Green algae
(exclusive of diatoms and cyanobacteria)

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No previous studies of the algae have been undertaken in the parks of the Potomac Gorge. During the BioBlitz, the algae team set out to document the algal flora of Great Falls and Turkey Run Parks (GWMP, VA) and portions of the CHOH, MD. The results were compared with a checklist of the known algal flora of the surrounding region in Virginia and Maryland compiled from various sources (Transaeu, 1950; Forest, 1954; Woodson, 1959, 1969; Woodson et al., 1966; Woodson & Gore, 1968; Woodson & Wilson, 1973; Nemeth, 1969; Marshall, 1976, 2001; Woodson & Afzel, 1976; Woodson & Seaburg, 1983; Parson & Parker, 1989; Sheavly & Marshall, 1989; Marshall & Burchardt, 2004). With the exception of a few small groups, the checklist of Maryland freshwater algae was quite incomplete; the Virginia flora is much better known.

Although freshwater algae are ubiquitous, they are highly sensitive to environmental changes, especially those affecting the characteristics of the medium in which they live. As a result, algal communities are known to change over the course of a single season and over the years in response to both naturally occurring phenomena and anthropogenic disturbances. Therefore, the results of the BioBlitz represent only a snapshot of just a portion of the algae flora of the Potomac Gorge. Much more work is needed to better understand the true diversity of the region.

The survey areas have a number of interesting, if not unique, habitats where one may encounter freshwater algae. When not flooded, the Potomac River has a large floodplain north of Great Falls where the river is wide and interrupted by small islands and large rocks that emerge from the water. These islands and rocks often contain small pools filled by rain or receding floodwaters that usually dry up annually. Along the Potomac's shores are a number of eddies and backwaters where large blooms of algae were frequently encountered. These were mostly cyanobacteria, but sometimes chlorophytes such as *Cladophora* and *Hydrodictyon reticulatum*, were present.

A list of the 32 sample locations is presented in Table 1 that includes some of the waters of the Potomac and its tributaries that are diverted into the C & O Canal. Sections of the canal that have fallen into disrepair contain stagnant collections of rainwater, creating a series of artificial tanks harboring algae that remain isolated from the Potomac's seasonal floodwaters.

Besides the river and the canal, there are two additional large bodies of water in the parks that were examined. Clay Pond, in Great Falls Park (GWMP, VA), is a shallow water body that is mostly shaded by large trees and is covered in *Lemna* and *Wolffia* that allows very little light to penetrate the pond. Rodey Pond (CHOH, MD) was also sampled, along with several smaller water bodies on both sides of the Gorge, including seeps, rain puddles, and damp soils. Algae from all of these habitats were collected and identified.

Figure 11 illustrates the algae species encountered during the BioBlitz; of the 68 taxa documented, several were recorded for the first time in the region. We had hoped to report on the conjugating green algae and dinoflagellates of the park (the areas of expertise of the authors), but few of these taxa were encountered during the inventory. It was not possible to identify all algae found during the survey.

The samples discussed below are of special note or were unidentifiable to species due to the lack of reproductive structures. Most of these entries include a brief description followed by an estimate of size based on the length (L.) along the longest axis and width (W.) of the shortest axis. In species where the cell is cylindrical or spherical, the width (W.) refers to the diameter of the organism. The sample numbers refer to vouchered field samples (see Table 1 for localities) deposited in the collections of the NPS.

Phylum Charophyta

Cosmarium sp. 1
(samples PGA2006.06.24-18, 20, 22; Fig. 11 [20]).

Semicells trapeziform, margins crenate; apical margin with five small verrucae; cell surface protruding in midregion in apical view. Too few cells were observed to identify to species, but the observed features are somewhat inconsistent with species of *Cosmarium* known from North America. L. 25-27 µm x. W. 18-23 µm, 13 µm thick in apical view.

Mougeotia sp.
(samples: PGA2006.06.24-15; PGB2006.06.24-9,10)

Several species are present in the park, but it was not possible to identify them without reproductive structures.

Table 1. Algae samples collected during the 2006 Potomac Gorge Bioblitz, 23-25 June 2006.

PARK[1]	LOCATION	SAMPLES
GF	Clay Pond	PGA2006.06.24-1, 2, 3
GF	Pool along Potomac River	PGA2006.06.24-4, 5, 6, 7, 10, 12
GF	Potomac River	PGA2006.06.24-8, 9
GF	Pothole in rocks in Potomac River	PGA2006.06.24-11, 13
GF	Along road near Potomac River	PGA2006.06.24-14, 15
GF	From old canal near viewing area	PGA2006.06.24-16
GF	Wet spot on concrete at visitors center	PGA2006.06.24-17
TR	Puddle at Turkey Run	PGA2006.06.24-18, 19, 20, 21, 22
CHOH	Canal at Lock 10	PGB2006.06.24-1, 2
CHOH	Potomac River at Lock 10	PGB2006.06.24-3, 4
CHOH	Canal at Lock 8	PGB2006.06.24-5
CHOH	Canal at Lock 7	PGB2006.06.24-6, 7, 8
CHOH	Rodey Pond	PGB2006.06.24-9, 10
CHOH	From carapace of N. Red-bellied Cooter	PGD2006.06.25-1

[1]George Washington Memorial Parkway, VA (GF=Great Falls Park; TR=Turkey Run Park); CHOH=C & O Canal National Historical Park, MD.

Sirogonium sp.
(samples: PGB2006.06.24-9, 10)

A single species of this genus was observed. It was not possible to identify it without reproductive characters.

Spirogyra sp.
(samples: PGA2006.06.24-10, 15; PGB2006.06.24-10)

Several species are present in the park, but it was not possible to identify them beyond genus without reproductive structures.

Zygnema sp. (samples: PGA2006.06.24-3, 18, 19, 20)

Several species are present in the park, but it was not possible to identify them beyond genus without reproductive structures.

Phylum Chlorophyta

Basicladia chelonum (Collins) Hoffman
(sample PGD2006.06.25-1; Fig. 11 [24])

W. ca. 27 µm, length variable. Collected from the carapace of a Northern Red-bellied Cooter (*Pseudemys rubriventris*) captured at CHOH, MD. The *Basicladia* sp. previously recorded from Virginia (Forest, 1954) was very likely *B. chelonum*.

Chlamydomonas sp. (samples: PGA2006.06.24-13, 22; PGB2006.06.24-2, 5; Fig. 11 [29]).

Too few cells were observed to identify with confidence to species. L. 16 µm x W. 11 µm.

Oedogonium sp. (samples: PGA2006.06.24-13, 15; PGB2006.06.24-9, 10)

Several species are present in the park, but it was not possible to identify them to species without reproductive structures.

Scenedesmus brasiliense Bohlin forma
(sample: PGB2006.06.24-6; Fig. 11 [13])

Similar to the typical form (Fig. 11 [12]) except that the cells, particularly those near the ends of the cenobium have two ridges along the length of the cell on each side (four on each cell). These ridges seem to be produced at the apices into what would appear to be spines. It is very likely that this form has been described as a separate subspecies or variety from another location; further research is needed to clarify its identity. L. 13 µm x W. 5 µm.

Phylum Chrysophyceae

Lagynion scherffelii Pascher
(sample: PGB2006.06.24-2; Fig. 11 [51])

Living cells were not observed; this is a possible dubious identification and it may be *L. ampullaceum*, but the observed cells seemed less spherical than is typical for that species. L. 6-8 µm x W. 3-4 µm. Not reported from Virginia.

