2011-2012 SURVEY OF THE DRAGONFLIES AND DAMSELFLIES (ODONATA) OF THE COVE POINT LNG PROPERTY (CALVERT COUNTY, MARYLAND)

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Rambur's Forktail (*Ischnura ramburii*) Cove Point Marsh Richard Orr June 4, 2011

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ABSTRACT

Full property surveys for dragonflies and damselflies were completed in 1998-1999 and again in 2011-2012. In addition, a limited survey was completed along the LNG pipeline right-of-way in 2005. To date, sixty-two (62) species of dragonflies and damselflies have been recorded from the Cove Point LNG property. Seven of the sixty-two species were added since the end of the 1998-1999 survey. Two (2) State-listed Maryland Endangered dragonflies (*Gomphus rogersi* and *Somatochlora filosa*) complete their life cycle on the property. The known larval site of *Gomphus rogersi* is a small stream along the pipeline right-of-way while the larval site of *Somatochlora filosa* is Cove Point Marsh.

Between the times of the two full property surveys, the larval site of *Somatochlora filosa* (Cove Point Marsh) was impacted by storm breaches resulting in saltwater from the Chesapeake Bay mixing with the freshwater of the marsh. In addition, the larval site of *Gomphus rogersi* (along the LNG pipeline right-of-way) had been intersected by the placement of an additional underground pipeline. Both sites have undergone extensive environmental restoration in the hopes of returning these wetlands to their original condition. Before the 2011-2012 survey the fate of the two State-listed species that were first reported during the 1998-1999 survey were unknown.

Somatochlora filosa and *Gomphus rogersi* were relocated during the 2011-2012 survey. Both species were found in reduced numbers in comparison with the 1998-1999 survey. The reduction in the number of individual *Somatochlora filosa* is likely due to a decrease in the size of the larval habitat that is now restricted just to the northern section of Cove Point Marsh. The reduction in the number of individual *Gomphus rogersi* is the result of a beaver dam that flooded the small stream where the larvae previously existed. Human intervention has returned the *Gomphus rogersi* habitat to its 1999 condition by removing the dam plus restoring the surrounding environment from the burying of the new pipeline. The restoration of Cove Point Marsh is currently in progress and it is reasonable to assume that when (or if) the southern section of Cove Point Marsh returns to a healthy freshwater habitat that *Somatochlora filosa* will recover to its earlier numbers.

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INTRODUCTION

A baseline survey of the dragonflies and damselflies was completed at the Cove Point LNG property (Cove Point) in 1998 and 1999 (Orr, 2001). In the passing decade several changes have occurred at Cove Point. Most evident was the installation of a LNG pipeline along the western end of the facility and the breaches to the berm separating the freshwater Cove Point Marsh from the saltwater of the Chesapeake Bay.

These two events had the potential to impact two threatened Maryland-listed dragonflies that were recorded during the 1998-1999 survey. One of the species (*Gomphus rogersi*) larvae lives in a stream that crosses the LNG pipeline right-of-way where extensive construction had taken place. The other species (*Somatochlora filosa*) larvae inhabits Cove Point Marsh which had become brackish due to the intrusion of the bay waters.

The purpose of the 2011-2012 survey was to: 1) survey for the threatened *Somatochlora filosa* and *Gomphus rogersi* to determine their current population health and larval distribution at Cove Point, 2) to check the condition of the dragonfly and damselfly populations currently at Cove Point Marsh to determine the degree of initial damage to the marsh and the degree of potential for recovery and 3) complete a general survey of all wetland sites at Cove Point with emphases on the northern (Gray's Creek) area that had received only limited visits during the 1998-1999 survey.

METHODS

Nine field days were conducted at Cove Point during the 2011-2012 odonate survey. Table 1 provides a summary of all dates spent at Cove Point where data were collected for this report. Table 1 includes the 2011-2012 survey, the 1998-1999 survey, the 2005 GAI Pipeline Survey and additional field visits during Cove Point Science Advisory meetings.

Table 1: Total Days Spent For Current and Preceding Surveys and Visits

1st Survey (Cove Point LNG)	1998	Jun 5, July 7, 29, Aug 22, Sep 11, 30, Oct 14, Dec 2
1st Survey (Cove Point LNG)	1999	Jan 3, Mar 31, Apr 23, 30, May 21, Jun 6, Jul 8, Sep 3, Oct 7
Science Advisory Meetings	2000	Jun 2, 17
Science Advisory Meeting	2001	May 4
Science Advisory Meeting	2002	Mar 29
2nd Survey (GAI-Gasline Survey)	2005	Mar 19, 20, May 29, Jun 14, 27, Apr 21
3rd Survey (Cove Point LNG)	2011	May 10, 24, Jun 4, Jul 24
3rd Survey (Cove Point LNG)	2012	Apr 1, May 5, 19, Jun 16, Aug 29

The field surveys focused on adult, larva and cast skin identification. All identified individual odonates were recorded by date and location, along with any relevant observed behavior (e.g. oviposition, mating and territoriality).

The majority of identifications were done through direct observation (with the aid of binoculars), or by netting and release. However, difficult or questionable identifications were taken to the lab for further examination. Photographs of the various species of dragonflies and damselflies were taken in their natural habitat whenever possible. Those

specimens kept as vouchers have been labeled and prepared and will be deposited in the National Insect Collection located at the Smithsonian Natural History Museum.

RESULTS

The results of the information on all of the dragonfly and damselfly species are summarized in Table 2 and Table 3. In Table 2 the sixty-two (62) species of dragonflies and damselflies known from Cove Point are provided along with scientific name, English common name, relative adult abundance and the known flight period. Table 3 lists the scientific names, English common names, where at Cove Point the larval development (life cycle) is completed and the year or years that the species were recorded. Species found during the 2011-2012 survey that had not previously been reported from Cove Point are highlighted in yellow in Table 3.

