

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY  
WATER RESOURCES DIVISION  
NOVEMBER 2017

STAFF REPORT

A BIOLOGICAL AND PHYSICAL SURVEY OF SITES IN THE  
MANISTIQUE AND MILLECOQUINS WATERSHEDS  
ALGER, CHIPPEWA, DELTA, LUCE, MACKINAC, AND  
SCHOOLCRAFT COUNTIES, MICHIGAN  
JULY AND SEPTEMBER 2014



**INTRODUCTION**

Monitoring by Michigan Department of Environmental Quality (MDEQ), Surface Water Assessment Section (SWAS), staff is implemented on a five-year rotating basis with the most recent survey reports for the Manistique and Millecoquins watersheds completed in 2004 (MDEQ, 2005) and 2009 (MDEQ, 2010). Biological and physical habitat conditions of the watersheds were assessed by SWAS staff in July and September 2014. The primary objectives of the 2014 assessments were to:

- Qualitatively evaluate current biological, chemical, and physical habitat conditions
- Evaluate biological integrity and general water quality trends
- Evaluate whether stream segments are attaining or not attaining Michigan Water Quality Standards (MDEQ, 2006)
- Identify possible sources of water quality impairment
- Satisfy monitoring requests submitted by internal and external customers

## DESCRIPTION

### Manistique

Located in the Upper Peninsula of Michigan, the Manistique watershed (HUC 04060106) drains approximately 1,461 square miles. The majority of land use is forest (37%) and wetland (51%) with a small amount of development, farmland, and grassland (Jin et al., 2013). Historically, the Manistique received wastes from sawmills, a paper mill, small industries, and the municipal wastewater treatment plant. The watershed was also heavily logged and subsequently burned, which contributes to sediment issues in areas of the watershed. The lower part of the river receives navigation for shipping, ferrying, recreational boating, and commercial fishing. The final 1.7 miles of the Manistique watershed from the Paper Mill Dam downstream to Lake Michigan is listed as a federal area of concern (AOC) due to historic problems with PCB-contaminated sediment, sawmills, municipal wastewater treatment plant, and combined sewer overflows (MDEQ, 1987). Most of the work on the AOC has been completed and the site is near completion of the last remaining restoration actions needed to delist the Manistique AOC (EPA, 2015).

### Millecoquins

The Millecoquins (HUC 04060107) watershed drains approximately 562 square miles and has 102.5 miles of Lake Michigan coastline. Dominant land use in the watershed is forest (45%) and wetlands (40%), with modest amounts of farm and developed land (Jin et al., 2013). The Hiawatha National Forest makes up a considerable portion of this watershed.

## METHODS

The surveys described in this report were conducted according to the SWAS Procedure 51 (MDEQ, 1990). The macroinvertebrate communities were scored with metrics that rate water bodies from excellent (+5 to +9) to poor (-5 to -9). Macroinvertebrate ratings from +4 to -4 are considered acceptable. Negative ratings that are acceptable indicate water bodies that are tending toward poor, while positive ratings that are acceptable indicate slight impairment (Creal et al., 1996). Stream habitat was qualitatively evaluated at each site using a scoring system that ranged from 0 (poor) to 200 (excellent). Scoring sheets for macroinvertebrates and habitat can be found in Appendix A.

Sampling locations are shown in Figure 1.

## SUMMARY

Twenty-one locations were sampled in 2014 with scores ranging from 5/“excellent” to 0/“acceptable” (Table 1). Overall scores for the 2 watersheds were relatively high as 16 of the 21 locations scored +5 or +6 as “excellent.” Sand deposition was a common issue in several of the rivers, which had impacts on available in-stream habitat.

## SAMPLING RESULTS

**Table 1. Location and Assessment Scores for Sites Sampled during 2014 in the Manistique and Millecoquins Watersheds.**

SITE	WATERBODY	LATITUDE	LONGITUDE	Date Sampled	COUNTY	TRS	STORET	Habitat Score	Invert Score 2014	Invert Score 2009
2	Kilpecker Creek	46.12938	-86.51379	24-Jul-14	Delta	43N18W14	210228	165	3	
3	Driggs River	46.23227	-86.03689	31-Jul-14	Schoolcraft	44N14W03	770167	134	6	
5	West Branch Manistique River	46.13812	-86.17710	25-Jul-14	Schoolcraft	43N15W10	770170	142	5	
9	Indian River	46.09030	-86.41051	24-Jul-14	Schoolcraft	43N17W27	770172	176	5	
10	Indian River	46.18461	-86.49013	24-Jul-14	Schoolcraft	44N18W25	770173	176	5	
12	Walsh Creek	46.31867	-86.11814	31-Jul-14	Schoolcraft	45N15W01	770168	158	6	
14	Driggs River	46.20095	-86.00134	31-Jul-14	Schoolcraft	44N14W24	770166	158	5	
15	West Branch Manistique River	46.16264	-86.19401	25-Jul-14	Schoolcraft	44N15W33	770171	127	6	
16	Indian River	46.18274	-86.59032	26-Jul-14	Schoolcraft	44N18W29	770169	176	5	
2T	Star Creek	46.37216	-86.39305	26-Jul-14	Alger	46N17W23	20124	142	5	5
3T	EB Taquamenon	46.31777	-84.95275	17-Sep-14	Chippewa	45N05W05	170288	153	4	-1
4T	E B Fox River	46.40537	-85.94790	31-Jul-14	Schoolcraft	46N13W04	770090	109	3	2
5T	Kilpecker Creek	46.11363	-86.49210	16-Sep-14	Delta	43N18W24	210305	187	5	3
6T	Mead Creek	46.17510	-85.92783	31-Jul-14	Schoolcraft	44N13W28	770089	171	2	0
7T	Big Murphy Creek	46.07271	-86.46623	24-Jul-14	Schoolcraft	43N17W32	770159	175	5	1
8T	Clear Creek	46.44920	-85.93765	31-Jul-14	Schoolcraft	47N12W21	770108	136	0	4
10T	Milakokia River	46.02832	-85.84404	23-Jul-14	Mackinac	42N13W18	490065	190	5	4
11T	Creighton River	46.24101	-86.24220	26-Jul-14	Schoolcraft	44N16W01	770156	140	5	3
13T	W B Manistique River	46.25295	-86.26227	25-Jul-14	Schoolcraft	45N16W35	770155	155	5	4
14T	W B Manistique River	46.22857	-86.23506	26-Jul-14	Schoolcraft	44N15W07	770160	129	6	3
15T	Little Fox River	46.48530	-86.14864	16-Sep-14	Schoolcraft	47N15W11	770157	171	5	2