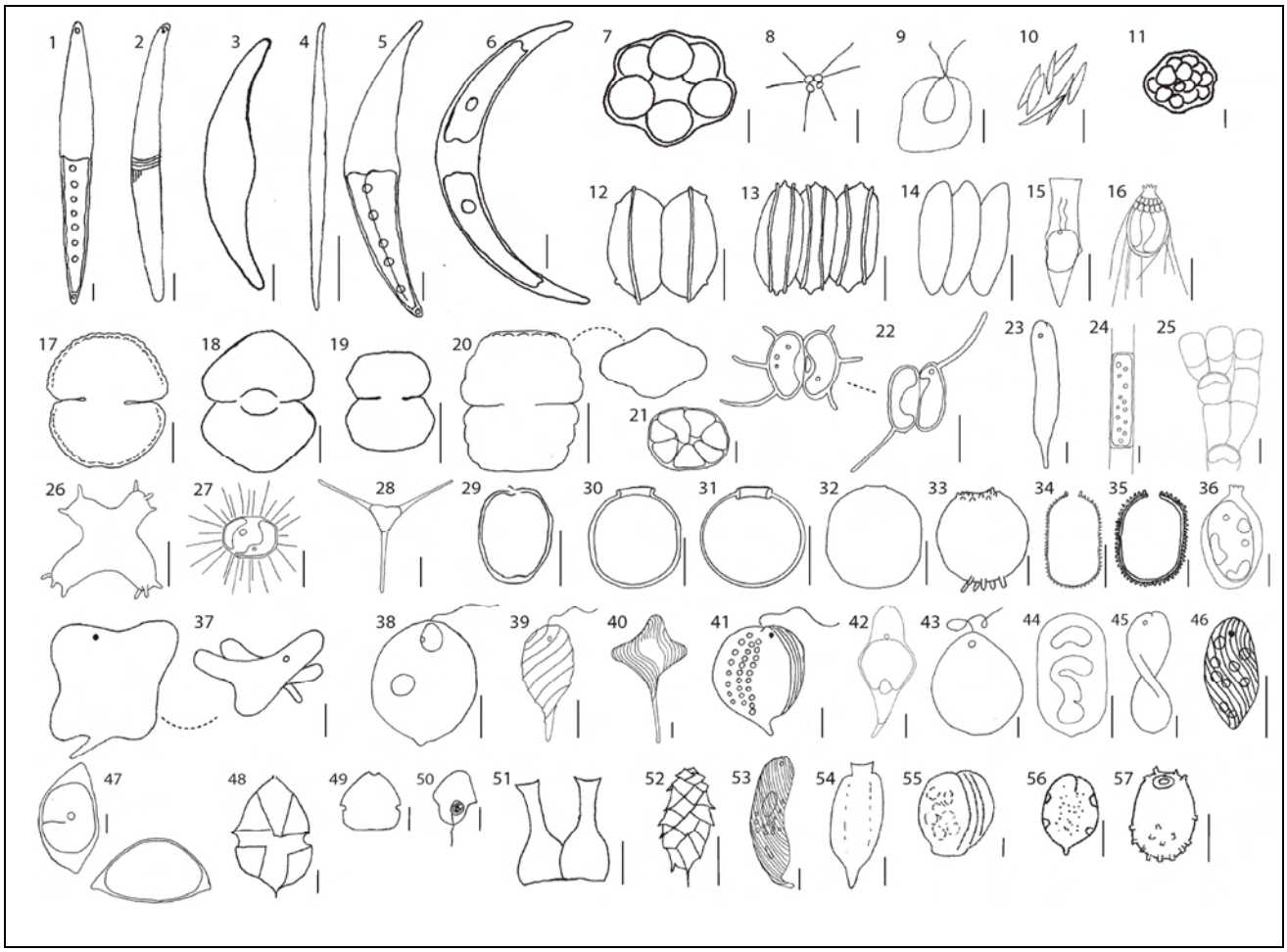

Fig. 11. Green algae collected during the 2006 Potomac Gorge BioBlitz, 23-25 June 2006. Scalebar length is 10 µm for each species unless noted otherwise. 1. *Closterium acerosum* (Schrank) Ehrenberg, scalebar = 50 µm; 2. *C. striolatum* Ehrenberg ex Ralfs, scalebar = 50 µm; 3. *C. ehrenbergii* Meneghini, scalebar = 50 µm; 4. *C. macilentum* Brébisson, scalebar = 50 µm; 5. *C. lunula* (Müller) Nitsch, scalebar = 20 µm; 6. C. cf. *venus* Kützing; 7. *C. microporum* Nägeli, scalebar = 5 µm; 8. *Micractinium pusillum* Fresenius; 9. *Pteromonas angulosa* (Carter) Lemmermann; 10. *Quadrigula lacustris* (Chodat) G.M. Smith; 11. *Botyrococcus braunii* Kützing; 12. *Scenedesmus brasiliense* Bohlin, scalebar = 5 µm; 13. *S. brasiliense* Bohlin forma, scalebar = 5 µm; 14. *S. bijuga* (Turpin) Lagerheim, scalebar = 5 µm; 15. *Dinobryon divergens* Imhof; 16. *Mallomonas* sp. 1; 17. *Cosmarium obtustatum* Schmidle, scalebar = 20 µm; 18. *C. granatum* var. *granatum* Brébisson ex Ralfs; 19. *C. abbreviatum* Raciborski; 20. *Cosmarium* sp. 1; 21. *Pandorina morum* (Müller) Bory; 22. *Scenedesmus abundans* (Kirchner) Chodat, scalebar = 5 µm; 23. *Euglena acus* Ehrenberg; 24. *Basicladia chelonum* (Collins) Hoffman, scalebar = 20 µm; 25. *Gongrosira burmanica* Skuja, scalebar = 20 µm; 26. *Tetraedron planctonicum* G. M. Smith; 27. *Franceia ovalis* (Francé) Lemmermann; 28. *Treubaria setigera* (Archer) G. M. Smith; 29. *Chlamydomonas* sp.; 30. *Trachelomonas oblonga* var. *australica* Playfair, scalebar = 5 µm; 31. *T. volvocina* Ehrenberg; 32. *T. zorensis* Deflandre; 33. *T. armata* (Ehrenberg) Stein; 34. *T. australica* var. *rectangularis* Deflandre; 35. *T. hispida* (Perty) Stein; 36. *T. hispida* var. *coronata*; 37. *Phacus* sp. 1; 38. *P. platalea* Drezepolski; 39. *Lepocinclis acuta* Prescott; 40. *Phacus* cf. *circumflexus* Pochman; 41. *P. pleuronectes* (Müller) Dujardin; 42. *Euglena proxima* Dangeard; 43. *Lepocinclis texta* (Dujardin) Lemmermann; 44. *Lepocinclis* sp. 1; 45. *Euglena limosa* Gard., scalebar = 20 µm; 46. *Euglena* sp. 1; 47. *Cystodinium bataviense* Klebs; 48. *Peridiniopsis polonicum* (Woloszynska) Bourrelly; 49. *Peridinium inconspicuum* Lemmermann; 50. *Gymnodinium albulum* Lindemann; 51. *Lagynion scherffelii* Pascher, scalebar = 5 µm; 52. *Mallomonas pseudocoronata* Prescott; 53. *Euglena oxyuris* Schmarda, scalebar = 20 µm; 54. *Strombomonas urceolata* (Stokes) Deflandre; 55. *Phacus stoeksii* Lemmermann; 56. *Lepocinclis glabra* Drezepolski; 57. *Trachelomonas bacillifera* Playfair.

Mallomonas sp. 1
(sample: PGB2006.06.24-5; Fig. 11 [16])

Free-living cells covered in circular scales; anterior of cell with a collar formed by scales; chloroplast single saddle-shaped, parietal; edges of cell with long setae of irregular length. L. 22 µm x W. 13 µm.