Table 2: The Dragonflies and Damselflies of Cove Point LNG Property: Abundance and Flight Period (Calvert County, Maryland, 1998-2012 Surveys)

ADULT ABUNDANCE (A) = Abundant and conspicuous in appropriate habitat
(C) = Common in suitable habitat
(U) = Uncommon but present, could easily be missed in suitable habitat
(R) = Rare not likely to encounter

	GENUS	SPECIES	ENGLISH NAME	ADULT ABUNDANCE	FLIGHT PERIOD
1	*Tachopteryx*	*thoreyi*	Grey Petaltail	U	24-May to 17-Jun
2	*Aeshna*	*umbrosa*	Shadow Darner	R	14-Oct to 2-Dec
3	*Anax*	*junius*	Common Green Darner	C	29-Mar to 14-Oct
4	*Anax*	*longipes*	Comet Darner	R	5-Jun to 7-Jul
5	*Basiaeschna*	*janata*	Springtime Darner	R	21-Apr to 5-May
6	*Boyeria*	*vinosa*	Fawn Darner	R	3-Sep
7	*Epiaeschna*	*heros*	Swamp Darner	U	4-May to 17-Jul
8	*Gomphaeschna*	*furcillata*	Harlequin Darner	R	21-Apr to 24-May
9	*Nasiaeschna*	*pentacantha*	Cyrano Darner	U	5-May to 17-Jun
10	*Gomphus*	*lividus*	Ashy Clubtail	U	23-Apr to 4-May
11	*Gomphus*	*rogersi*	Sable Clubtail	R	10-May to 14-Jun
12	*Hagenius*	*brevistylus*	Dragonhunter	R	16-Jun
13	*Cordulegaster*	*bilineata*	Brown Spiketail	U	31-Mar to 14-Jun
14	*Cordulegaster*	*maculata*	Twin-spotted Spiketail	R	23-Apr to 10-May
15	*Didymops*	*transversa*	Stream Cruiser	U	21-Apr to 10-May
16	*Epitheca*	*cynosura*	Common Baskettail	C	1-Apr to 14-Jun
17	*Epitheca*	*princeps*	Prince Baskettail	R	4-Jun
18	*Somatochlora*	*filosa*	Fine-lined Emerald	R	29-Aug to 30-Sep
19	*Somatochlora*	*tenebrosa*	Clamp-tipped Emerald	U	16-Jun to 11-Sep
20	*Brachymesia*	*gravida*	Four-spotted Pennant	C	17-Jun to 3-Sep
21	*Celithemis*	*elisa*	Calico Pennant	C	21-May to 22-Aug
22	*Celithemis*	*eponina*	Halloween Pennant	C	4-Jun to 11-Sep
23	*Celithemis*	*fasciata*	Banded Pennant	U	4-Jun to 7-Jul
24	*Erythemis*	*simplicicollis*	Common Pond Hawk	A	5-May to 30-Sep
25	*Erythrodiplax*	*berenice*	Seaside Dragonlet	U	24-May to 11-Sep

	GENUS	SPECIES	ENGLISH NAME	ADULT ABUNDANCE	FLIGHT PERIOD
26	*Libellula*	*axilena*	Bar-winged Skimmer	R	14-Jun to 8-Jul
27	*Libellula*	*cyanea*	Spangled Skimmer	C	19-May to 8-Jul
28	*Libellula*	*deplanata*	Blue Corporal	A	1-Apr to 21-May
29	*Libellula*	*flavida*	Yellow-sided Skimmer	R	24-May to 24-Jul
30	*Libellula*	*incesta*	Slaty Skimmer	C	4-Jun to 30-Sep
31	*Libellula*	*luctuosa*	Widow Skimmer	C	19-May to 11-Sep
32	*Libellula*	*lydia*	Common Whitetail	A	21-Apr to 30-Sep
33	*Libellula*	*needhami*	Needham's Skimmer	A	19-May to 14-Oct
34	*Libellula*	*pulchella*	Twelve-spotted Skimmer	R	17-Jun
35	*Libellula*	*semifasciata*	Painted Skimmer	U	4-May to 11-Sep
36	*Libellula*	*vibrans*	Great Blue Skimmer	U	24-May to 11-Sep
37	*Pachydiplax*	*longipennis*	Blue Dasher	A	19-May to 14-Oct
38	*Pantala*	*flavescens*	Wandering Glider	C	24-May to 11-Sep
39	*Pantala*	*hymenaea*	Spot-winged Glider	C	21-May to 22-Aug
40	*Perithemis*	*tenera*	Eastern Amberwing	A	19-May to 3-Sep
41	*Sympetrum*	*vicinum*	Autumn Meadowhawk	A	14-Oct to 2-Dec
42	*Tramea*	*carolina*	Carolina Saddlebags	C	5-May to 30-Sep
43	*Tramea*	*lacerata*	Black Saddlebags	C	19-May to 11-Sep
44	*Tramea*	*onusta*	Red-mantled Saddlebags	R	29-Jul
45	*Calopteryx*	*maculata*	Ebony Jewelwing	C	23-Apr to 29-Jul
46	*Archilestes*	*grandis*	Great Spreadwing	R	11-Sep to 30-Sep
47	*Lestes*	*australis*	Common Spreadwing	C	23-Apr to 30-Sep
48	*Lestes*	*inaequalis*	Elegant Spreadwing	R	16-Jun
49	*Lestes*	*rectangularis*	Slender Spreadwing	R	19-May to 29-Aug
50	*Amphiagrion*	*saucium*	Eastern Red Damsel	U	10-May to 14-Jun
51	*Argia*	*fumipennis*	Variable Dancer	R	19-May to 11-Sep
52	*Argia*	*moesta*	Powdered Dancer	R	24-Jul
53	*Enallagma*	*aspersum*	Azure Bluet	C	5-May to 11-Sep
54	*Enallagma*	*basidens*	Double-striped Bluet	U	5-Jun to 11-Sep
55	*Enallagma*	*civile*	Familiar Bluet	A	4-May to 2-Dec
56	*Enallagma*	*divagans*	Turquoise Bluet	R	16-Jun
57	*Enallagma*	*geminatum*	Skimming Bluet	R	4-Jun
58	*Enallagma*	*signatum*	Orange Bluet	C	3-Sep to 14-Oct
59	*Ischnura*	*hastata*	Citrine Forktail	U	21-Apr to 30-Sep
60	*Ischnura*	*posita*	Fragile Forktail	A	1-Apr to 30-Sep
61	*Ischnura*	*ramburii*	Rambur's Forktail	A	21-Apr to 14-Oct
62	*Ischnura*	*verticalis*	Eastern Forktail	C	21-Apr to 30-Sep