Habitat scores (>154-Excellent, 105-154-Good, 56-104-Marginal, <56-Poor)

Invertebrate assessment scores (+5 to +9-Excellent, +4 to -4-Acceptable, -5 to -9-Poor)

## STATUS SITES

Nine Sites (2-16) (Table 1) were randomly chosen for, and determination of, the attainment status of the Manistique and Millecoquins Watersheds (status sites). These locations all scored “excellent” (+5 or +6) except 1 location that scored “acceptable” (only slightly lower with +3).

### West Branch Manistique River

Two sites (5 and 15) were surveyed on the West Branch Manistique River. Both locations scored “excellent” for invertebrates and “good” for habitat. These sites had issues with sand deposition in the stream channel and along the banks (Figure 2), which limited in-stream habitat and led to lowered scores in the habitat category. In-stream invertebrate habitat consisted mainly of large woody debris and aquatic vegetation.

### Indian River

Three sites (9, 10, and 16) were surveyed on the Indian River. All three sites were very similar in structure with sandy bottoms with small areas of gravel. The margins of the river contained depositional areas that were heavily vegetated. This diversity of in-stream habitat is conducive to high macroinvertebrate diversity and abundance. All three locations scored “excellent” for invertebrates and habitat.

### Driggs River

Two sites (3 and 14) were sampled on the Driggs River in 2014. Site 14 is located within the Seney Wildlife Refuge and site 3 is located upstream of 14 and just outside of the refuge. Both locations were very similar in structure with sandy bottoms and little to no gravel or cobble. Large woody debris and overhanging riparian vegetation was significant at both sites. Both

locations scored “excellent” for invertebrates as diversity and abundance was very high. Site 3 scored “good” for habitat while site 14 scored “excellent.”

#### Kilpecker Creek

One location (site 2) was surveyed on Kilpecker Creek. This site was a very sandy and cold small stream located in a dense forest, which created significant large woody debris and overhanging vegetation. Invertebrates scored “good” and habitat scored “excellent.”

#### Walsh Creek

One site (12) was surveyed on Walsh Creek inside the Seney National Wildlife refuge. Upstream of this location was the focus of a large wetland restoration project conducted within the Seney National Wildlife Refuge (Bork et al., 2013). The survey was conducted downstream of the outlet of the wetland restoration water control structures. Likely due to groundwater or upstream inputs of dissolved iron, significant iron-oxide deposits covered many of the in-stream surfaces (Figure 3). These types of deposits can occur on hot, dry days where flows are sluggish as were the conditions on the day this site was sampled. Invertebrates and habitat scored “excellent.”

### **TREND SITES**

Twelve sites (2T-15T) (Table 1) were sampled as part of trend program, which resamples the same locations every five years in an effort to provide an estimate of water quality trends based on changes in the macroinvertebrate community. Invertebrate scores recorded at these locations during the previous round (2009) are located in Table 1 as well.

#### Star Creek

One site (2T) was sampled on Star Creek. The culvert at the road crossing was impacted by a beaver dam, which appeared to impound a short section of this stream around the road crossing. The stream was relatively slow moving and became braided a short distance from the road crossing. Invertebrate abundance and diversity was good and the stream scored “excellent.” Habitat was slightly lacking in in-stream cover and scored “good” overall.

#### East Branch Tahquamenon

This location (3T) was pulled as a replacement for a targeted location that had to be dropped due to site condition changes that were discovered. Although outside of the Manistique and Millecoquins watersheds, this site was completed to satisfy statewide trend goals. Rust colored iron oxide deposits and aquatic macrophytes were significant at this location (Figure 4). The abundance of invertebrates was noted as being relatively low as one-half of the entire sample was sorted before 300 individuals was achieved. Invertebrates scored 4 or “acceptable,” which is higher than in 2009 when it scored -1. Habitat scored “good.”

#### East Branch Fox River

One location (4T) was sampled on the east branch of the Fox River. Invertebrates scored “good” and habitat scored on the lower end of “good.” Lower scores for habitat were results of the stream having large amounts of sand and lacking in-stream cover diversity as gravel and cobble were lacking.

#### Kilpecker Creek

One location (5T) was sampled on Kilpecker Creek. As with the status location (2) that was sampled slightly downstream, this site was cold, clear, and scored “excellent” for invertebrates and habitat.

### Mead Creek

One location (6T) was sampled on Mead Creek. As in previous years, downstream of the bridge crossing was sampled. The stream was relatively slow moving and lacked in-stream available habitat. Much of the stream bottom was covered in silt, with small areas of gravel in the center channel. A few cobbles were found close to the bridge crossing. Invertebrates scored "acceptable" and habitat score "excellent."

### Big Murphy Creek

This location (7T) on Big Murphy Creek was located upstream of a new and adequately sized concrete box culvert. Abundance and diversity of invertebrates was good at this location and available habitat in the stream was diverse. Invertebrates and habitat scored "excellent."

### Clear Creek

Clear Creek (8T) was sampled at the M-77 road crossing. Invertebrates scored 0/ "acceptable" and habitat scored "good." In-stream habitat was lacking solid structures and consisted mainly of sand.

### Milakokia River

Site 10T on the Milakokia River was sampled at the Batty Doe Lake Road crossing. This site flowed through a cedar swamp and had a very tannic color to the water. Cobble, gravel, and large woody debris were abundant at this location. Invertebrates and habitat scored "excellent."