Phylum Euglenophyta

Euglena sp. 1
(samples: PGA2006.06.24-18, 20; Fig. 11 [46])

Cell somewhat fusiform; posterior produced into a very short caudus, appearing as a papillum; chloroplasts discoid; surface ridged. L. 18 µm x W. 8 µm.

Lepocinclis acuta Prescott
(samples: PGB2006.06.24-1, 5; Fig. 11 [39])

Specimens from the park (CHOH, MD) are of somewhat smaller dimensions than are often reported for this species and the caudus not as long. Previously reported from Virginia (Woodson & Seaburg, 1953).

Lepocinclis sp. 1
(sample: PGA2006.06.24-1; Fig. 11 [44])

Cell bacilliform, nearly cylindrical; pellicle smooth, rigid; posterior with a very small caudal protrusion; chloroplasts large and discoid or bowl-shaped. Few cells were observed and all were in poor condition. L. 34 µm x D. 17.4 µm.

Phacus sp. 1 (sample: PGB2006.06.24-5; Fig. 11 [37])

Cells nearly rectangular in broad view; triangular compressed in apical view; edges of cell upturned; caudus short and bent. L. 38 µm x W. 38 µm; caudus 8 µm long. Similar to several described species of *Phacus*, but the outline of the cell is very rectangular and the angles upturned.

Phylum Xanthophyceae

Vaucheria sp. (sample: PGA2006.06.24-16)

Cells in long filaments; early stages of reproductive structures present. It was impossible to identify this to species from the available material.

Cosmarium abbreviatum, *Spirogyra* cf. *jugalis*, *Gongrosira burmanica*, *Euglena limosa*, *Trachelomonas oblongum* var. *australica*, and *Cystodinium bataviense* are all thought to be new records for the state of Virginia.

Discussion. In addition to the organisms that could not be identified with great certainty as a result of the unavailability of relevant literature or the lack of reproductive structures, it appears that one of the taxa collected may be new to science. *Cosmarium* sp. 1 is inconsistent with any of the species in that genus known to the members of the survey team. Since too few cells were available, additional sampling is needed to obtain adequate material for further study to assess if this is a new species or a species known from some other part of the world.

It is less likely that the other unidentified species (*Mallomonas* sp. 1, *Phacus* sp. 1, and *Euglena* sp. 1) collected during the BioBlitz are new to science, but more investigation of these taxa is also warranted.

The conjugating green algae encountered are mostly common, widely distributed species. Of the two taxa not previously recorded from Virginia, *Cosmarium abbreviatum* is within its known range, while *Sirogonium* sp. is commonly confused with other common taxa. Because of the short duration of the survey during the BioBlitz, it is very likely that there are a great many more species of algae present in the Potomac Gorge. It would be desirable to sample the region earlier in the year when it would be possible to find more conjugating green algae in reproductive stages, and again later in the season when other species may appear.

The algae of the Potomac Gorge parks are still very poorly understood and much could be gained from a long-term study of groups in the region, including diatoms and cyanobacteria. Diatoms are of particular interest because they are valuable indicators of water quality.

The Potomac Gorge, while unique, is hardly isolated. Floodwaters regularly flow through it via the Potomac River and the Chesapeake & Ohio Canal. Furthermore, these waters are part of a major flyway for migratory birds, which are well known agents of algal dispersal. And thousands of visitors from all over the world also visit the region annually. As such, the national parklands within this region are uniquely suited for studies investigating the impacts of exotic introductions and human activity on the native flora.

A total of 68 species of green algae was recorded during the BioBlitz (Table 2). None of the species encountered are listed as threatened, endangered, or globally or state rare.

The members of the algae survey team were John Hall (team leader), Susan Carty, Gregg Mendez, Kate Nisselson, Terry Richards, Michael Rhodin, and Michael Wittig. They contributed a combined total of 60 hours in the field (including travel time and processing 32 samples), and 110 hours on specimen identification (including data entry, report writing, and specimen transfer to NPS) for a grand total of 170 hours (Table 25).

Table 2. Green algae (Kingdom Protista) documented during the Potomac Gorge BioBlitz, 23-25 June 2006. GWMP=George Washington Memorial Parkway, VA (GF=Great Falls Park; TR=Turkey Run Park); CHOH=C & O Canal National Historical Park, MD. All are new records for the Potomac Gorge. New state records for VA or MD are indicated in bold.

PHYLUM	SPECIES	GWMP		CHOH	Published VA records?[a]
		GF	TR		
Charophyta	*Closterium acerosum* (Schrank) Ehrenberg	X			7,14
	Closterium ehrenbergii Meneghini			X	2,7,13,14,16
	Closterium lunula (Müller) Nitzsch	X			Yes
	Closterium macilentum Brébisson			X	Yes
	Closterium striolatum Ehrenberg ex Ralfs	X		X	Yes
	Closterium cf. *venus* Kützing			X	Yes
	Cosmarium abbreviatum Raciborski		**X**		No (10)
	Cosmarium granatum var. *granatum* Brébisson ex Ralfs			X	17
	Cosmarium obtusatum Schmidle		X	X	7,15,18
	Cosmarium sp. 1		X		-
	Cylindrocystis brebissonii de Bary	X			1,17
	Mougeotia sp.	X		X	-
	Sirogonium sp.			X	-
	Spirogyra cf. *jugalis* (Dillwyn) Kützing	**X**		X	No (12)
	Spirogyra sp.	X		X	-
	Zygnema sp.	X	X		-
Chlorophyta	*Basicladia chelonum* (Collins) Hoffman			X	1(?) – see text
	Botyrococcus braunii Kützing			X	7,9,14,19
	Chlamydomonas sp.	X	X	X	-
	Coelastrum microporum Nägeli			X	2,9,14,15,16
	Hydrodictyon reticulatum (L.) Lagerheim	X			13
	Gongrosira burmanica Skuja	**X**			No
	Franceia ovalis (Francé) Lemmermann			X	17
	Micractinium pusillum Fresenius			X	5,7
	Oedogonium sp.	X		X	-
	Pandorina morum (Müller) Bory			X	9,13,14,15,17
	Pteromonas angulosa (Carter) Lemmermann			X	No
	Quadrigula lacustris (Chodat) G.M. Smith			X	5,9
	Rhizoclonium heiroglyphicum (Agardh) Kützing		X		13
	Scenedesmus abundans (Kirchner) Chodat			X	7,15
	Scenedesmus bijuga (Turpin) Lagerheim	X			3,5,7,8,9,14
	Scenedesmus brasiliense Bohlin			X	14,19
	Scenedesmus brasiliense Bohlin forma			X	-
	Tetraedron planctonicum G. M. Smith		X		Yes
	Tetraspora lubrica (Roth) Agardh	X			1,9,13,14,15,18
	Treubaria setigera (Archer) G. M. Smith			X	7,15
Chrysophyceae	*Dinobryon divergens* Imhof			X	2,7,9,15,18
	Lagynion scherffelii Pascher			X	No
	Mallomonas pseudocoronata Prescott			X	No
	Mallomonas sp. 1			X	-
Euglenophyta	*Euglena acus* Ehrenberg			X	3,5,7,14,15,18
	Euglena limosa Gard.		**X**		No
	Euglena oxyuris Schmarda	X		X	4,9,14
	Euglena proxima Dangeard	X	X	X	3,16
	Euglena sp. 1			X	-
	Lepocinclis acuta Prescott			X	17
	Lepocinclis glabra Drezepolski			X	No
	Lepocinclis texta (Dujardin) Lemmermann	X			1,17
	Lepocinclis sp. 1	X			-

Table 2 (continued).

