639	10000094	220	Species	2	4	Tanytarsus sp. m epler	1	8
41639	128583	220	Species	2	4	Cricotopus bicinctus	1	8
41639	128563	180	Genus	2	4	Corynoneura	1	8
41639	129190	220	Species	2	4	Thienemanniella xena	3	24
41639	129102	220	Species	2	4	Rheocricotopus robacki	3	24
41639	129959	220	Species	2	4	Rheotanytarsus pellucidus	4	32
41639	10000084	220	Species	2	4	Rheotanytarsus exiguus grp.	18	143
41639	10002651	220	Species	2	4	Polypedilum flavum	10	79
41639	136327	180	Genus	2	4	Hemerodromia	6	48

41639	127917	140	Family	2	4	Chironomidae	4	32
41639	126774	180	Genus	2	4	Simulium	5	40
41639	115392	220	Species	2	4	Lype diversa	1	8
41639	117098	220	Species	2	4	Neureclipsis crepuscularis	1	8
41639	117104	180	Genus	2	4	Nyctiophylax	2	16
41639	117043	140	Family	2	4	Polycentropodidae	1	8
41639	115408	180	Genus	2	4	Cheumatopsyche	2	16
41639	10000312	220	Species	2	4	Acerpenna pygmaea	2	16
41639	100713	180	Genus	2	4	Stenacron	1	8
41639	10010891	180	Genus	2	4	Maccaffertium	3	24
41639	100504	140	Family	2	4	Heptageniidae	2	16
41639	10000629	220	Species	2	4	Eurylophella doris	1	8
41639	129952	180	Genus	1	4	Rheotanytarsus	2	16
41639	10000094	220	Species	1	4	Tanytarsus sp. m epler	2	16
41639	128583	220	Species	1	4	Cricotopus bicinctus	5	40
41639	10000084	220	Species	1	4	Rheotanytarsus exiguus grp.	18	143
41639	129959	220	Species	1	4	Rheotanytarsus pellucidus	5	40
41639	129102	220	Species	1	4	Rheocricotopus robacki	3	24
41639	10002651	220	Species	1	4	Polypedilum flavum	7	56
41639	136327	180	Genus	1	4	Hemerodromia	1	8
41639	127917	140	Family	1	4	Chironomidae	3	24
41639	126774	180	Genus	1	4	Simulium	3	24
41639	114213	220	Species	1	4	Macronychus glabratus	2	16
41639	115373	180	Genus	1	4	Cernotina	1	8
41639	117098	220	Species	1	4	Neureclipsis crepuscularis	2	16
41639	117104	180	Genus	1	4	Nyctiophylax	1	8
41639	115408	180	Genus	1	4	Cheumatopsyche	4	32
41639	10000312	220	Species	1	4	Acerpenna pygmaea	6	48
41639	100714	220	Species	1	4	Stenacron interpunctatum	2	16
41639	10010891	180	Genus	1	4	Maccaffertium	3	24
41639	100504	140	Family	1	4	Heptageniidae	1	8

Simms Creek SCI							
Sample Date: 1/13/2011							
Storet #: 20030364							
Sample ID #: 68994							
BenID	TaxonID	RankID	Rank Name	Rep Num	Number of Replicates	Scientific name	Qual NCounted
41634	10002651	220	Species	2	2	Polypedilum flavum	1
41634	129746	180	Genus	2	2	Stenochironomus	2
41634	128272	220	Species	2	2	Djalmabatista pulcher	1
41634	10000084	220	Species	2	2	Rheotanytarsus exiguus grp.	7
41634	129182	180	Genus	2	2	Thienemanniella	2
41634	127917	140	Family	2	2	Chironomidae	4
41634	136327	180	Genus	2	2	Hemerodromia	1
41634	126774	180	Genus	2	2	Simulium	3
41634	127076	140	Family	2	2	Ceratopogonidae	1
41634	68872	220	Species	2	2	Stylaria lacustris	1
41634	115408	180	Genus	2	2	Cheumatopsyche	6
41634	114131	220	Species	2	2	Dubiraphia vittata	1
41634	102052	180	Genus	2	2	Calopteryx	1
41634	116960	220	Species	2	2	Micrasema wataga	1
41634	83034	180	Genus	2	2	Lebertia	1
41634	83029	180	Genus	2	2	Sperchonopsis	2
41634	10010891	180	Genus	2	2	Maccaffertium	5
41634	100755	140	Family	2	2	Baetidae	1
41634	116689	220	Species	2	2	Ceraclea transversus	1
41634	115641	180	Genus	2	2	Hydroptila	1
41634	116565	180	Genus	2	2	Triaenodes	5
41634	114194	220	Species	2	2	Ancyronyx variegatus	2
41634	101095	140	Family	2	2	Leptophlebiidae	3
41634	102139	180	Genus	2	2	Argia	4
41634	114147	220	Species	2	2	Microcylloepus pusillus	23