Table 3: The Dragonflies and Damselflies of Cove Point LNG Property: Larval Locations and Years Seen (Calvert County, Maryland, 1998-2012 Surveys)

LARVAL CYCLE COMPLETED
(PS) Permanent Forest Seeps Grays Creek Drainage
(SW) Swamps (Permanent or Temporary)
(GS) Sunny Grassy Seeps or Pools (Permanent or Temporary)
(GC) Grays Creek Proper
(TR) Tributaries running into Grays Creek
(CM) Cove Point Marsh
(LO) Lake Levy & Osborn Pond
(SP) Settling Pond
(DS) Drainage streams from Settling Pond, Lake Levy & Osborn Pond
(N/A) No evidence that larval development occurs in area – adults migratory or strays

SPECIES HIGHLIGHTED WERE NEW SPECIES RECORDS FROM THE 2011-2012 SURVEY

GENUS	SPECIES	ENGLISH NAME	LARVAL CYCLE COMPLETED	YEARS RECORDED
Tachopteryx	*thoreyi*	Grey Petaltail	PS	00, 05, 11, 12
Aeshna	*umbrosa*	Shadow Darner	GC, TR	98
Anax	*junius*	Common Green Darner	CM, LO, SP, GS	98, 99, 00, 02, 05, 11, 12
Anax	*longipes*	Comet Darner	LO, SP	98, 99, 00
Basiaeschna	*janata*	Springtime Darner	GC	11, 12
Boyeria	*vinosa*	Fawn Darner	GC	99
Epiaeschna	*heros*	Swamp Darner	SW	99, 00, 01, 05, 11, 12
Gomphaeschna	*furcillata*	Harlequin Darner	SW	99, 01, 11
Nasiaeschna	*pentacantha*	Cyrano Darner	GC, SW	11, 12
Gomphus	*lividus*	Ashy Clubtail	GC, TR, DS	99, 01, 12
Gomphus	*rogersi*	Sable Clubtail	GC, TR	99, 05, 11
Hagenius	*brevistylus*	Dragonhunter	GC, TR	98, 12
Cordulegaster	*bilineata*	Brown Spiketail	GC, TR, DS	99, 05, 11, 12
Cordulegaster	*maculata*	Twin-spotted Spiketail	GC, TR, DS	99, 01, 12
Didymops	*transversa*	Stream Cruiser	GC	99, 11, 12
Epitheca	*cynosura*	Common Baskettail	LO, SP, SW	99, 00, 01, 05, 11, 12
Epitheca	*princeps*	Prince Baskettail	N/A	11
Somatochlora	*filosa*	Fine-lined Emerald	CM?	98, 99, 12
Somatochlora	*tenebrosa*	Clamp-tipped Emerald	GC, TR, DS	98, 99, 00, 11, 12
Brachymesia	*gravida*	Four-spotted Pennant	LO, CM	98, 99, 00, 11
Celithemis	*elisa*	Calico Pennant	LO, CM, SP	98, 99, 00, 05, 11, 12
Celithemis	*eponina*	Halloween Pennant	LO, CM, SP	98, 99, 00, 11, 12
Celithemis	*fasciata*	Banded Pennant	LO	98, 11
Erythemis	*simplicicollis*	Common Pond Hawk	SW, LO, SP, CM	98, 99, 00, 05, 11, 12
Erythrodiplax	*berenice*	Seaside Dragonlet	CM	98, 08, 11
Libellula	*axilena*	Bar-winged Skimmer	SW, GS	99, 05
Libellula	*cyanea*	Spangled Skimmer	LO, SP, CM	98, 99, 00, 05, 08, 11, 12
Libellula	*deplanata*	Blue Corporal	LO, SP, CM	99, 11, 12
Libellula	*flavida*	Yellow-sided Skimmer	GS	05, 11
Libellula	*incesta*	Slaty Skimmer	LO, SP, CM	98, 99, 00, 08, 11, 12
Libellula	*luctuosa*	Widow Skimmer	LO, SP, CM	98, 99, 00, 05, 11, 12
Libellula	*lydia*	Common Whitetail	SW, GS, CM, LO, SP	98, 99, 00, 01, 05, 08, 11, 12
Libellula	*needhami*	Needham's Skimmer	LO, SP, CM	98, 99, 00, 05, 08, 11, 12
Libellula	*pulchella*	Twelve-spotted Skimmer	N/A	98, 00
Libellula	*semifasciata*	Painted Skimmer	GS	98, 99, 00, 01, 05, 11, 12

GENUS	SPECIES	ENGLISH NAME	LARVAL CYCLE COMPLETED	YEARS RECORDED
Libellula	*vibrans*	Great Blue Skimmer	SW, LO	98, 05, 11
Pachydiplax	*longipennis*	Blue Dasher	SW, GS, CM, LO, SP	98, 99, 00, 05, 08, 11, 12
Pantala	*flavescens*	Wandering Glider	LO? possibly N/A	98, 99, 00, 11, 12
Pantala	*hymenaea*	Spot-winged Glider	LO? SP? possibly N/A	98, 99, 00, 11
Perithemis	*tenera*	Eastern Amberwing	LO, SP	98, 99, 00, 11, 12
Sympetrum	*vicinum*	Autumn Meadowhawk	LO, SP	98
Tramea	*carolina*	Carolina Saddlebags	LO, SP	98, 99, 00, 11, 12
Tramea	*lacerata*	Black Saddlebags	LO, SP	98, 99, 00, 08, 11, 12
Tramea	*onusta*	Red-mantled Saddlebags	N/A	98
Calopteryx	*maculata*	Ebony Jewelwing	GC, TR, DS	98, 99, 00, 05, 11, 12
Archilestes	*grandis*	Great Spreadwing	TR, DS	98
Lestes	*australis*	Common Spreadwing	LO, SP, SW	98, 99
Lestes	*inaequalis*	Elegant Spreadwing	TR?	12
Lestes	*rectangularis*	Slender Spreadwing	LO, SP, SW	98, 11, 12
Amphiagrion	*saucium*	Eastern Red Damsel	GS	99, 05, 11
Argia	*fumipennis*	Variable Dancer	LO, SP	98, 00, 11, 12
Argia	*moesta*	Powdered Dancer	GC	11
Enallagma	*aspersum*	Azure Bluet	LO, SP, CM	98, 99, 11, 12
Enallagma	*basidens*	Double-striped Bluet	LO, SP, CM?	98
Enallagma	*civile*	Familiar Bluet	SW, GS, CM, LO, SP	98, 99, 00, 01, 05, 11, 12
Enallagma	*divagans*	Turquoise Bluet	TR	12
Enallagma	*geminatum*	Skimming Bluet	LO, SP, CM?	11
Enallagma	*signatum*	Orange Bluet	LO, SP, CM	98, 99,
Ischnura	*hastata*	Citrine Forktail	GS, LO, SP	98, 99, 00, 11
Ischnura	*posita*	Fragile Forktail	SW, GS, CM, LO, SP	98, 99, 01, 05, 11, 12
Ischnura	*ramburii*	Rambur's Forktail	LO, SP, CM	98, 99, 00, 11, 12
Ischnura	*verticalis*	Eastern Forktail	SW, GS, CM, LO, SP	98, 99, 11