PHYLUM	SPECIES	GWMP		CHOH	Published VA records?[a]
		GF	TR		
Euglenophyta	*Phacus* cf. *circumflexus* Pochmann			X	No
	Phacus platalea Drezepolski		X		No
	Phacus pleuronectes (Müller) Dujardin	X		X	9,14
	Phacus stokesii Lemmermann			X	No
	Phacus sp. 1			X	-
	Strombomonas urceolata (Stokes) Deflandre			X	No
	Trachelomonas armata (Ehrenberg) Stein		X		14
	Trachelomonas australica var. *rectangularis* Deflandre		X	X	No
	Trachelomonas bacillifera Playfair			X	No
	Trachelomonas hispida (Perty) Stein		X		3,4,5,6,9,11,15
	Trachelomonas hispida var. *coronata* Lemmermann			X	4,14,19
	Trachelomonas oblongum var. *australica* Playfair	**X**			No
	Trachelomonas volvocina Ehrenberg		X	X	4,5,11,17
	Trachelomonas zorensis Deflandre			X	No
Pyrrophyta	*Cystodinium bataviense* Klebs	**X**			No
	Gymnodinium albulum Lindemann			X	No
	Peridiniopsis polonicum (Woloszynska) Bourrelly			**X**	No
	Peridinium inconspicuum Lemmermann			X	9
Xanthophyceae	*Vaucheria* sp.	X			-

[a] Published sources: 1. Forest 1954; 2. Marshall 1976; 3. Marshall 1980; 4. Marshall 2001; 5. Marshall & Burchardt 2004; 6. Marshall et al. 1981; 7. Nemeth 1969; 8. O'Reilly & Marshall 1988; 9. Parson & Parker 1989; 10. Prescott et al. 1981; 11. Shearly & Marshall 1989; 12. Transeau 1950; 13. Woodson 1959; 14. Woodson 1969; 15. Woodson & Afzal 1976; 16. Woodson & Gore 1968; 17. Woodson & Seaburg 1983; 18. Woodson & Wilson 1973; 19. Woodson et al. 1966.

Slime molds and fungi

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Previous to the Potomac Gorge BioBlitz, numerous species of fungi have undoubtedly been found within George Washington Memorial Parkway (GWMP, VA), but they have never been formally inventoried. Mushroom hunters collecting in similar environments around the Greenbelt region of Washington, D.C. have collected as many as 200-250 species per season (J. Ellifritz, pers. comm.).

Although the BioBlitz was scheduled for 24-25 June, Biechele had an opportunity to explore Great Falls Park on the afternoon of 23 June. The remaining members of the slime molds and fungi survey team arrived early Saturday morning. The survey team concentrated its collecting efforts within Turkey Run Park (GWMP, VA). The nine-member survey team was divided into two teams. The first team, led by team leader Lance Biechele, consisted of Richard Gaines, Susan Milius, and Susanna Rhodes. The second team, led by William Roody, consisted of Nicole Cinta, Jon Ellifritz, Donna Mitchell, and Christopher Van DeMoortel. Additionally, members of other survey teams working the Maryland side of the Potomac in the C & O Canal National Historical Park contributed specimens. Of the Maryland species, only seven proved to be different from those collected in Turkey Run Park. No field collections were made during the last day of the BioBlitz due to inclement weather.

Six unknown specimens of mushrooms were collected, along with three species of unidentified rusts. Of 62 total specimens collected, 55 were positively determined to species.

The total number of specimens collected was surprisingly low. Mid-June is typically a poor time of year for many gilled mushroom species. Ideally, inventories should take place from late July through September at Great Falls and Turkey Run parks. Surveys scheduled during this time could possibly result in tripling the number of mushroom species observed and collected.

The slime molds and fungi survey team collected five species of slime molds in Great Falls Park (GWMP, VA), including *Arcyria denutata* (L.) Wettst. (Arcyriaceae), *Lycogala epidenrum* (L.) Fries (Lycogalaceae), *Fuligo septica* (L.) Wiggers (Physaraceae), *Stemonitis fusca* Roth. (Stemonitidaceae), and *Hemitrichia calyculata* (Spreg.) Farr (Trichiaceae).

Table 3. Fungi (Mycotina) documented during the Potomac Gorge BioBlitz, 23-25 June 2006. GWMP=George Washington Memorial Parkway, VA (GF=Great Falls Park; TR=Turkey Run Park); CHOH=Great Falls, C & O Canal National Historical Park, MD.

ORDER	FAMILY	SPECIES	GWMP		CHOH
			GF	TR	
Ascomycetes	Leotiaceae	*Phaeocalicium polyporaceum* (Nyl.) Tibell	X		X
	Otideaceae	*Scutellinia erinaceus* (Schwein.) Kuntze	X		
		Scutellinia scutellata (L.) Lambotte			X
	Pezizaceae	*Galiella rufa* (Schwein.) Nannf. & Korf	X		X
	Xylariaceae	*Ustulina deusta* (Fr.) Petrak	X		X
		Xylaria hypoxylon (Linnaeus: Fries) Greville		X	
		Xylaria polymorpha (Persoon: Merat.) Greville			X
Gastromycetes	Lycoperdaceae	*Lycoperdon pyriforme* Schaeff.:Pers.		X	
	Phallaceae	*Dictyophora duplicata* (Bosc.) E. Fischer		?	
	Sclerodermataceae	*Scleroderma citrinum* Pers.			X
Heterobasido-mycetes	Auriculariaceae	*Auricularia auricula* (L.) Underw.		X	
	Tremellaceae	*Calocera cornea* (Batsch) Fr.		X	
		Exidia alba (Lloyd) Burt.	X	X	
		Tremella mesenterica Retz.:Fr.		X	
		Tremellodendron pallidum (Schwein.) Burt			X
Homobasido-mycetes	Agaricaceae	*Agaricus campestris* L.		X	
	Amanitaceae	*Amanita lignophila* Atkinson		X	
	Bolbitiaceae	*Amanitopsis volvata* var. *elongata* (Peck) Lloyd		X	
		Conocybe lactea (Lange) Metrod		X	
	Boletaceae	*Boletus fraternus* Peck			X
		Boletus innixus Frost			X
	Coprinaceae	*Coprinus variegatus* Peck		X	X
	Corticiaeae	*Merulius incarnatus* Schweinitz		X	
	Crepidotaceae	*Crepidotus applanatus* (Pers.) P. Kumm.			X
	Pluteaceae	*Pluteus cervinus* (Schaeff. Fr.) P. Kumm.		X	
		Pluteus pellitus (Fr.) P. Kumm.		X	
	Polyporaceae	*Ceriporia spissa* (Schwein.:Fr.) Rajchenb.	X	X	
		Daedaleopsis confragosa (Bolton:Fries) Schroet.		X	X
		Ganoderma applanatum (Pers.) Pat.	X	X	
		Laetiporus cincinnatus (Morgan) Burds,Banik,Volk			X
		Lenzites betulina (Fr.) Fr.			X
		Phellinus gilvis (Schwein.) Pat.		X	
		Phellinus robiniae (Murrill) A. Ames			X
		Polyporus mori (Pollini:Fries) Fries		X	X
		Polyporus varius (Pers.) Fr.	X	X	
		Pycnoporus cinnabarinus (Jacq.) Fr.		X	
		Trametes elegans (Spreng.:Fr.) Fr.		X	X
		Trametes versicolor (L.) C.G. Lloyd		X	
		Trichaptum biformis (Fr.) Ryv.		X	X
		Tyromyces chioneus (Fr.) Karst.		X	X
	Russulaceae	*Russula ochrophylla* Peck			X
		Russula subfoetens Smith		X	X
		Russula vinacea Burlingham		X	
	Schizophyllaceae	*Schizophyllum commune* Fries	X		X
		Stereum complicatum (Fr.) Fries			X
		Stereum ostrea (Schwein.:Fr.) Fries		X	X
		Stereum striatum (Fr.) Fries			X
		Xylobolus frustulata (Persoon:Fries) Boidin		X	X
	Stereaceae	*Naematoloma fasciculare* (Hudson:Fr.) Karst.		X	
	Strophariaceae	*Armillariella mella* (Vahl.:Fr.) Karst.			X
	Tricholomataceae	*Lentinus strigosus* (Schwein.) Fr.		X	
		Marasmius rotula (Scop.:Fr.) Fr.	X	X	
		Megacolllybia platyphylla (Pers. Fr.) Kotl. & Pouz.		X	
		Pleurotus ostreatus (Jacq.:Fr.) Quél.	X		
		Xerula megalosporia (Clements) Redhead, Ginns & Shoemaker		X	

Fifty-five species of fungi were collected (Table 3). One fungus species of particular interest was the blue bolbitus (*Bolbitus callistrus*), a rare fungus that has been collected previously at Great Falls Park; it was not found during the survey. None of the species encountered are listed as threatened, endangered, or globally or state rare.