41634	114095	180	Genus	2	2	Stenelmis	5
41634	10000629	220	Species	2	2	Eurylophella doris	59
41634	117104	180	Genus	2	2	Nyctiophylax	1
41634	117098	220	Species	2	2	Neureclipsis crepuscularis	2
41634	116607	180	Genus	2	2	Oecetis	1
41634	115833	180	Genus	2	2	Neotrichia	1
41634	116479	220	Species	2	2	Molanna tryphena	1
41634	10008931	220	Species	2	2	Triaenodes perna/helo	2
41634	116571	220	Species	2	2	Triaenodes ignitus	1
41634	10000136	220	Species	1	2	Dicrotendipes simpsoni	1
41634	10000094	220	Species	1	2	Tanytarsus sp. m epler	1
41634	128178	220	Species	1	2	Labrundinia pilosella	1
41634	129102	220	Species	1	2	Rheocricotopus robacki	1
41634	128272	220	Species	1	2	Djalmabatista pulcher	6
41634	10000487	220	Species	1	2	Microtendipes pedellus grp.	4
41634	10014512	220	Species	1	2	Stempellinella fimbriata	2
41634	10000079	220	Species	1	2	Polypedilum scalaenum grp.	1
41634	10000084	220	Species	1	2	Rheotanytarsus exiguus grp.	8
41634	129182	180	Genus	1	2	Thienemanniella	3
41634	127917	140	Family	1	2	Chironomidae	2
41634	126774	180	Genus	1	2	Simulium	3
41634	127076	140	Family	1	2	Ceratopogonidae	1
41634	102102	180	Genus	1	2	Enallagma	2
41634	115641	180	Genus	1	2	Hydroptila	2
41634	116565	180	Genus	1	2	Triaenodes	12
41634	114194	220	Species	1	2	Ancyronyx variegatus	2
41634	101095	140	Family	1	2	Leptophlebiidae	5
41634	101406	220	Species	1	2	Tricorythodes albilineatus	1
41634	102139	180	Genus	1	2	Argia	6
41634	114147	220	Species	1	2	Microcylloepus pusillus	15
41634	114095	180	Genus	1	2	Stenelmis	6

41634	10000629	220	Species	1	2	Eurylophella doris	51
41634	83093	180	Genus	1	2	Koenikea	1
41634	10000312	220	Species	1	2	Acerpenna pygmaea	3
41634	115392	220	Species	1	2	Lype diversa	1
41634	116660	220	Species	1	2	Nectopsyche pavida	1
41634	117104	180	Genus	1	2	Nyctiophylax	1
41634	115398	140	Family	1	2	Hydropsychidae	1
41634	117098	220	Species	1	2	Neureclipsis crepuscularis	2
41634	116607	180	Genus	1	2	Oecetis	2
41634	115833	180	Genus	1	2	Neotrichia	1
41634	116479	220	Species	1	2	Molanna tryphena	1
41634	10008931	220	Species	1	2	Triaenodes perna/helo	1
41634	116571	220	Species	1	2	Triaenodes ignitus	1