### Creighton River

This site (11T) had heavy sand deposits and the banks showed signs of continued erosion (Figure 5). Large woody debris was relatively abundant providing stable in-stream habitat in areas. Invertebrates scored 5/ "excellent" and habitat scored "good."

### West Branch Manistique River

Two locations (13T and 14T) were sampled on the West Branch of the Manistique River. Habitat scored "excellent" on 13T and "good" on 14T. Obvious areas of bank erosion were present at both locations as well as large areas of heavy sand within the river. Invertebrates scored "excellent" at both locations.

### Little Fox River

This location (15T) was located downstream of Stanley Lake, which is an impoundment of the Little Fox River. Both invertebrates and habitat scored "excellent" at this location.

## **FUTURE NEEDS**

- MDEQ Nonpoint Source staff will be contacted to determine if sampling is needed for any projects within the Manistique or Millecoquins watersheds.
- MDEQ Fish Contaminant Monitoring Program staff will be contacted to determine if any water bodies in the Manistique or Millecoquins are in need of fish collection.
- The MDEQ will solicit recommendations internally and externally for monitoring efforts within the Manistique and Millecoquins watersheds.

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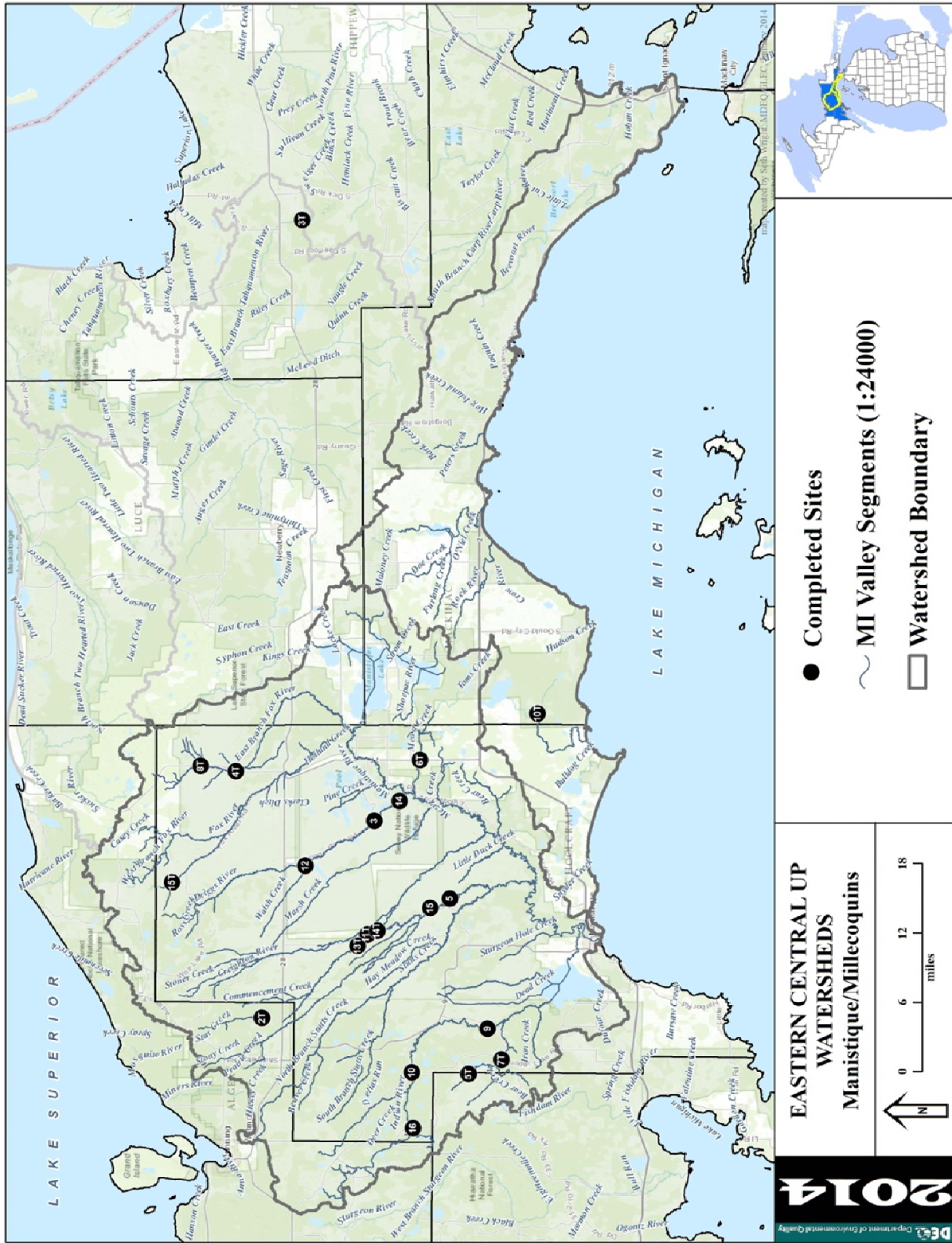


Figure 1. Sites sampled in Manistique and Millecoquins (Eastern Central Upper Peninsula) Watersheds 2014.