The slime mold and fungi team spent 6.5 hours in the field, 1.5 hours on travel time, and 5 hours on specimen identification and cataloging for a total of 13 hours (Table 25).

Mosses and liverworts

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Bryophytes include the hornworts, liverworts, and mosses, and represent a poorly known division of the plant kingdom. Prior to the BioBlitz, the most recent bryophyte survey of parks within the Potomac Gorge was conducted over a five-year period by Dr. Charles Davis and Mrs. Linda Davis (Davis & Davis, 2006); both were members of the BioBlitz bryophyte team. They had collected extensively in Great Falls Park (GWMP, VA), identifying 29 families and 48 genera of mosses and 17 families and 20 genera of liverworts. No hornworts were found during their field surveys.

The bryophyte team sampled sites in Great Falls Park (CHOH, MD) and Turkey Run Park (GWMP, VA) including areas of disturbance, shade and high moisture, rocks, fallen trees, and at the edges of the waterways in order to locate a diversity of bryophytes during the BioBlitz. Due to the small size of individual bryophytes, the extensive terrain, and the small number of volunteers on the team, the collections made during the BioBlitz represented only a fraction of the species that are probably found in Great Falls Park (CHOH, MD). We focused on several potentially productive habitats. As with the Davis & Davis (2006) study, no hornworts were collected during the survey.

Of the 22 samples collected, 15 moss specimens and both liverwort specimens were identified to species. Four moss samples were determined to genus only, while several other samples were unidentified due to lack of sporophytic structures.

Season and environmental conditions were the largest obstacles faced by the bryophyte team. In June, most species are at the middle or end of their life cycle. High rates of herbivory on the sporophytes during this time by birds, deer, and other wildlife were also impediments to the collection and identification of bryophytes.

A better collection period for the hornworts, liverworts, and mosses, would have been in early May when the sporophytes are becoming mature and are more abundant. Water availability is also higher during this time of year, which supports healthier and more productive bryophyte populations. We were surprised not to find *Polytrichum ohioense* or *Sphagnum* sp., moss species that are known to be very common elsewhere in Maryland. Nevertheless, three collections made during the BioBlitz deserve special mention. *Haplohymenium triste*, *Drepanocladus* sp., and *Leucobryum glaucum* appear to only be established in the Maryland Great Falls Park (CHOH, MD), not the Virginia Great Falls Park (GWMP, VA), suggesting slight variation in habitat and/or pollution levels.

All identified species have a state ranking in Maryland of S5, which suggests that these species are demonstrably secure within the state. However, one species, *Anomodon minor*, is not ranked, suggesting that its presence in Maryland has not been previously reported. Globally, all species reported are demonstrably secure, though they may be quite rare in some areas, especially at the peripheries of their ranges.

The limited number of liverworts was unexpected to us because they are quite numerous on the Virginia side of the Potomac (Davis & Davis, 2006). The steep and rocky riverbanks sampled by the team are generally less hospitable to liverworts, which are normally found on marshier banks like those found on the opposite side of the river in the GWMP, VA. Liverworts vary greatly in size and habitat. The two species found were small and inconspicuous, occurring on or around other bryophytes.

In spite of their close proximity to one another, the brief survey conducted during the BioBlitz suggests that it is very likely that Great Falls Park (CHOH, MD) differs in habitat types and bryophyte species composition when compared to Great Falls Park (GWMP, VA) (Davis & Davis, 2006). Additional bryophyte surveys in this and other regions of the CHOH have been strongly encouraged and supported previously by the NPS.

The bryophyte survey team collected or observed 21 species (Table 4). The team members were DorothyBelle Poli (team leader), Michael J. Adkins, Chris Carr, Charles and Linda Davis, and A. Ester Sztein. The team contributed a combined total of 40 hours in the field (including preparation and travel time), and 200 hours on specimen preparation and identification (including data entry, report writing, specimen transfer to NPS) for a grand total of 240 hours (Table 25).

Table 4. Bryophytes (Class Bryopsida) documented during the Potomac Gorge BioBlitz, 23-25 June 2006. All species were collected or observed at Great Falls Park (CHOH, MD).

ORDER	FAMILY	SPECIES
Hypnales	Amblystegiaceae	*Amblystegium varium* (Hedw.) Lindb.
		Campylium chrysophyllum (Brid.) J. Lange
		Drepanocladus sp.
	Brachytheciaceae	*Bryoandersonia illecebra* (Hedw.) Robins
	Climaciaeceae	*Climacium americanum* Brid.
	Dicranaceae	*Dicranum* sp.
	Entodontaceae	*Entodon seductrix* (Hedw.) C. Mull.
	Hypnaceae	*Homomallium adnatum* (Hedw.) Broth
		Isopterygium pulchellum (Hedw.) Jaeg. & Sauerb.
	Leskeaceae	*Bryohaplocladium microphyllum* (Hedw.) Wat. & Iwats.
	Leucobryaceae	*Leucobryum albidium* (Brid. Ex. P.-Beauv.) Lindb.
		Leucobryum glaucum (Hedw.) Angstr.
	Mniaceae	*Mnium* sp. 1
		Mnium sp. 2
	Thuidiaceae	*Anomodon minor* (Hedw.) Furnr.
		Haplohymenium triste (Ces. Ex De Not.) Kindb.
		Thuidium allenii Aust.
		Thuidium delicatulum (Hewd.) Schimp
Jungermanniales	Cephaloziaceae	*Cephaloziella rubella* (sprice) Steph.
		Odontoschisma protratum (Sw.) Trevis.
Polytrichiales	Polytrichaceae	*Atrichum angustatum* (Brid.) Bruch & Schimp.

Select botanicals

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The Potomac Gorge has long been recognized as a site of great botanical diversity and has been intensively documented by field collections for more than a century (Ward, 1881; Hitchcock & Stanley, 1919; Hermann 1941, 1946; Shetler & Orli, 2000, 2002; Shetler et al. 2006). As of 1 June 2006, more than 900 vascular plant taxa had been documented from Great Falls Park, VA, both from historical specimens and more recent collections (Steury et al., 2008).

Forty-five specimens representing 38 vascular plant taxa were collected during the BioBlitz. These include:

22 taxa new to the Great Falls Park flora;

9 taxa previously known only from historical collections;

7 replacements for lost, photographic, or questionably identified vouchers.

Thirty-one of the represented taxa were native and seven were introduced. Two state-rare species were collected. A complete list of taxa collected is provided in Table 5.