Rice Creek @ Bardin Road SCI							
Sample Date: 1/12/2011							
Storet #: 20030254							
Sample ID: 68944							
BenID	TaxonID	RankID	Rank Name	Rep Num	Number of Replicates	Scientific name	Qual NCounted
41615	10014511	220	Species	2	2	Stempellinella leptocelloides	1
41615	10000098	220	Species	2	2	Tanytarsus sp. c epler	1
41615	10013971	220	Species	2	2	Tanytarsus sp. y epler	1
41615	10000094	220	Species	2	2	Tanytarsus sp. m epler	10
41615	128178	220	Species	2	2	Labrundinia pilosella	1
41615	10000084	220	Species	2	2	Rheotanytarsus exiguus grp.	3
41615	10002651	220	Species	2	2	Polypedilum flavum	1
41615	10000312	220	Species	2	2	Acerpenna pygmaea	2
41615	117043	140	Family	2	2	Polycentropodidae	1
41615	76643	180	Genus	2	2	Micromenetus	1
41615	101095	140	Family	2	2	Leptophlebiidae	1
41615	126774	180	Genus	2	2	Simulium	1
41615	81387	220	Species	2	2	Corbicula fluminea	2
41615	127113	180	Genus	2	2	Atrichopogon	1
41615	96383	180	Genus	2	2	Palaemonetes	1
41615	10011251	180	Genus	2	2	Floridobia	1
41615	117095	180	Genus	2	2	Neureclipsis	1
41615	102077	140	Family	2	2	Coenagrionidae	1
41615	114095	180	Genus	2	2	Stenelmis	2
41615	116565	180	Genus	2	2	Triaenodes	3
41615	114194	220	Species	2	2	Ancyronyx variegatus	2
41615	53963	30	Phylum	2	2	Platyhelminthes	1
41615	127917	140	Family	2	2	Chironomidae	8
41615	116607	180	Genus	2	2	Oecetis	2
41615	100504	140	Family	2	2	Heptageniidae	1
41615	115408	180	Genus	2	2	Cheumatopsyche	1

41615	102139	180	Genus	2	2	Argia	6
41615	136327	180	Genus	2	2	Hemerodromia	2
41615	92686	180	Genus	2	2	Caecidotea	5
41615	116659	220	Species	2	2	Nectopsyche exquisita	1
41615	10008931	220	Species	2	2	Triaenodes perna/helo	7
41615	115833	180	Genus	2	2	Neotrichia	1
41615	81390	140	Family	2	2	Sphaeriidae(mollusca)	2
41615	70747	180	Genus	2	2	Amnicola	7
41615	114213	220	Species	2	2	Macronychus glabratus	1
41615	114131	220	Species	2	2	Dubiraphia vittata	7
41615	114147	220	Species	2	2	Microcylloepus pusillus	22
41615	10000629	220	Species	2	2	Eurylophella doris	33
41615	10000094	220	Species	1	2	Tanytarsus sp. m epler	6
41615	128178	220	Species	1	2	Labrundinia pilosella	1
41615	10000084	220	Species	1	2	Rheotanytarsus exiguus grp.	1
41615	129746	180	Genus	1	2	Stenochironomus	1
41615	10002651	220	Species	1	2	Polypedilum flavum	1
41615	10000312	220	Species	1	2	Acerpenna pygmaea	2
41615	100755	140	Family	1	2	Baetidae	1
41615	10011251	180	Genus	1	2	Floridobia	1
41615	117095	180	Genus	1	2	Neureclipsis	2
41615	102077	140	Family	1	2	Coenagrionidae	1
41615	114095	180	Genus	1	2	Stenelmis	1
41615	116565	180	Genus	1	2	Triaenodes	1
41615	114194	220	Species	1	2	Ancyronyx variegatus	3
41615	53963	30	Phylum	1	2	Platyhelminthes	2
41615	10000018	180	Genus	1	2	Palpomyia/bezzia grp.	1
41615	127917	140	Family	1	2	Chironomidae	5
41615	116607	180	Genus	1	2	Oecetis	1
41615	100504	140	Family	1	2	Heptageniidae	1
41615	115408	180	Genus	1	2	Cheumatopsyche	1

41615	102139	180	Genus	1	2	Argia	2
41615	136327	180	Genus	1	2	Hemerodromia	4
41615	92686	180	Genus	1	2	Caecidotea	7
41615	116659	220	Species	1	2	Nectopsyche exquisita	1
41615	10008931	220	Species	1	2	Triaenodes perna/helo	3
41615	115833	180	Genus	1	2	Neotrichia	1
41615	81390	140	Family	1	2	Sphaeriidae(mollusca)	9
41615	70747	180	Genus	1	2	Amnicola	24
41615	114213	220	Species	1	2	Macronychus glabratus	3
41615	114131	220	Species	1	2	Dubiraphia vittata	4
41615	114147	220	Species	1	2	Microcylloepus pusillus	17
41615	10000629	220	Species	1	2	Eurylophella doris	33