**Figure 2. Site 15-- West Branch Manistique River sand deposition issues.**



**Figure 3. Iron-oxide deposits located at Walsh Creek (Site 12).**





**Figure 4. Iron oxide and aquatic macrophytes located at the site on the East Branch Tahquamenon (3T).**



**Figure 5. Creighton River (Site 11T) bank erosion.**

# Appendix A

## Macroinvertebrate and Habitat Scores

TAXA	Kilpecker Creek Federal Forest Road 7/24/2014 Station 2	Driggs River Driggs River Road 7/31/2014 Station 3	West Branch Cals Drive 7/25/2014 Station 5	Indian River County Road 449 7/24/2014 Station 9
PORIFERA (sponges)	1			
ANNELIDA (segmented worms)				
Oligochaeta (worms)	1		2	5
ARTHROPODA				
Crustacea				
Amphipoda (scuds)	5		3	11
Decapoda (crayfish)		2	5	1
Arachnoidea				
Hydracarina	21	1	3	3
Insecta				
Ephemeroptera (mayflies)				
Baetiscidae			3	1
Baetidae	6	10	13	110
Caenidae		6	9	5
EphemereIIDae	2	1	1	1
Ephemeridae		1		
Heptageniidae		6	9	11
Isonychidae		1		1
Leptophlebiidae	2		1	2
Potamanthidae				6
Odonata				
Anisoptera (dragonflies)				
Aeshnidae		9	17	1
Gomphidae		5	1	1
Libellulidae		1		
Zygoptera (damselflies)				
Calopterygidae		14	8	1
Coenagrionidae		1		
Plecoptera (stoneflies)				
Leuctridae	4			
Nemouridae	13			
Perlidae		1	6	1
Pteronarcyidae		7	5	10
Taeniopterygidae		1	1	
Hemiptera (true bugs)				
Corixidae		5	1	1
Gerridae		1	1	1
Velidae		4	4	1
Megaloptera				
Corydalidae (dobson flies)		1	1	
Sialidae (alder flies)	2	1		1
Trichoptera (caddisflies)				
Brachycentridae	3	133	61	39
Hydropsychidae	4	119	88	42
Leptoceridae	1	3	1	3
Limnephilidae	13	1	2	
Molannidae	1			
Phryganeidae		6		
Polycentropodidae	1	3	12	2
Coleoptera (beetles)				
Dytiscidae (total)	1	3	1	
Gyrinidae (adults)		1		1
Hydrophilidae (total)	1		2	1
Elmidae	1		5	
Gyrinidae (larvae)				1
Diptera (flies)				
Athericidae		2	3	
Ceratopogonidae	6		1	1
Chironomidae	198	18	26	30
Culicidae			1	
Dvidae				1
Simuliidae	4	19	10	38
Tabanidae	1	1	2	1
MOLLUSCA				
Gastropoda (snails)				
Hydrobiidae	1			1
Physidae	1	1	1	1
Pelecypoda (bivalves)				
Pisididae	1		1	1
Sphaeriidae (clams)	4			3
TOTAL INDIVIDUALS	299	389	312	341

METRIC	Kilpecker Creek Federal Forest Road 7/24/2014 Station 2		Driggs River Driggs River Road 7/31/2014 Station 3		West Branch Manistique River Cals Drive 7/25/2014 Station 5		Indian River County Road 449 7/24/2014 Station 9	
	Value	Score	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	27	0	34	1	37	1	36	1
NUMBER OF MAYFLY TAXA	3	0	6	1	6	1	8	1
NUMBER OF CADDISFLY TAXA	6	1	6	1	5	0	4	0
NUMBER OF STONEFLY TAXA	2	1	3	1	3	1	2	1
PERCENT MAYFLY COMP.	3.34	0	6.43	0	11.54	0	40.18	1
PERCENT CADDISFLY COMP.	7.69	0	68.12	1	52.56	1	25.22	0
PERCENT DOMINANT TAXON	66.22	-1	34.19	-1	28.21	-1	32.26	-1
PERCENT ISOPOD, SNAIL, LEECH	0.67	1	0.26	1	0.32	1	0.59	1
PERCENT SURF. AIR BREATHERS	0.67	1	3.60	1	3.53	1	1.47	1
TOTAL SCORE		3		6		5		5
MACROINV. COMMUNITY RATING		ACCEPT.		EXCELLENT		EXCELLENT		EXCELLENT

TAXA	Indian River County Road 449 7/24/2014 Station 10	Walsh Creek C3 Pool Road 7/31/2014 Station 12	Driggs River Seney Wildlife 7/31/2014 Station 14	West Branch off Cals Drive 7/25/2014 Station 15
ANNELIDA (segmented worms)				
Hirudinea (leeches)		1		
Oligochaeta (worms)	5	1		
ARTHROPODA				
Crustacea				
Amphipoda (scuds)	11			
Decapoda (crayfish)	1	6	1	3
Isopoda (sowbugs)			1	
Arachnoidea				
Hydracarina	3	6	1	6
Insecta				
Ephemeroptera (mayflies)				
Baetiscidae	1			1
Baetidae	110	13	9	61
Caenidae	5	5	2	2
EphemereIIDae	1	4	1	1
Ephemeridae		1		
Heptageniidae	11	84	4	7
Isonychidae	1		1	1
Leptophlebiidae	2	15		
Potamanthidae	6		2	
Siphonuridae			2	
Tricythyidae				1
Odonata				
Anisoptera (dragonflies)				
Aeshnidae	1	16	6	6
Cordulegastridae			1	
Gomphidae	1		2	1
Libellulidae		3		
Zygoptera (damselflies)				
Calopterygidae	1	6	7	4
Coenagrionidae		6		
Plecoptera (stoneflies)				
Leuctridae				1
Perlidae	1	1	3	2
Pteronarcyidae	10	1	1	1
Hemiptera (true bugs)				
Corixidae	1		1	
Gerridae	1	1		1
Mesovelidae		2		
Velidae	1		2	1
Megaloptera				
Sialidae (alder flies)	1	3		
Trichoptera (caddisflies)				
Brachycentridae	39		38	98
Hydropsychidae	42	21	126	61
Leptoceridae	3			
Limnephilidae		2	3	1
Phryganeidae		1		
Polycentropodidae	2	1	7	4
Coleoptera (beetles)				
Dytiscidae (total)			1	1
Gyrinidae (adults)	1		1	
Halpidae (adults)		1		
Hydrophilidae (total)	1			
Elmidae			1	2
Gyrinidae (larvae)	1	1		1
Diptera (flies)				
Athericidae				1
Ceratopogonidae	1	3	1	
Chironomidae	30	74	41	32
Culicidae				1
Dvidae	1	1		
Simuliidae	38	28	30	4
Tabanidae	1			1
Tipulidae		2	3	
MOLLUSCA				
Gastropoda (snails)				
Hydrobiidae	1		1	
Physidae	1	1		
Pelecypoda (bivalves)				
Pisididae	1	1	1	
Sphaeriidae (clams)	3			
TOTAL INDIVIDUALS	341	313	301	308