DISCUSSION

"New" Dragonfly-Damselfly Species Found In 2011-2012

Seven new species (three dragonflies and four damselflies) were found during the 2011-2012 survey that had not previously been recorded from Cove Point. All seven of the new species are highlighted in yellow in Table 3. Five of the new species (Springtime Darner, Cyrano Darner, Elegant Spreadwing, Powdered Dancer and Turquoise Bluet) were found while surveying the far northern section of the property that borders on Grays Creek and its associated wetlands. This area had not previously been surveyed in depth due to the difficulty in reaching this area by foot from the south. Access to the Cove Point Grays Creek area in 2011-2012 was accomplished by entering the property from the north from the Red Trail at Calvert Cliffs State Park. Grays Creek provided a more extensive stream habitat than other locations at Cove Point explaining the finding of the five new species.

The Skimming Bluet was found at Lake Levy and the Settling Pond in 2011-2012 but was not found during the 1998-1999 survey. This small damselfly easily blends in with

the larger and far more abundant Familiar Bluet and why it was missed in 1998-1999 is unknown. It likely was present at Cove Point during the earlier survey. It is possible that the Skimming Bluet population at Cove Point has increased in numbers during the last ten years resulting in it becoming easier to find.

A single Prince Baskettail was seen flying over Cove Point Marsh on June 4, 2011. This is the only record of this species from Cove Point. Prince Baskettails are large dragonflies that are capable of dispersing long distances. There is currently no evidence that this species breeds at Cove Point.

Changes in Cove Point Marsh Dragonfly and Damselfly Populations

Significant changes occurred to Cove Point Marsh between the 1998-1999 survey and the 2011-2012 survey. Cove Point Marsh was identified early on as a conservation significant site by the State of Maryland and over the past decade effort has been put into studying, surveying and protecting the marsh from invasive phragmites.

Soon after the 1998-1999 survey was completed, a series of severe weather events caused breaches in the berm that had historically separated the bay from the marsh. The massive influx of saltwater into the marsh severely compromised the freshwater plants and animals living in the marsh.

Extensive effort was undertaken to strengthen and protect the marsh after the berm was breached in the hope that it would recover to its earlier condition. The mitigation project was mostly completed by the time the 2011-2012 survey started and detailed long term monitoring of the marsh had been in progress since July of 2010.

The dragonfly and damselfly species found in Cove Point Marsh during 1998-1999 were generally consistent with other freshwater ponds and marshes in the area. Generally the assemblages were the same as those found along the marshy edges of Lake Levy and Osborn Pond. However one significant difference was the presence of the Fine-lined Emerald (*Somatochlora filosa*) found breeding along the western edge of Cove Point Marsh. This species was not found elsewhere at Cove Point. The Fine-lined Emerald is designated as an S2 (state rare -- imperiled in Maryland) by the Department of Natural Resources (DNR, 2010). The status of this species after the marsh was breached was not known before the completion of the 2011-2012 survey.

For the purpose of this report, I have divided Cove Point Marsh into a Northern Section and a Southern Section. The smaller Northern Section consists of the remnants of the old Wilbur Pond north to the end of the marsh proper. Included in the Northern Section are the Boardwalk Marsh and the smaller open pond just to its north. Two streams feed freshwater into the Northern Section. One stream is just north and parallel to the boardwalk entrance road. This stream flows from the Settling Pond into the marsh. The other stream is just to the south of the entrance road which it also parallels. This stream is fed by drainage and leakage from Lake Levy and Osborn Pond (remnants of the old

Wilbur Creek). Both these creeks provide a reasonably consent flow of freshwater into the Northern Section of the marsh.

The Southern Section of the marsh is larger than the Northern Section and contains the three monitoring stations. Freshwater flow into the Southern Section is limited to mostly seepage, rain and the influx of freshwater from the Northern Section. The Southern Section is still brackish (as of 2012) while the Northern Section retains enough freshwater to support a continuance of the pre-existing biota of Cove Point Marsh.

There is a reasonably sharp demarcation of fresh versus brackish water species between the Northern Section and the Southern Section. This might be entirely due to the freshwater influx from the two creeks feeding into the Northern Section but the biological change is so abrupt that it leads me to think that there is also a partial hydrological disconnect between the Northern Section and the Southern Section of the marsh. This boundary may be due to a slight ground raise between the two sections of the marsh. Whatever the cause, there seems to be something limiting the exchange of waters between the Northern Section and the Southern Section.

Freshwater dragonflies and damselflies were well established in the Northern Section of the marsh during the 2011-2012 survey; including the rare Fine-lined Emerald (*Somatochlora filosa*). In addition, calling frogs and spotted turtles were also present indicating a freshwater habitat. Some brackish water intrusion did occur in the recent past since Blue Crabs were occasionally seen in the open areas of the Northern Marsh. I saw no difference in the species composition in the Northern Section between the 1998-1999 survey and the 2011-2012 survey except for a reduction in numbers of individuals. The reason for the reductions in numbers is likely due to the result of the reduced size of the total usable marsh (north and south sections combined) for breeding.