Rice Creek Downstream of Georgia Pacific discharge SCI							
Sample Date: 1/12/2011							
Storet #: 20030961							
Sample ID: 68995							
BenID	**TaxonID**	**RankID**	**Rank Name**	**Rep Num**	**Number of Replicates**	**Scientific name**	**Qual NCounted**
41635	93773	180	Genus	1	2	Gammarus	30
41635	10000427	220	Species	2	2	Goeldichironomus amazonicus	6
41635	128277	180	Genus	2	2	Procladius	3
41635	10000087	220	Species	2	2	Tanytarsus sp. l epler	1
41635	10000081	220	Species	2	2	Polypedilum halterale grp.	1
41635	128010	180	Genus	2	2	Coelotanypus	1
41635	10000136	220	Species	2	2	Dicrotendipes simpsoni	3
41635	10000080	220	Species	2	2	Polypedilum illinoense grp.	1
41635	10001769	220	Species	2	2	Dero digitata complex	1
41635	117092	220	Species	2	2	Cyrnellus fraternus	1
41635	103364	140	Family	2	2	Corixidae	1
41635	125930	140	Family	2	2	Culicidae	1
41635	93294	100	Order	2	2	Amphipoda	10
41635	127917	140	Family	2	2	Chironomidae	3
41635	102102	180	Genus	2	2	Enallagma	1
41635	114131	220	Species	2	2	Dubiraphia vittata	5
41635	76643	180	Genus	2	2	Micromenetus	3
41635	94026	220	Species	2	2	Hyalella azteca	56
41635	93773	180	Genus	2	2	Gammarus	30
41635	76677	180	Genus	2	2	Physa	13
41635	129873	180	Genus	1	2	Cladotanytarsus	1

41635	128844	180	Genus	1	2	Nanocladius	1
41635	129978	180	Genus	1	2	Tanytarsus	1
41635	10000427	220	Species	1	2	Goeldichironomus amazonicus	3
41635	128277	180	Genus	1	2	Procladius	4
41635	10000087	220	Species	1	2	Tanytarsus sp. l epler	3
41635	10000081	220	Species	1	2	Polypedilum halterale grp.	3
41635	128010	180	Genus	1	2	Coelotanypus	2
41635	129448	220	Species	1	2	Dicrotendipes modestus	1
41635	129506	180	Genus	1	2	Goeldichironomus	1
41635	10000136	220	Species	1	2	Dicrotendipes simpsoni	3
41635	10000080	220	Species	1	2	Polypedilum illinoense grp.	1
41635	129569	220	Species	1	2	Parachironomus carinatus	3
41635	53963	30	Phylum	1	2	Platyhelminthes	1
41635	114194	220	Species	1	2	Ancyronyx variegatus	1
41635	92686	180	Genus	1	2	Caecidotea	1
41635	130573	180	Genus	1	2	Odontomyia	1
41635	93294	100	Order	1	2	Amphipoda	1
41635	127917	140	Family	1	2	Chironomidae	4
41635	116607	180	Genus	1	2	Oecetis	3
41635	102102	180	Genus	1	2	Enallagma	4
41635	114095	180	Genus	1	2	Stenelmis	2
41635	114131	220	Species	1	2	Dubiraphia vittata	2
41635	76643	180	Genus	1	2	Micromenetus	7
41635	94026	220	Species	1	2	Hyalella azteca	50
41635	96383	180	Genus	1	2	Palaemonetes	2
41635	127996	180	Genus	2	2	Clinotanypus	1
41635	76677	180	Genus	1	2	Physa	8

Rice Creek Downstream of GP Discharge HD								
Sample Date: 2/9/2011								
Storet #: 20030961								
Sample ID #: 69008								
BenID	**TaxonID**	**RankID**	**Rank Name**	**Rep Num**	**Number of Replicates**	**Scientific name**	**Quan NCounted**	**Quan Nind/m2**
41638	76643	180	Genus	1	4	Micromenetus	1	8
41638	76568	140	Family	4	4	Ancylidae	1	8
41638	92283	140	Family	4	4	Sphaeromatidae	1	8
41638	76677	180	Genus	4	4	Physa	1	8
41638	93773	180	Genus	4	4	Gammarus	323	2563
41638	92283	140	Family	3	4	Sphaeromatidae	3	24
41638	93773	180	Genus	3	4	Gammarus	611	4849
41638	76677	180	Genus	3	4	Physa	4	32
41638	102114	220	Species	3	4	Enallagma pollutum	1	8
41638	129483	180	Genus	2	4	Glyptotendipes	1	8
41638	69459	60	Class	2	4	Gastropoda	1	8
41638	92283	140	Family	2	4	Sphaeromatidae	4	32
41638	93773	180	Genus	2	4	Gammarus	435	3452
41638	92283	140	Family	1	4	Sphaeromatidae	1	8
41638	93773	180	Genus	1	4	Gammarus	689	5468
41638	117043	140	Family	4	4	Polycentropodidae	1	8
41638	76677	180	Genus	1	4	Physa	3	24