METRIC	Indian River County Road 449 7/24/2014 Station 10		Walsh Creek C3 Pool Road 7/31/2014 Station 12		Driggs River Seney Wildlife 7/31/2014 Station 14		West Branch off Cals Drive 7/25/2014 Station 15	
	Value	Score	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	36	1	33	1	31	1	30	1
NUMBER OF MAYFLY TAXA	8	1	6	1	7	1	7	1
NUMBER OF CADDISFLY TAXA	4	0	5	0	4	0	4	0
NUMBER OF STONEFLY TAXA	2	1	2	1	2	1	3	1
PERCENT MAYFLY COMP.	40.18	1	38.98	1	6.98	0	24.03	1
PERCENT CADDISFLY COMP.	25.22	0	8.31	0	57.81	1	53.25	1
PERCENT DOMINANT TAXON	32.26	-1	26.84	0	41.86	-1	31.82	-1
PERCENT ISOPOD, SNAIL, LEECH	0.59	1	0.64	1	0.66	1	0.00	1
PERCENT SURF. AIR BREATHERS	1.47	1	1.28	1	1.66	1	1.30	1
TOTAL SCORE		5		6		5		6
MACROINV. COMMUNITY RATING		EXCELLENT		EXCELLENT		EXCELLENT		EXCELLENT



TAXA	Milakokia River	Creighton River	West Branch	West Branch
	Betty Doe Lake Rd	Creighton Truck	Hickey Truck Trail	off Creighton Truck
	7/23/2014	7/26/2014	7/25/2014	7/26/2014
	Station 10T	Station 11T	Station 13T	Station 14T
<b>ANNELIDA (segmented worms)</b>				
Hirudinea (leeches)	1			1
Oligochaeta (worms)	1		1	
<b>ARTHROPODA</b>				
<b>Crustacea</b>				
Amphipoda (scuds)	2		21	12
Decapoda (crayfish)	4	6	10	11
<b>Arachnoidea</b>				
Hydracarina	11	9	12	9
<b>Insecta</b>				
<b>Ephemeroptera (mayflies)</b>				
Baetiscidae			3	1
Baetidae	2	21	36	75
Caenidae	1	5		3
Ephemerellidae		3	3	1
Heptageniidae	46	14	2	2
Isonychidae			1	
Leptophlebiidae	26		1	
Potamanthidae			1	
Tricothyridae	1	1	1	
<b>Odonata</b>				
<b>Anisoptera (dragonflies)</b>				
Aeshnidae	20	1	6	7
Zygoptera (damselflies)				
Calopterygidae	14		12	2
Coenagrionidae				1
<b>Plecoptera (stoneflies)</b>				
Leuctridae			1	
Perlidae	3	1	1	5
Perlomyzidae	1			
Pteronarcyidae		1	1	1
Hemiptera (true bugs)				
Corixidae	1	8	4	10
Gerridae		1		
Mesovelidae		1		
Notonectidae				1
Velidae	2	8	9	1
<b>Megaloptera</b>				
Corydalidae (dobson flies)	3		1	1
Sialidae (alder flies)	1	1		
<b>Trichoptera (caddisflies)</b>				
Brachycentridae		87	14	70
Helicopsychidae	1		1	
Hydropsychidae	16	28	8	29
Hydroptilidae		3	14	
Leptoceridae	5	1		
Limnephilidae	4	2	2	1
Molannidae	1			
Phryganeidae		13	1	1
Polycentropodidae	21	8	9	
Uenoidae	2			
<b>Coleoptera (beetles)</b>				
Dytiscidae (total)		2	2	3
Gyrinidae (adults)	1		1	1
Haliphidae (adults)				10
Hydrophilidae (total)				1
Elmidae	12	7	8	9
Gyrinidae (larvae)		3	2	1
Haliphidae (larvae)		2	1	1
<b>Diptera (flies)</b>				
Athericidae		2		1
Ceratopogonidae	19		15	1
Chironomidae	128	47	70	28
Cubicidae		2	3	
Simuliidae		5	16	8
Tabanidae		2	3	
Tipulidae	5	1	1	
<b>MOLLUSCA</b>				
<b>Gastropoda (snails)</b>				
Ancylidae (limpets)		1		
Physidae				2
<b>Pelecypoda (bivalves)</b>				
Sphaeriidae (clams)	3	1		

METRIC	Milakokia River	Creighton River	West Branch	West Branch				
	Betty Doe Lake Rd	Creighton Truck	Hickey Truck Trail	off Creighton Truck				
	7/23/2014	7/26/2014	7/25/2014	7/26/2014				
	Station 10T	Station 11T	Station 13T	Station 14T				
	Value	Score	Value	Score				
TOTAL NUMBER OF TAXA	34	1	36	1	39	1	33	1
NUMBER OF MAYFLY TAXA	5	1	5	1	8	1	5	1
NUMBER OF CADDISFLY TAXA	7	1	7	1	7	1	4	0
NUMBER OF STONEFLY TAXA	2	1	2	1	3	1	2	1
PERCENT MAYFLY COMP.	20.43	0	14.10	0	16.00	0	26.28	1
PERCENT CADDISFLY COMP.	13.44	0	45.51	1	16.33	0	32.37	1
PERCENT DOMINANT TAXON	34.41	-1	27.88	-1	23.33	0	24.04	0
PERCENT ISOPOD, SNAIL, LEECH	0.27	1	0.32	1	0.00	1	0.96	1
PERCENT SURF. AIR BREATHERS	1.08	1	7.05	0	6.33	0	8.65	0
TOTAL SCORE		5		5		5		6
MACROINV. COMMUNITY RATING		EXCELLENT		EXCELLENT		EXCELLENT		EXCELLENT