The relatively small number of plant collections made during the BioBlitz in part reflects the condition of the Park's flora in early summer. In this region, late June typically constitutes a low ebb in the flowering and fruiting of vascular plants. By this time, the numerous spring geophytes and members of the family Cyperaceae that peak from late April to early June have evanesced or shed fruit. Likewise, late June falls before a late-summer peak of activity that includes members of several large families (e.g., Asteraceae, Poaceae) and a host of species occurring on exposed river shores. Nevertheless, for a one-day effort, the BioBlitz survey was relatively successful in adding new taxa to an already robust flora.

Most of the taxa new to Great Falls Park were known elsewhere in the Potomac Gorge, or were exotics that represent members of a weedy, dynamic flora that inhabits the fertile and constantly flood-disturbed river bottom.

The members of the botany survey team were Gary Fleming (team leader), Cristol Fleming, Diane Holsinger, and Betty Rosson. The team brought extensive field experience in the Potomac Gorge to the effort. Previous projects included a comprehensive study of plant communities and vegetation ecology on the Virginia side of the Gorge (G. Fleming), as well as inventories of rare species in Great Falls Park and

Table 5. Vascular plants (Kingdom Plantae) collected from Great Falls Park, VA during the 2006 Potomac Gorge BioBlitz. Classification system follows Cronquist (1981); species nomenclature follows Wieboldt et al. (2007).

Class	Order	Family	Species / ssp. / var.	Comments
Gymnosperma	Coniferophyta	Pinaceae	*Pinus echinata* Mill.	Replacement for voucher of uncertain identification
Liliopsida	Arales	Araceae	*Arisaema dracontium* (L.) Schott	Replacement for photographic voucher
	Cyperales	Poaceae	*Deschampsia flexuosa* (L.) Trin. var. *flexuosa*	Last collected 1879
	Cyperales	Poaceae	*Elymus macgregorii* Brooks & Campbell	New park record; see Campbell (2000)
	Cyperales	Poaceae	*Festuca arundinacea* Schreb.	New park record
	Cyperales	Poaceae	*Glyceria striata* (Lam.) A.S. Hitchc.	New park record
	Liliales	Liliaceae	*Maianthemum stellatum* (L.) Link.	Replacement for photographic voucher; state-rare
	Liliales	Liliaceae	*Uvularia sessilifolia* L.	New park record; specimen vegetative
Magnoliopsida	Aristolochiales	Aristolochiaceae	*Aristolochia serpentaria* L.	Last collected 1941; specimen vegetative
	Asterales	Asteraceae	*Eurybia schreberi* (Nees) Nees	Last collected 1915; specimen vegetative
	Asterales	Asteraceae	*Hasteola suaveolens* (L.) Pojark.	Last collected 1919; specimen vegetative; state-rare
	Capparales	Brassicaceae	*Brassica nigra* (L.) W.D. Koch	New park record
	Capparales	Brassicaceae	*Erysimum cheiranthoides* L.	New park record
	Caryophyllidae	Caryophyllaceae	*Silene latifolia* Poir.	New park record
	Celastrales	Celastraceae	*Euonymus alatus* (Thunb.) Sieb.	New park record
	Cornales	Cornaceae	*Cornus amomum* P.Mill. ssp. *obliqua* (Raf.) J.S. Wilson	New park record
	Dipsacales	Caprifoliaceae	*Symphoricarpos orbiculatus* Moench	New park record
	Dipsacales	Caprifoliaceae	*Viburnum nudum* L.	New park record
	Ericales	Ericaceae	*Vaccinium fuscatum* Ait.	New park record
	Fabales	Fabaceae	*Desmodium rotundifolium* DC.	New park record; specimen vegetative
	Fagales	Betulaceae	*Betula lenta* L.	Last collected 1884
	Fagales	Fagaceae	*Quercus muhlenbergii* Engelm.	New park record
	Geraniales	Oxalidaceae	*Oxalis stricta* L.	Last collected 1915
	Juglandales	Juglandaceae	*Juglans nigra* L.	Replacement for lost voucher
	Lamiales	Lamiaceae	*Lycopus americanus* Muhl. ex. W. Bart.	New park record
	Polygonales	Polygonaceae	*Rumex altissimus* Wood	Replacement for voucher of uncertain identification
	Polygonales	Polygonaceae	*Rumex congomeratus* Murr.	New park record; Fairfax Co. record
	Primulales	Primulaceae	*Lysimachia vulgaris* L.	New park record
	Ranunculales	Ranunculaceae	*Thalictrum dioicum* L.	Last collected 1915; specimen vegetative
	Ranunculales	Ranunculaceae	*Thalictrum pubescens* Pursh	New park record
	Rhamnales	Vitaceae	*Parthenocissus quinquefolia* (L.) Plach.	Replacement for lost voucher
	Rhamnales	Vitaceae	*Vitis aestivalis* Michx. var. *aestivalis*	Last collected 1941
	Rhamnales	Vitaceae	*Vitis cinerea* (Englem.) Millard	New park record
	Rhamnales	Vitaceae	*Vitis vulpina* L.	Replacement for lost voucher
	Sapindales	Aceraceae	*Acer nigrum* Michx.f.	New park record
	Sapindales	Aceraceae	*Acer saccharum* Marsh. var. *saccharum*	New park record
	Solanales	Cuscutaceae	*Cuscuta pentagona* Engelm.	Last collected 1922
Pteridophyta	Polypodiophyta	Dryopteridaceae	*Cystopteris protrusa* (Weath.) Blasd.	New park record

Turkey Run Parks (GWMP, VA), and the CHOH, MD (C. Fleming). The team contributed a combined total of 24 hours in the field (including preparation and travel time), and 8 hours on specimen preparation and identification (including report writing) for a grand total of 32 hours (Table 25).

Triclad planarians

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Aquatic planarians were sought in the CHOH, specifically in and around the Great Falls Visitors Center, and the canal for approximately one mile downstream. To my knowledge, the only previous survey within this region was conducted by Norden (1978), who reported one species, *Dugesia dorotocephala* (Woodworth), from Great Falls, but the record was inadvertently omitted in Norden, et al. (1992). The triclad planarian fauna of Plummers Island (CHOH) was recently reviewed (Norden, 2008a).

Aquatic planarians were sampled at the following two locations during the BioBlitz:

1. Carroll Branch and its tributaries in mature deciduous forest just above the parking area at Great Falls Park (CHOH, MD). Planarians were sought under rocks and logs in the stream, and under sparse accumulations of fallen deciduous leaves.

2. The C&O Canal from the Great Falls Visitor Center to a point about 1 mile downstream. The canal is filled with dense patches of *Hydrilla*, and there were scattered patches of gravel and rock substrate, and accumulations of fallen deciduous leaves.

Four species of triclad planarians (Order Polycladida) were found within CHOH during the BioBlitz. Each species is briefly discussed below.

Family Dugesidae

Dugesia tigrina (Girard). This is the most abundant and widespread aquatic planarian in Maryland (Norden et al., 1992). It occurs in a wide variety of relatively clean freshwater habitats. Individuals were found in masses of *Hydrilla* and in accumulations of leaf litter and other detritus in the canal. It is also expected to occur in quiet areas of the Potomac River.

Dugesia dorotocephala (Woodworth). This large species was found in abundance in 1975 at a spring-fed stream trickling down a steep rock face at Great Falls (Norden, 1978). This site could not be relocated during the BioBlitz survey. However, there is no reason to believe that *D. dorotocephala* does not still inhabit clean, cool high order tributaries of the Potomac River within the park.

Family Planariidae

Phagocata gracilis (Leidy). This distinctive, large, polypharyngeal species is easily recognized. It was found in small numbers in Carroll Branch just above the entry kiosk at the Great Falls Visitor Center. Individuals were found under leaves and small rocks in a clear stream running through mature deciduous forest.