Etonia Creek at Bardin Road SCI							
Sample Date: 1/12/2011							
Storet #: 20030260							
Sample ID #: 68943							
BenID	**TaxonID**	**RankID**	**Rank Name**	**Rep Num**	**Number of Replicates**	**Scientific name**	**Qual NCounted**
41614	114095	180	Genus	1	2	Stenelmis	2

41614	129676	220	Species	2	2	Polypedilum fallax	1
41614	10000084	220	Species	2	2	Rheotanytarsus exiguus grp.	25
41614	10002651	220	Species	2	2	Polypedilum flavum	41
41614	100755	140	Family	2	2	Baetidae	1
41614	10000312	220	Species	2	2	Acerpenna pygmaea	7
41614	116659	220	Species	2	2	Nectopsyche exquisita	1
41614	117043	140	Family	2	2	Polycentropodidae	1
41614	111963	140	Family	2	2	Dytiscidae	1
41614	83006	180	Genus	2	2	Sperchon	1
41614	83029	180	Genus	2	2	Sperchonopsis	2
41614	10010851	220	Species	2	2	Maccaffertium exiguum	1
41614	100504	140	Family	2	2	Heptageniidae	1
41614	76677	180	Genus	2	2	Physa	1
41614	101095	140	Family	2	2	Leptophlebiidae	4
41614	116636	220	Species	2	2	Oecetis persimilis	1
41614	127917	140	Family	2	2	Chironomidae	5
41614	83282	180	Genus	2	2	Atractides	1
41614	10000629	220	Species	2	2	Eurylophella doris	4
41614	114194	220	Species	2	2	Ancyronyx variegatus	1
41614	115408	180	Genus	2	2	Cheumatopsyche	3
41614	102077	140	Family	2	2	Coenagrionidae	1
41614	10010891	180	Genus	2	2	Maccaffertium	1
41614	127113	180	Genus	2	2	Atrichopogon	2
41614	116565	180	Genus	2	2	Triaenodes	13
41614	116607	180	Genus	2	2	Oecetis	2
41614	81387	220	Species	2	2	Corbicula fluminea	1
41614	136327	180	Genus	2	2	Hemerodromia	6
41614	114095	180	Genus	2	2	Stenelmis	1
41614	114147	220	Species	2	2	Microcylloepus pusillus	21
41614	128216	220	Species	1	2	Pentaneura inconspicua	1
41614	10000084	220	Species	1	2	Rheotanytarsus exiguus grp.	26
41614	10002651	220	Species	1	2	Polypedilum flavum	51

41614	10000312	220	Species	1	2	Acerpenna pygmaea	6
41614	101095	140	Family	1	2	Leptophlebiidae	1
41614	117095	180	Genus	1	2	Neureclipsis	1
41614	116636	220	Species	1	2	Oecetis persimilis	2
41614	100502	100	Order	1	2	Ephemeroptera	1
41614	127917	140	Family	1	2	Chironomidae	4
41614	83282	180	Genus	1	2	Atractides	1
41614	115833	180	Genus	1	2	Neotrichia	1
41614	10000629	220	Species	1	2	Eurylophella doris	1
41614	126774	180	Genus	1	2	Simulium	1
41614	114194	220	Species	1	2	Ancyronyx variegatus	1
41614	116643	220	Species	1	2	Oecetis georgia	1
41614	115408	180	Genus	1	2	Cheumatopsyche	3
41614	102077	140	Family	1	2	Coenagrionidae	1
41614	10010891	180	Genus	1	2	Maccaffertium	1
41614	127113	180	Genus	1	2	Atrichopogon	3
41614	116565	180	Genus	1	2	Triaenodes	6
41614	116607	180	Genus	1	2	Oecetis	8
41614	81387	220	Species	1	2	Corbicula fluminea	1
41614	136327	180	Genus	1	2	Hemerodromia	8
41614	129102	220	Species	2	2	Rheocricotopus robacki	1
41614	114147	220	Species	1	2	Microcylloepus pusillus	28