HABITAT METRIC	Kilpecker Creek	Driggs River	West Branch	Indian River
	Federal Forest Road 2717	Driggs River Road	Manistique River	County Road 449
	RIFFLE/RUN	GLIDE/POOL	GLIDE/POOL	RIFFLE/RUN
	Station 2	Station 3	Station 5	Station 9
<b>Substrate and Instream Cover</b>				
Epifaunal Substrate/ Avail Cover (20)	8	8	10	15
Embeddedness (20)*	9			16
Velocity Depth Regime (20)*	18			18
Pool Substrate Characterization (20)**		10	11	
Pool Variability (20)**		15	13	
<b>Channel Morphology</b>				
Sediment Deposition (20)	16	7	5	18
Flow Status - Maint. Flow Volume (10)	10	8	10	10
Flow Status - Flashiness (10)	9	5	5	10
Channel Alteration (20)	20	20	20	20
Frequency of Riffles/Bends (20)*	15			9
Channel Sinuosity (20)**		17	18	
<b>Riparian and Bank Structure</b>				
Bank Stability (L) (10)	10	6	7	10
Bank Stability (R) (10)	10	6	7	10
Vegetative Protection (L) (10)	10	6	8	10
Vegetative Protection (R) (10)	10	6	8	10
Riparian Veg. Zone Width (L) (10)	10	10	10	10
Riparian Veg. Zone Width (R) (10)	10	10	10	10
TOTAL SCORE (200):	165	134	142	176
<b>HABITAT RATING</b>				
	EXCELLENT	GOOD	GOOD	EXCELLENT
	(NON-IMPAIRED)	(SLIGHTLY IMPAIRED)	(SLIGHTLY IMPAIRED)	(NON-IMPAIRED)
Note: Individual metrics may better describe conditions directly affecting the biological community while the Habitat Rating describes the general riverine environment at the site(s).				
Date:	7/24/2014	7/31/2014	7/25/2014	7/24/2014
Weather:	Sunny	Sunny		Sunny
Air Temperature:	65 Deg. F.	70 Deg. F.	70 Deg. F.	70 Deg. F.
Water Temperature:	58 Deg. F.	66 Deg. F.	66 Deg. F.	62 Deg. F.
Ave. Stream Width:	11.264 Feet	42 Feet	67 Feet	57 Feet
Ave. Stream Depth:	1.05 Feet	1.71 Feet	1.3222 Feet	1.68 Feet
Surface Velocity:	0.752 Ft./Sec.	1.458 Ft./Sec.	0.983 Ft./Sec.	2.304 Ft./Sec.
Estimated Flow:	8.8946544 CFS	104.71356 CFS	87.0814142 CFS	220.63104 CFS
Stream Modifications:	None	None	None	None
Nuisance Plants (Y/N):	N	N	N	N
Report Number:				
STORET No.:	210228	770167	770170	770172
<b>Stream Name:</b> Kilpecker Creek, Driggs River, West Branch Manistique River, Indian River				
<b>Road Crossing/Location:</b> Federal Forest Road 2717, Driggs River Road, Cals Drive, County Road 449				
<b>County Code:</b> 21, 77, 77, 77				
<b>TRS:</b> 43N18W14, 44N14W03, 43N15W34, 43N17W27				
<b>Latitude (dd):</b> 46.12955, 46.23227, 46.13812, 46.0903				
<b>Longitude (dd):</b> -86.51395, -86.03689, -86.1771, -86.41051				
<b>Ecoregion:</b> NLAFF, NLAFF, NLAFF, NLAFF				
<b>Stream Type:</b> Warmwater, Coldwater				
<b>USGS Basin Code:</b> 4060106, 4060106, 4060106, 4060106				
* Applies only to Riffle/Run stream Surveys				
** Applies only to Glide/Pool stream Surveys				

	Indian River	Walsh Creek	Driggs River	West Branch Manistique River
	County Road 449	C3 Pool Road	Seney Wildlife Refuge 4 Road	off Cals Drive
	RIFFLE/RUN Station 10	GLIDE/POOL Station 12	GLIDE/POOL Station 14	GLIDE/POOL Station 15
<b>HABITAT METRIC</b>				
<b>Substrate and Instream Cover</b>				
Epifaunal Substrate/ Avail Cover (20)	15	16	10	7
Embeddness (20)*	16			
Velocity/Depth Regime (20)*	18			
Pool Substrate Characterization (20)**		11	14	13
Pool Variability (20)**		15	15	17
<b>Channel Morphology</b>				
Sediment Deposition (20)	18	14	16	6
Flow Status - Maint. Flow Volume (10)	10	8	9	9
Flow Status - Flashiness (10)	10	6	8	5
Channel Alteration (20)	20	16	20	20
Frequency of Riffles/Bends (20)*	9			
Channel Sinuosity (20)**		17	16	19
<b>Riparian and Bank Structure</b>				
Bank Stability (L) (10)	10	8	8	3
Bank Stability (R) (10)	10	7	7	3
Vegetative Protection (L) (10)	10	10	7	4
Vegetative Protection (R) (10)	10	10	7	4
Riparian Veg. Zone Width (L) (10)	10	10	10	7
Riparian Veg. Zone Width (R) (10)	10	10	10	10
<b>TOTAL SCORE (200):</b>	<b>176</b>	<b>158</b>	<b>158</b>	<b>127</b>
<b>HABITAT RATING:</b>	<b>EXCELLENT</b>	<b>EXCELLENT</b>	<b>EXCELLENT</b>	<b>GOOD</b>
	(NON-IMPAIRED)	(NON-IMPAIRED)	(NON-IMPAIRED)	(SLIGHTLY IMPAIRED)
Note: Individual metrics may better describe conditions directly affecting the biological community while the Habitat Rating describes the general riverine environment at the site(s).				
Date:	7/24/2014	7/31/2014	7/31/2014	7/25/2014
Weather:	Sunny	Sunny	Sunny	Sunny
Air Temperature:	70 Deg. F.	70 Deg. F.	70 Deg. F.	70 Deg. F.
Water Temperature:	62 Deg. F.	68 Deg. F.	65 Deg. F.	66 Deg. F.
Ave. Stream Width:	57 Feet	5.25 Feet	35.5 Feet	90.5 Feet
Ave. Stream Depth:	1.68 Feet	0.264 Feet	1.57 Feet	0.771 Feet
Surface Velocity:	2.04 Ft./Sec.	0.399 Ft./Sec.	2.02 Ft./Sec.	1.48 Ft./Sec.
Estimated Flow:	220.63104 CFS	0.399399 CFS	112.5847 CFS	103.26774 CFS
Stream Modifications:	None	Impounded	None	None
Nuisance Plants (Y/N):	N	Y	N	N
Report Number:				
STORET No.:	770172	770168	770166	770171
Stream Name:	Indian River	Walsh Creek	Driggs River	West Branch Manistique River
Road Crossing/Location:	Indian River County Road 449	C3 Pool Road	Seney Wildlife Refuge 4 Road	off Cals Drive
County Code:	77	77	77	77
TRS:	43N17W27	45N15W1	44N14W24	44N15W33
Latitude (dd):	46.0903	46.31867	46.20095	46.16264
Longitude (dd):	-86.41051	-86.11814	-86.001	-86.19401
Ecoregion:	NLAF	NLAF	NLAF	NLAF
Stream Type:	Coldwater			Coldwater
USCS Basin Code:	4060106	4060106	4060106	4060106
* Applies only to Riffle/Run stream Surveys ** Applies only to Glide/Pool stream Surveys				