The Southern Section of the marsh is still brackish but in a steady recovery to freshwater due to the restoration effort. The three monitoring stations located in the Southern Section reflect this positive trend as shown in Table 4 (YSI, 2012). This table shows the 1st reading from the monitoring stations and the reading at the time of the writing of this report.

Table 4: Salinity Readings from YSI Remote Monitoring Stations at Cove Point Marsh
Seawater is approximately 35 ppt
Bay Water at Cove Point = 15-18 ppt
Brackish Water = 0.5–20 ppt
Fresh Water is less than 0.5 ppt

MONITORING STATIONS	SALINITY (ppt) JULY 4, 2010	SALINITY (ppt) OCTOBER 20, 2012
South Point	8.19 ppt	1.62 ppt
Mid Point	9.30 ppt	1.62 ppt
North Point	6.98 ppt	1.65 ppt

With the exception of the Seaside Dragonlet (a brackish water species) no dragonflies or damselflies in 2011 were seen utilizing the Southern Section of the marsh for breeding. However, in 2012 a few species that are semi-tolerant of brackish water were found in limited numbers with males establishing territories and females ovipositing along the marshy edges of the Southern Section. It is not a given that their larvae will succeed in completing their life cycle in the Southern Section but it does show that conditions have improved enough for the adults to attempt to utilize the site for larval development. The species observed were the damselflies Familiar Bluet and Rambur's Forktail, and the dragonflies Eastern Pondhawk, Needham's Skimmer and Blue Dasher.

It is reasonable to assume that if the Southern Section returns to a healthy freshwater marsh that all the species present in the marsh during the 1998-1999 survey will return.

Status of the Rare and Threatened Dragonfly Species of Cove Point

Maryland's Department of Natural Resources updated their threatened and endangered animals list (DNR, 2010) including several changes in their listed dragonflies and damselflies. Most significant from a Cove Point perspective is that the Grey Petaltail (*Tachopteryx thoryi*) is no longer listed as a threatened species. The larvae of this species can be found in the forested seeps adjacent to Grays Creek and its tributaries at Cove Point. The adults were not difficult to find during the 2011-2012 survey in sunny openings near their larval habitat. The Grey Petaltail was not recorded during 1998-1999 probably since the survey did not focus on the Grays Creek area.

Two threatened (S2) species of dragonflies are currently known from Cove Point. The Sable Clubtail (*Gomphus rogersi*) and the Fine-lined Emerald (*Somatochlora filosa*) were both found in the 1998-1999 and the 2011-2012 surveys.

The Sable Clubtail larval habitat is a small stream that intercepts the LNG pipeline right-of-way on the western section of the property. The population of this dragonfly had been greatly compromised compared to the healthy population that was present in the 1998-1999 survey. Only a single larva was found at this location in 2011-2012 despite extensive sampling of the stream.

The reason for the disappearance of Sable Clubtail larvae from the stream was due to beavers damming the area in 2007. This resulted in the disappearance of the flowing sandy bottom stream that is required for larval development of this species. The beaver dam was removed and the stream returned to its former condition during the installation of the new LNG pipeline.

A healthy population of the Sable Clubtail exists in the sandy bottom sections of Gray's Creek just north of Cove Point at Calvert Cliffs State Park. It is likely that the small stream crossing the LNG pipeline right-of-way will eventually be repopulated with the Sable Clubtail.

The Fine-lined Emerald (*Somatochlora filosa*) is still present along Cove Point Marsh but in reduced numbers compared to the data collected during the 1998-1999 survey. It is likely that the Fine-lined Emerald's larval habitat is still intact in the Northern Section of Cove Point Marsh. The reduction in numbers from the earlier survey is probably the result of the Southern Section of the marsh not being able to sustain the larvae of this species due to the increased salinity.

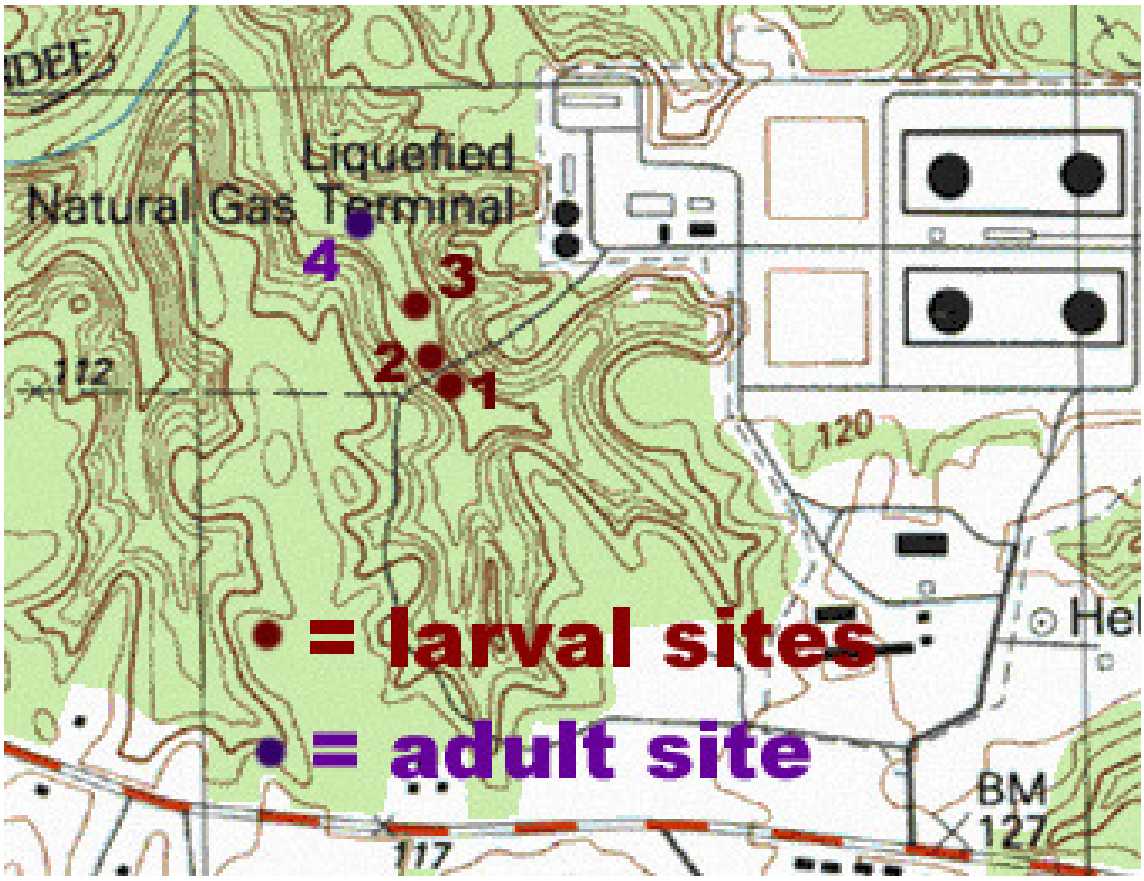
When (or if) the Southern Section of Cove Point Marsh returns to its original condition it is expected to, once again, be utilized by the Fine-lined Emerald.