Phagocata morgani (Stevens & Boring). This small, unpigmented planarian is one of the typical invertebrate inhabitants of clean springs west of the Fall Line in Maryland. Small numbers were found under rocks along with the much larger, darkly pigmented *P. gracilis* in Carroll Creek.

Several additional species of aquatic triclad planarians are expected to occur in the Great Falls portion of the park. *Cura foremani* (Girard) is likely to occur in tributary streams. Two vernal pool species, *Hymanella retenuova* Castle and *Phagocata velata* Stringer, are also expected; *P. velata* inhabits springs during the late winter/early spring months. Both species are found among fallen leaves at the bottom of vernal pools.

Team leader Arnold Norden was the sole member of the triclad planarian survey team. He contributed a combined total of 7 hours in the field (including preparation and travel time) and 6 hours on specimen preparation and identification (including report writing) for a grand total of 13 hours (Table 25).

Land snails

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The terrestrial snail fauna of Great Falls Park (CHOH, MD) and the GWMP, VA appear to be healthy and diverse. Ken Hotopp (Hotopp & Evans, 2005) conducted a survey of Great Falls Park (CHOH, MD) and found 27 species. His vouchers are deposited in the NPS collection at Turkey Run Park (fide B. Steury, NPS, GWMP, VA). A review of the Plummers Island (CHOH) fauna was published by Norden (2008b).

Four introduced taxa, all slugs, were observed, including *Arion hortensis* complex, *A. intermedius* (Normand), *A. subfuscus* (Draparnaud), and *Limax maximus* Linnaeus. Each of these species is widespread throughout the region and is expected to occur in the Potomac Gorge.

Two snail species found during the BioBlitz are particularly worthy of note. *Pomatiopsis lapidaria* (Say) is an infrequently collected species that has previously been reported in Maryland from Anne Arundel and Cecil counties, as well as the Eastern

Shore (Hubricht, 1985). During the BioBlitz a population was found around a vernal pool adjacent to a stone retaining wall supporting the towpath trail, just downstream of the Visitor Center at Great Falls Park (CHOH, MD); this represents a new record for the park. Another infrequently collected species, *Punctum smithi* Morrison, was found under leaf litter in the same area as *P. lapidaria*.

The land snail survey team recorded 35 species of snails and two species of freshwater mussels (Table 6) during the BioBlitz. The members of the survey team were Arnold Norden (team leader), Tim Pearce, Maureen Dougherty, Kim Harrell, Aydin Orstan, Megan Paustian, Mary Travaglini, and Ralph Webb. They contributed a combined total of 50 hours in the field (including preparation and travel time) 20 hours on specimen preparation and identification (including report writing) for a grand total of 70 hours (Table 25).

Table 6. Snails (Mollusca, Gastropoda) and freshwater mussels (Mollusca, Bivalvia) documented during the Potomac Gorge BioBlitz, 23-25 June 2006. C & O Canal National Historical Park, MD. Asterisks (*) denote new records for the Potomac Gorge.

CLASS	ORDER	FAMILY	SPECIES
Gastropoda	Archaeogastropoda	Pomatiopsidae	*Pomatiopsis lapidaria* (Say)*
	Basommatophora	Physidae	*Physa* sp.
	Neotaenioglossa	Hydrobiidae	*Fontigens* sp. probably *bottimeri*
		Pleuroceridae	*Elimia virginica* (Say)
	Stylommatophora	Arionidae	*Arion hortensis* complex
			Arion intermedius (Normand)*
			Arion subfuscus (Draparnaud)
		Cochlicopidae	*Cochlicopa lubrica* (Muller)
		Discidae	*Anguispira alternata* (Say)
			Anguispira fergusoni (Bland)
		Gastrocoptidae	*Gastrocopta contracta* (Say)
			Gastrocopta pentodon (Say)
			Striatura meridionalis (Pilsbry & Ferriss)
			Ventridens ligera (Say)
			Ventridens supressus (Say)
			*Zonitoides arboreus (Say)**
		Haplotrematidae	*Haplotrema concavum* (Say)
		Helicodiscidae	*Helicodiscus parallelus* (Say)*
		Limacidae	*Deroceras* nr. *hirsutum*
			Limax maximus Linnaeus
		Philomycidae	nr. *Megapallifera* sp.
			Philomycus carolinianus (Bosc)
		Pisidiidae	*Musculium partumeium* (Say)
			nr. *Pisidium* sp.
		Polygyridae	*Mesodon thryoidus* (Say)
			Stenotrema nr. *hirsuta*
			Triodopsis juxtidens (Pilsbry)
		Punctidae	*Punctum minutissimum* (I. Lea)
			Punctum smithi Morrison
			Punctum vitreum H.B Baker*
		Strobilopsidae	*Strobilops aeneus* Pilsbry
			Strobilops labyrinthica (Say)
		Vitrinidae	*Hawaiia miniscula* (A. Binney)*
		Zonitidae	*Glyphyalinia indentata* complex
			Glyphyalinia wheatleyi (Bland)
Bivalvia	Unionoida	Unionidae	Unionidae sp.
	Veneroida	Corbiculidae	*Corbicula fluminea* (Müller)

Subterranean macroinvertebrates

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Subterranean macroinvertebrates (Crustacea, Malacostraca; Mollusca, Gastropoda) were documented in the Potomac Gorge as early as 1883 with the discovery of the eyeless and unpigmented amphipod, *Stygobromus tenuis potomacus* (Holsinger) (Holsinger, 1976). Since then, additional collecting in Washington, D.C. and the immediate surrounding areas of Maryland and Virginia has revealed a rich diversity of species within the subterranean genus *Stygobromus*. The local diversity of this subaquatic genus is surpassed in the United States only by the Edwards Aquifer in Texas (Feller, 1997a, b; Hobson, 1997; Culver & Sereg, 2004).

The Potomac Gorge *Stygobromus* fauna is comprised primarily of three species on the Virginia side, two of which also occur in Maryland. Other groundwater-limited species include the Appalachian spring snail (*Fontigens bottimeri* Walker) that is found in both Maryland and Virginia, and a possibly undescribed species of isopod (*Caecidotea* sp., Hobbsi group) from Maryland.

Two general areas of seeps and springs were selected for inventory during the BioBlitz (both in CHOH, MD). These included the Glen Echo Quarry (springs 1, 2, 3) and a previously unsurveyed area south of Great Falls Tavern in the Gold Mine Tract. Glen Echo Quarry springs were a high priority to obtain additional specimens of the possibly undescribed *Caecidotea* sp. based on a single example collected in 1996 and to further sample amphipod species.

The two *Fontigens* specimens collected during the BioBlitz could not be positively verified to species due to difficulty in observing the penis, but are almost certainly *F. bottimeri*. Shell characteristics are consistent with *F. bottimeri* and *F. orolibas* Hubricht, but all previous records of this genus in Montgomery Co., MD, surrounding counties, and in immediately adjacent springs are assigned to *F. bottimeri*. Furthermore, *F. orolibas* is known only from the Blue Ridge and Ridge and Valley physiographic provinces, whereas the type locality for *F. bottimeri* is in nearby Glen Echo.

New site locality records for *Stygobromus pizzinii* (Shoemaker), *S. tenuis potomacus*, and *Fontigens* (prob. *bottimeri*) were documented during the BioBlitz, but all were known previously to occur in the Potomac Gorge.

A single immature specimen of *Caecitodea* was collected at Glen Echo Quarry spring. Additional mature males of this lightly pigmented but otherwise subterranean species were sought to aid species identification and description, but to no avail.

The best time to sample for these organisms at spring and seep emergences is typically in late winter to early spring. The sampling effort during the BioBlitz was therefore less than optimal due to lower groundwater flow rates.