	Indian River	Star Creek	East Branch Tabquamenon River	East Branch Fox River
	Federal Forest Road 2258	Off Star Siding Road	Arbutus Truck Trail	M-77 (downstream)
	GLIDE/POOL Station 16	GLIDE/POOL Station 2T	GLIDE/POOL Station 3T	RIFFLE/RUN Station 4T
<b>HABITAT METRIC</b>				
<b>Substrate and Instream Cover</b>				
Epifaunal Substrate/ Avail Cover (20)	12	10	8	8
Embeddness (20)*				3
Velocity/Depth Regime (20)*				8
Pool Substrate Characterization (20)**	15	11	11	
Pool Variability (20)**	16	8	8	
<b>Channel Morphology</b>				
Sediment Deposition (20)	18	8	10	6
Flow Status - Maint. Flow Volume (10)	10	9	9	10
Flow Status - Flashiness (10)	10	8	10	6
Channel Alteration (20)	20	20	20	20
Frequency of Riffles/Bends (20)*				3
Channel Sinuosity (20)**	15	14	19	
<b>Riparian and Bank Structure</b>				
Bank Stability (L) (10)	10	9	9	9
Bank Stability (R) (10)	10	9	9	9
Vegetative Protection (L) (10)	10	8	10	7
Vegetative Protection (R) (10)	10	8	10	5
Riparian Veg. Zone Width (L) (10)	10	10	10	6
Riparian Veg. Zone Width (R) (10)	10	10	10	9
<b>TOTAL SCORE (200):</b>	<b>176</b>	<b>142</b>	<b>153</b>	<b>109</b>
<b>HABITAT RATING:</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
	(IMPAIRED)	(IMPAIRED)	(IMPAIRED)	(IMPAIRED)
Note: Individual metrics may better describe conditions directly affecting the biological community while the Habitat Rating describes the general riverine environment at the site(s).				
Date:	7/26/2014	6/24/2009	9/17/2014	7/31/2014
Weather:	Sunny	Sunny	Partly Cloudy	Sunny
Air Temperature:	70 Deg. F.	75 Deg. F.	70 Deg. F.	70 Deg. F.
Water Temperature:	65 Deg. F.	62 Deg. F.	51 Deg. F.	50 Deg. F.
Ave. Stream Width:	41 Feet	18 Feet	6.99 Feet	24 Feet
Ave. Stream Depth:	1.72 Feet	1.5 Feet	0.52 Feet	2.31 Feet
Surface Velocity:	1.62 Ft./Sec.	0.33 Ft./Sec.	0.39 Ft./Sec.	1.98 Ft./Sec.
Estimated Flow:	114.2424 CFS	8.91 CFS	1.417572 CFS	109.7712 CFS
Stream Modifications:	None	None	None	None
Nuisance Plants (Y/N):	N	N	Y	N
Report Number:				
STORET No.:	770169	20124	170288	770090
Stream Name:	Indian River	Star Creek	East Branch Tabquamenon River	East Branch Fox River
Road Crossing/Location:	Federal Forest Road 2258	Off Star Siding Road	Arbutus Truck Trail	M-77 (downstream)
County Code:	77	02	17	77
TRS:	44N18W29	46N17W23	45N05W05	46N13W05
Latitude (dd):	46.18274	46.37216	46.3177	46.4007
Longitude (dd):	-86.59032	-86.39325	-84.9527	-85.94795
Ecoregion:	NLAF	NLAF	NLAF	NLAF
Stream Type:	Coldwater	Coldwater	Coldwater	Coldwater
USCS Basin Code:	4060106	4060106	4020202	4060106
* Applies only to Riffle/Run stream Surveys ** Applies only to Glide/Pool stream Surveys				