Details on these threatened dragonflies have been reported to the Maryland Department of Natural Resources using their standard Rare Animal Form. These forms are reproduced in their entirety in this report (see attachments 1 & 2).

ATTACHMENT 1: DNR Rare Animal Form for the *Gomphus rogersi*

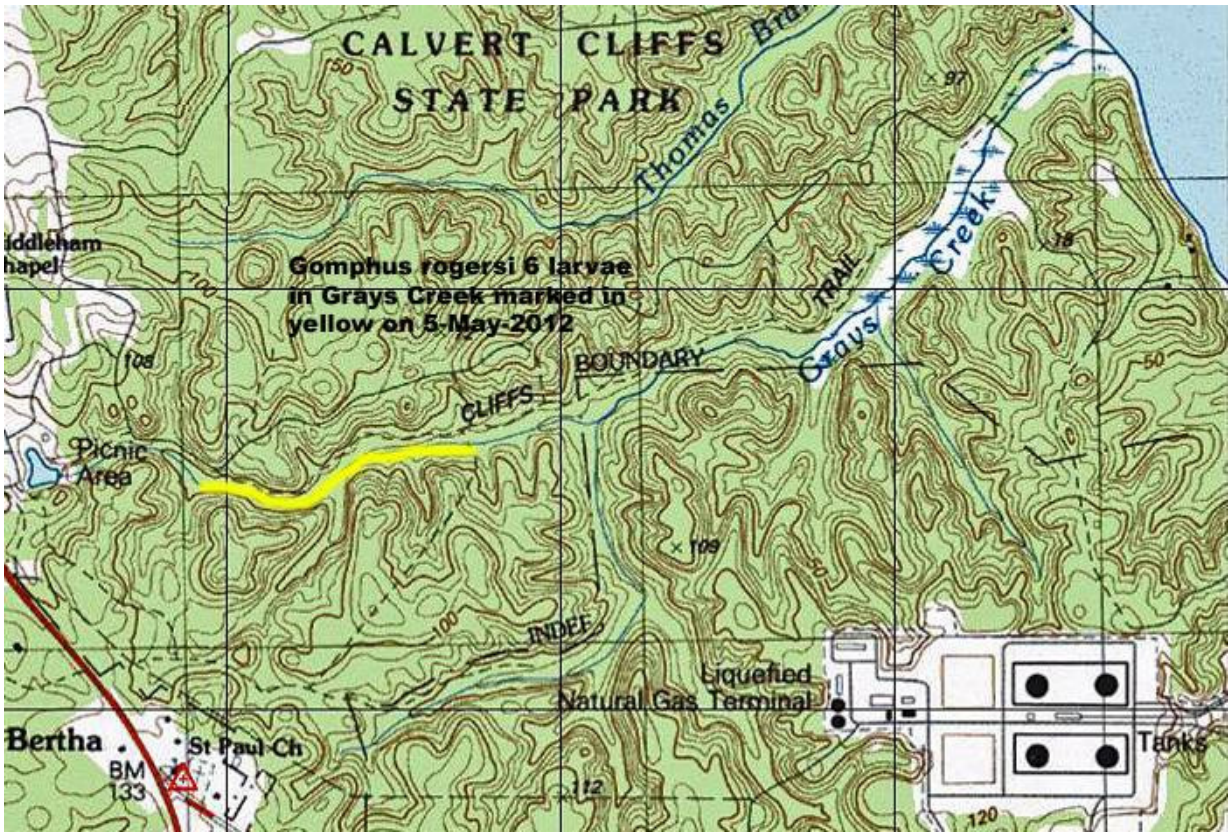
***GOMPHUS ROGERSI* (SABLE CLUBTAIL)**

AUTHOR: Richard Orr
DATE CREATED: 2012-9-25
SPECIES NAME: *Gomphus rogersi* (Sable Clubtail)
SURVEY SITE: ODON1 (Cove Point Gasline Right of Way & Grays Creek at Calvert Cliffs State Park)
COUNTY: Calvet QUAD: Cove Point
DIRECTIONS: **Gasline Right-of-Way** from Cove Point LNG plant boundary fence going west. Location of the eastern most stream crossing the gasline right-of-way at Cove Point has a GPS reading, at the intake pipe, of N38° 23.328 W 076° 24.975.



LARVAL AND ADULT SITES AT COVE POINT LNG PROPERTY

Grays Creek Take red trail from Calvert Cliffs State Park to Grays Creek from the intersections of the yellow trail to the intersection of the blue trail.



OBSERVERS: Richard Orr
LAST SURVEY DATE: 2012-05-05
LAST OBSERVED: 2012-05-05
FIRST OBSERVED: 1999-03-31

EO DATA:	1999-03-31	three 2nd year larvae collected – 1st map site location Cove Point
	1999-04-23	seven 2nd year larvae collected alive and reared in lab (3 emerged May 5, 2 emerged May 16, 1 emerged May 17 and 1 emerged May 18) – 1st map site location (Cove Point)
	2005-03-19	two 1st year larvae collected (1st and 3rd map site Cove Point)
	2005-03-20	one 2nd year larvae collected (2nd map site location Cove Point)
	2005-06-14	one adult male seen (4th site on map) Cove Point
	2011-05-10	one larva found (photographed) 4th map site location Cove Point
	2012-05-05	six larvae found (none collected) on Grays Creek

EO RANK: Excellent or Good (AB) DATE ASSIGNED: 2005-06-18

COMMENTS ABOUT EO RANK: The Grays Creek site is the best site for this species known from the Coastal Plain of Maryland. It is likely the source population for the smaller population found at Cove Point LNG Property. Although, the population from Muddy Creek in Garrett County is much larger there are enough

differences between the two populations (color of larvae, size of preferred streams, preference for different substrates) to warrant the possibility that we are dealing with two separate subspecies or possibly sibling species.

ID PROBLEMS: Yes COMMENTS: There are no keys for early instar gomphid larvae. This was why there was a need for the initial rearing to adults. Mature larvae and adults can be keyed to species by someone familiar with clubtail dragonflies. Currently, I have a good series of cast skins and larval samples of various instars which can be used to make identifications. For Calvert County the task is made easier because *Gomphus rogersi* is the only member of the subgenus *Gomphurus* currently known from the county. Identification of early instars at locations where multiple species of the subgenus *Gomphurus* are present should be done with care.

DATA SENSITIVE: No

CONFIDENCE EXTENT: No COMMENTS: Known from within the area surveyed; but extent of the population not known downstream from the surveyed area along Gray's Creek. At Cove Point the habitat is not sufficient for larval development of this species on the other streams crossing the pipeline.

ADDITIONAL INVENTORY NEEDED: Yes COMMENTS: It is possible that this species may also be further distributed along Grays Creek beyond the area surveyed.

SPECIMEN: **Collector**: Richard Orr **Collection #**: By date and species
Repository: Personal Collection

All cast skins, larvae and reared adults have been kept as voucher specimens except for the single adult male seen in June of 2005 and the six larvae found along Grays Creek in 2012. The three larvae collected on March 19-20, 2005 are in the photo below. Their lengths are 24mm, 16mm, and 13mm respectively. The larger is a 2nd year larva and the smaller two are 1st year larvae.

PHOTO TAKEN: Slides (35mm) of reared adults were taken in 1999 which are in the author's personal collection. Photo below is of a live 2nd year larvae taken on March 20, 2005 (note greenish sheen which is lacking from *Gomphus rogersi* larvae that occur in Garrett County).

HABITAT DESCRIPTION: *Gomphus rogersi* adults from the Coastal Plain are found along small forested streams in which the canopy has been removed (sunlit) historically by natural disturbances; but in the case of Cove Point because of the right-of-way. The presence of the right-of-way is advantageous to this dragonfly and not a detriment. The other requirements for this species are permanent clean running water, with a clean sand bottom and with minimum scouring during the year. Larvae are found scattered along the stream in sandy areas for most of their two year larval life but appear to become phototrophic once they reach maturity where the 2nd year larvae move to sunny locations along the stream before they emerge. The larvae bury themselves in the sand with only the eyes and tip of the abdomen showing. The mature larvae (2nd year) are likely feeding on Northern two-lined salamanders and/or the large Crane fly larvae (Tipulidae) which are both common in the stream sections where *G. rogersi* was found.

Site #1 location (stream through right-of-way) upstream from intake pipe located at N38° 23.328 W 076° 24.975 to southern edge of right-of-way. Larvae found on three field dates at this location.

Site #2 location (3 feet north of out take pipe) downstream from right-of-way at N 38° 23.331 W 076° 24.985. One larva collected on March 20, 2005.

Site #3 location collected 170 ft downstream from intake pipe)(N 38° 23.359 W 076° 25.003) 1 larva collected on March 19, 2005.

Site #4 location of adult sighting on June 14, 2005 and larva find of 2011-05-10. Natural clearing (tornado caused?) downstream just north of the pipeline. N38^{o} 23.383 W 076^{o} 25.001; approximately 410 feet from the intake pipe.

GENERAL COMMENTS: When a thin layer of silt develops over the top of the sand *Cordulegaster bilineata* replaces *G. rogersi*. When the silt dominates the stream bottom *Cordulegaster maculata* becomes the dominant dragonfly. Other insects observed while sampling the stream on March 19-20, 2005 were Ephemeroptera, Plecoptera (adults belonging to the family Leuctridae were already on the wing), Zygoptera (noticed *Calopteryx maculata* in one of the samples), Trichoptera (including some huge 30mm long Phryganeidae belonging to the genus *Ptilstomis*), Tipulidae (at least 4 species) and a number of different families of beetle larvae.

The only stream to harbor *G. rogersi* on the Cove Point property was badly compromised in 2007 when it was flooded due to a beaver dam. This resulted in a large pond which silted over the stream removing the habitat for the dragonfly larvae. The dam and beavers have been removed and the stream returned to its original pre 2007 condition. However, sampling in 2011 recovered only one larva indicating that the population still is not as robust as it was during the 1999 and 2005 surveys. The finding of a healthy population along Gray's Creek in 2011 indicates that *G. rogersi* is likely to return to its normal status along the stream at Cove Point.

GOOGLE MAP SHOWING BEAVER POND OVER 1ST STREAM IN 2007

THREATS & PROTECTION NEEDS: Currently no threats are identified.
MANAGEMENT NEEDS: None identified.
OWNER INFO: For Cove Point: Dominion Cove Point LNG, LP
For Calvert Cliffs State Park: State of Maryland