	Kilpecker Creek two-track off Federal RIFFLERUN Station 5T	Mead Creek M-77 (downstream) GLIDE/POOL Station 6T	Big Murphy Creek County Road 437 RIFFLERUN Station 7T	Clear Creek upstream M-77 RIFFLERUN Station 8T
<b>HABITAT METRIC</b>				
<b>Substrate and Instream Cover</b>				
Epifaunal Substrate/ Avail Cover (20)	19	13	13	6
Embeddedness (20)*	17		15	15
Velocity/Depth Regime (20)*	18		17	8
Pool Substrate Characterization (20)**		14		
Pool Variability (20)**		11		
<b>Channel Morphology</b>				
Sediment Deposition (20)	17	18	15	6
Flow Status - Maint. Flow Volume (10)	10	10	10	10
Flow Status - Flashiness (10)	10	10	10	6
Channel Alteration (20)	20	20	20	20
Frequency of Riffles/Bends (20)*	16		15	8
Channel Sinuosity (20)**		17		
<b>Riparian and Bank Structure</b>				
Bank Stability (L) (10)	10	9	10	10
Bank Stability (R) (10)	10	9	10	10
Vegetative Protection (L) (10)	10	10	10	9
Vegetative Protection (R) (10)	10	10	10	8
Riparian Veg. Zone Width (L) (10)	10	10	10	10
Riparian Veg. Zone Width (R) (10)	10	10	10	10
<b>TOTAL SCORE (200):</b>	<b>187</b>	<b>171</b>	<b>175</b>	<b>136</b>
<b>HABITAT RATING:</b>				
	EXCELLENT (NON- IMPAIRED)	EXCELLENT (NON- IMPAIRED)	EXCELLENT (NON- IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)
Note: Individual metrics may better describe conditions directly affecting the biological community while the Habitat Rating describes the general riverine environment at the site(s).				
Date:	9/16/2014	7/31/2014	7/24/2014	7/31/2014
Weather:	Sunny	Sunny	Sunny	Sunny
Air Temperature:	60 Deg. F.	60 Deg. F.	75 Deg. F.	75 Deg. F.
Water Temperature:	48 Deg. F.	62 Deg. F.	65 Deg. F.	49 Deg. F.
Ave. Stream Width:	14.217 Feet	15.9 Feet	45.5 Feet	16 Feet
Ave. Stream Depth:	0.876 Feet	1.02 Feet	1.14 Feet	1.11 Feet
Surface Velocity:	1.53 Ft./Sec.	0.298 Ft./Sec.	1.38 Ft./Sec.	0.824 Ft./Sec.
Estimated Flow:	19.05476076 CFS	4.832964 CFS	71.5906 CFS	14.6324 CFS
Stream Modifications:	None	None	None	None
Nuisance Plants (Y/N):	N	N	N	N
Report Number:				
STORET No.:	210305	77089	770159	770108
Stream Name:	Kilpecker Creek two-track off Federal Forest Rd 2438	M-77 (downstream)	Big Murphy County Road 437	Clear Creek upstream M-77
Road Crossing/Location:				
County Code:	21	77	77	77
TRS:	43N18W24	44N13W28	43N17W32	47N13W21
Latitude (dd):	46.11395	46.17484	46.07281	46.44928
Longitude (dd):	-86.49214	-85.92751	-86.4669	-85.93728
Ecoregion:	NLAF	NLAF	NLAF	NLAF
Stream Type:	Coldwater	Warmwater	Coldwater	Coldwater
USCS Basin Code:	4060106	4060106	4060106	4060106
* Applies only to Riffle/Run stream Surveys ** Applies only to Glide/Pool stream Surveys				

	Milakokia River Betty Doe Lake Rd RIFFLERUN Station 10T	Creighton River Creighton Truck Trail GLIDE/POOL Station 11T	West Branch Manistique River Hickey Truck Trail GLIDE/POOL Station 13T	West Branch Manistique River off Creighton Truck Trail GLIDE/POOL Station 14T
<b>HABITAT METRIC</b>				
<b>Substrate and Instream Cover</b>				
Epifaunal Substrate/ Avail Cover (20)	19	7	9	8
Embeddedness (20)*	18			
Velocity/Depth Regime (20)*	15			
Pool Substrate Characterization (20)**		13	15	15
Pool Variability (20)**		16	17	15
<b>Channel Morphology</b>				
Sediment Deposition (20)	20	7	14	5
Flow Status - Maint. Flow Volume (10)	10	10	10	8
Flow Status - Flashiness (10)	10	3	8	4
Channel Alteration (20)	20	20	20	20
Frequency of Riffles/Bends (20)*	18		19	20
Channel Sinuosity (20)**		20	19	20
<b>Riparian and Bank Structure</b>				
Bank Stability (L) (10)	10	4	5	4
Bank Stability (R) (10)	10	4	6	4
Vegetative Protection (L) (10)	10	8	6	5
Vegetative Protection (R) (10)	10	8	6	5
Riparian Veg. Zone Width (L) (10)	10	10	10	6
Riparian Veg. Zone Width (R) (10)	10	10	10	10
<b>TOTAL SCORE (200):</b>	<b>190</b>	<b>140</b>	<b>155</b>	<b>129</b>
<b>HABITAT RATING:</b>				
	EXCELLENT (NON- IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)	EXCELLENT (NON- IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)
Note: Individual metrics may better describe conditions directly affecting the biological community while the Habitat Rating describes the general riverine environment at the site(s).				
Date:	7/23/2014	7/26/2014	7/25/2014	7/26/2014
Weather:	Sunny	Sunny	Sunny	Sunny
Air Temperature:	78 Deg. F.	70 Deg. F.	76 Deg. F.	70 Deg. F.
Water Temperature:	76 Deg. F.	68 Deg. F.	64 Deg. F.	66 Deg. F.
Ave. Stream Width:	20.92 Feet	42 Feet	31.5 Feet	68 Feet
Ave. Stream Depth:	0.299 Feet	1.76 Feet	0.58 Feet	0.748 Feet
Surface Velocity:	0.824 Ft./Sec.	0.7 Ft./Sec.	1.136 Ft./Sec.	1.41 Ft./Sec.
Estimated Flow:	5.15418592 CFS	51.744 CFS	20.75472 CFS	71.71824 CFS
Stream Modifications:	None	None	None	None
Nuisance Plants (Y/N):	N	N	N	N
Report Number:				
STORET No.:	490065	770156	770155	770160
Stream Name:	Milakokia River Betty Doe Lake Rd	Creighton River Creighton Truck Trail	West Branch Manistique River Hickey Truck Trail	West Branch Manistique River off Creighton Truck Trail
Road Crossing/Location:				
County Code:	49	77	77	77
TRS:	42N12W18	44N16W01	45N16W35	44N15W07
Latitude (dd):	46.02832	46.24108	46.25291	46.22857
Longitude (dd):	-85.84404	-86.24185	-86.26238	-86.23506
Ecoregion:	NLAF	NLAF	NLAF	NLAF
Stream Type:	Warmwater	Warmwater	Warmwater	Warmwater
USCS Basin Code:	4060107	4060106	4060106	4060106
* Applies only to Riffle/Run stream Surveys ** Applies only to Glide/Pool stream Surveys				