MD DNR ODONATE FIELD SURVEY FORM
SOURCE FEATURES

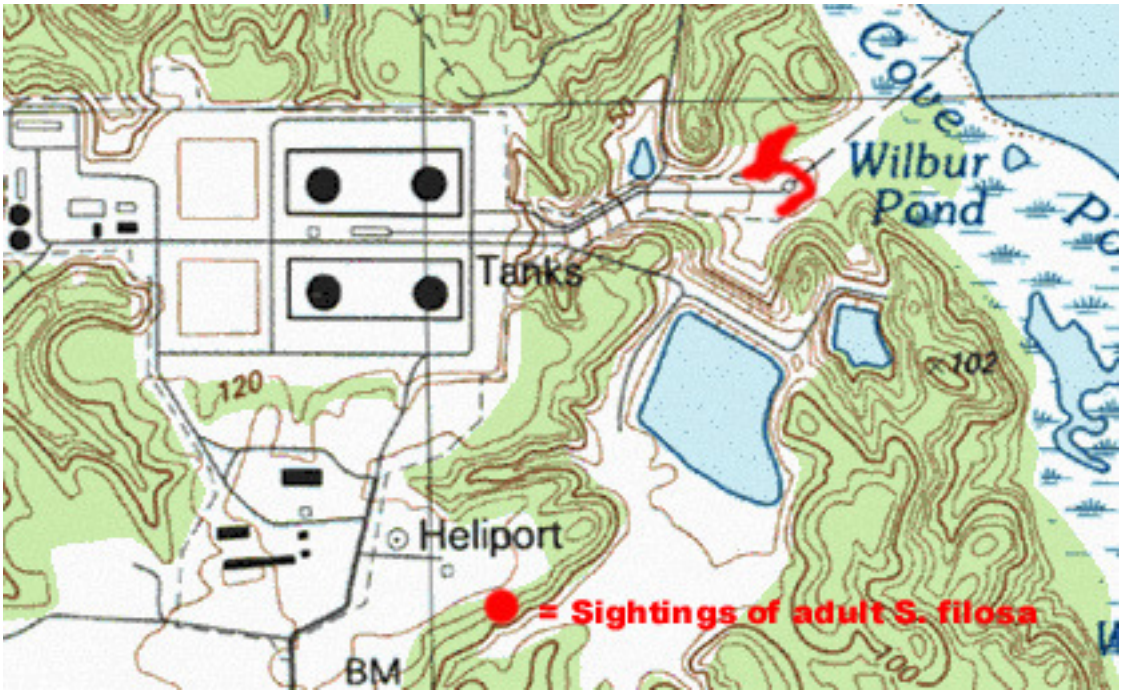
OBSERVER: Richard Orr
SURVEY DATES: See EO DATA Section
OBSERVATION DATA: See EO DATA Section
CONCEPTUAL FEATURE: linear (stream at Cove Point and Grays Creek at Calvert Cliffs State Park)
LOCATIONAL UNCERTAINTY: Negligible
GPS COORDINATES: Cove Point Site #1: N38° 23.328 W076° 24.975
Cove Point Site #2: N38° 23.331 W076° 24.985
Cove Point Site #3: N38° 23.359 W076° 25.003
Cove Point Site #4: N38° 23.383 W076° 25.001
Grays Creek Site: Centered around N38° 23' 39.5" W076° 25' 41.8"
GPS MAKE, MODEL, ACCURRACY: Coordinates with GPS Garmin Etrex Vista unit -- error rate approximately 20 feet
MAPPING COMMENTS: None
LOCATIONAL USE CLASS: Breeding
SURVEY TYPE : Qualitative ground survey

ATTACHMENT 2: DNR Rare Animal Form for *Somatochlora filosa*

***SOMATOCHLORA FILOSA* (FINE-LINED EMERALD)**

AUTHOR OF FORM: Richard Orr
DATE FORM CREATED: 2005-07-04 (revised 2012-09-27)
SPECIES NAME*: Somatochlora filosa*
SURVEY SITE: #ODON1 [Cove Point – edge of Cove Point Marsh]

COUNTY: Calvert QUAD: Cove Point
MAP & DIRECTIONS: Access is restricted and possible only through the main entrance of the Dominion Cove Point LNG Facility. Permission is required before entry and should be requested a few days before coming. All sightings were near the western edge of Cove Point Marsh.



OBSERVER(S): Richard Orr
LAST SURVEY DATE: 2012-08-29
LAST OBSERVED: 2012-08-29
FIRST OBSERVED: 1998-09-30
EO DATA SUMMARY:
2012-08-29 One adult seen – not collected
1998-09-30 Two individuals were seen – one collected and photographed
1999-09-03 Nine individuals were seen – three were collected

SPECIMENS OR PHOTOGRAPHIC DATA: Total of four adults collected. 35mm slides of one specimen was taken by the author. **Collection #**: By date, location and species **Repository**: Personal Collection

LARVAL HABITAT DESCRIPTION: The western edge of Cove Point Marsh.

GENERAL COMMENTS: Cove Point Marsh (the most likely source of the larval life cycle) was breached by the bay and flooded with salt water in the early 2000 resulting in damaging large sections of the marsh. Extensive reconstruction of the marsh to return it to a fresh water marsh is on going. The significance of the 2012 find is that *S. filosa* is likely still completing its life cycle in the marsh – at least in the northern section which was least impacted by the breach.

CITATIONS/REFERENCES:

MD DNR ODONATE FIELD SURVEY FORM
SOURCE FEATURES

OBSERVER: Richard Orr
SURVEY DATES: 1999-09-03 & 1998-09-30 & 2012-08-29
OBSERVATION DATA: See EO DATA SUMMARY
CONCEPTUAL FEATURE: Polygon
LOCATIONAL UNCERTAINTY: Areal Delimited
GPS COORDINATES: None taken in 1999. In 2012 single adult was at N038° 23' 25.3" W076° 24' 08.9"
GPS MAKE, MODEL, ACCURRACY: Garmin eTrex Vista model
MAPPING COMMENTS: None
LOCATIONAL USE CLASS: Adult foraging

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LITERATURE CITED

DNR 2010 Rare, Threatened and Endangered Animals of Maryland.. Maryland's Department of Natural Resources.

Orr, 2005 A Larval and Adult Field Survey for Maryland-listed Endangered, Threatened and Watchlist Dragonflies & Damselflies for the Cove Point LNG Terminal and Proposed TL-532 Natural Gas Pipeline (Calvert County, Maryland). A report to the GAI Inc. 26 pages.

Orr, 2001 The Dragonflies and Damselflies (Insecta:Odonata) of Cove Point, Calvert County, Maryland. The Maryland Naturalist Summer 2001 pages 5-19.

Orr, 1999 The Dragonflies and Damselflies of the Cove Point LNG Site Calvert County, Maryland. Survey Report to the Cove Point Natural Heritage Trust. 31 pages.

YSI, 2012 Remote Monitoring Stations at Cove Point http://www.ysieconet.com/public/WebUI/Default.aspx?hidCustomerID=224