In Maryland, *Stygobromus pizzinii* is ranked G2G4/S1, and *S. tenuis potomacus* G4T3T4Q/S3, while *Fontigens bottimeri* is G2/S2. The only non-native isopod observed at springs and seeps is the terrestrial/semi-aquatic *Haplothalmus danicus* Budde-Lund, a widespread species from Europe.

The subterranean macroinvertebrate survey team collected or observed one snail (Table 6), three amphipods, and three isopods (Table 7). The team members were Daniel J. Feller (team leader) and Jennifer A. Selfridge, who contributed a combined total of 16 hours in the field (including preparation and travel time) and 8 hours on specimen preparation and identification (including data entry, report writing, specimen transfer to NPS) for a grand total of 24 hours (Table 25).

Crustaceans

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Freshwater crustaceans have historically received little attention in faunistic inventories throughout North America (Thorp & Covich, 2001). Of the crustacean groups likely to be present in the full range of freshwater habitats, decapods, specifically crayfishes, have received the most attention. The larger anostracans (fairy, clam, and tadpole shrimps) of temporary water bodies have also been well-studied in certain parts of the continent. However, relatively little effort has focused on micro-crustaceans, specifically copepods (Williamson & Reid, 2001). During the Potomac Gorge BioBlitz, Loughman focused on freshwater crayfishes (Cambaridae), while Reid inventoried free-living copepods in an effort to document species that inhabit Great Falls Park (GWMP, VA).

Table 7. Amphipods and isopods (Crustacea) documented during the Potomac Gorge BioBlitz, 23-25 June 2006 at CHOH, MD. (GF=Great Falls Tavern; LF=Little Falls Tavern; RI=Rocky Islands).

ORDER	FAMILY	SPECIES	GF	LF	RI
Amphipoda	Crangonyctidae	*Crangonyx shoemakeri* (Hubricht & Mackin)	X	X	
		Stygobromus pizzinii (Shoemaker)		X	X
		Stygobromus tenuis (Smith)		X	
Isopoda	Asellidae	*Caecidotea kenki* (Bowman)	X	X	
		Caecidotea sp. (Hobbsi sp. group)		X	
	Trichoniscidae	*Haplothalmus danicus* Budde-Lunde		X	

Table 8. Sites sampled for crayfishes in Great Falls Park (GWMP, VA) during the Potomac Gorge BioBlitz, 23-25 June 2006.

Site	Location	Latitude	Longitude	Habitat Type
1	Large eddy immediately adjacent to Clay Pond parking lot	39.0050	77.2555	Potomac River Mainstem
2	Potomac River immediately below Georgetown aqueduct	39.0067	77.2544	Potomac River Mainstem
3	Potomac River Pool 150 meters upstream of aqueduct	39.008	77.2539	Potomac River Mainstem
4	Potomac River side channel 0.2 mi south of Georgetown aqueduct along River Trail	39.0047	77.2588	Potomac River Eddie
5	Confluence of Mine Run Branch/Potomac Canal	38.9997	77.2561	Canal
6	Potomac Canal 0.2 mi south of Mine Run Branch/Potomac Canal confluence	38.9992	77.2555	Canal
7	Potomac Canal 0.4 mi south of Mine Run Branch/Potomac Canal confluence	38.9981	77.2546	Canal
8	Difficult Run at cross-country trails trail head	38.976	77.2448	Stream
9	Mine Run Branch plunge pool immediately upstream of Park Rd. Culvert	38.9992	77.2567	Second Order Stream
10	Mine Run Branch 0.2 mi upstream of Park Rd. Culvert	39.0000	77.2572	Second Order Stream
11	Mine Run Branch plunge pool immediately down stream of Park Rd. Culvert	38.9998	77.2565	Second Order Stream
12	First-order tributary to Mine Run Branch 0.2 mi east of Mine Run Branch	39.0033	77.2594	First Order Stream
13	Mine Run Branch pool immediately below River Trail	38.9997	77.2564	Second Order Stream
14	Unnamed headwater tributary on river trail 0.8 mi north of River Trail trail head	39.0086	77.2542	Headwater Stream
15	Bank of Clay Pond between Park Road and pond margin	39.0007	77.2569	Bottom Land Forest
16	Swamp trail adjacent to talus slope	38.9896	77.2542	Bottom Land Forest
17	Stream fed Skunk Cabbage Swamp 0.2 mi from S entrance to Swamp Trail	38.9862	77.2488	Bottom Land Forest
18	Stream fed Skunk Cabbage Swamp adjacent to 2nd foot bridge along Swamp Trail	38.9867	77.2517	Bottom Land Forest
19	Unnamed tributary running under 2nd foot bridge along Swamp Trail	38.9892	77.2517	Headwater Stream
20	Ditch alongside first parking area at Swamp Trail trail head	38.9931	77.2531	Headwater Stream

Crayfish results. Four species of crayfish were collected from the Potomac Gorge (see photo on inside back cover; Tables 8, 9). Two species, *Cambarus diogenes* Girard and *Orconectes virilis* (Hagen) were recorded in the park prior to the BioBlitz survey. *Cambarus bartonii* (Fabricius) and *Orconectes limosus* (Rafinesque) were also collected within the park's boundaries and represent new additions to the Potomac Gorge crayfish fauna. Natural history observations and potential conservation concerns are listed below for each of the species observed during the BioBlitz.

Appalachian Brook Crayfish, *Cambarus* (*Cambarus*) *bartonii bartonii* (Fabricius). Individuals were collected from headwater and second order streams throughout the park. Robust populations were present in streams feeding "The Swamp", Mine Run Branch, and associated tributaries. An additional individual was collected from the Potomac Canal at the confluence of Mine Run Branch. In headwater situations, *C. bartonii* burrows were present in stream banks and throughout stream substrates. Lotic habitats with a mixed gravel/cobble substrate, mesophytic canopy, and abundance of slab boulders supported the largest populations of this crayfish.

Appalachian brook crayfishes are likely to inhabit the Potomac Canal in limited numbers during active hydroperiods. Their population probably recedes into Mine Run Branch during periods of drawdown. This species requires highly oxygenated water across its range. The eutrophic nature of the Potomac Canal and Potomac River upstream of the aqueduct adjacent to the park likely represent environmental stressors not conducive to the success of *C. bartonii* populations (Crocker & Bar, 1968; Hobbs, 1981; Jezerinac et al., 1995).

Northern Crayfish, *Orconectes virilis* (Hagen). This species is a highly successful competitor and its presence is very likely a detriment to *C. bartonii*. As a result, *O. virilis* represents an important source of imperilment for the Appalachian brook crayfish in this and other habitats where the two initially coexist. This competitive exclusion was exemplified by observations of a population of *C. bartonii* in Mine Run Branch. The main park road where the stream is directed through a culvert running underneath the road divides its population with that of *O. virilis*. Only one individual of *C. bartonii* was collected in the Mine Run Branch from the downstream culvert plunge pool to the confluence with Potomac Canal. In this same stream reach, *O. virilis* now lives in habitats once likely occupied by *C. bartonii*. Stream reaches upstream of the culvert were dominated by *C. bartonii*; only one *O. virilis* was observed in the same area. This individual had been partially consumed, and possibly relocated there by a predator.

Spiny-cheeked Crayfish, *Orconectes* (*Faxonius*) *limosus* (Rafinesque) were collected in the Potomac River mainstem and Difficult Run. Potomac River populations were limited to eddies and littoral zones. No individuals were collected from the stream channel; further investigations are warranted to determine if they utilize channel habitats. Only one specimen was collected from Difficult Run, which was flooding during the survey, thus making sampling of this stream both difficult and dangerous; the low sample size should not be interpreted as low population size. Future collecting efforts on this stream are required to determine the extent of the *O. limosus* population. Difficult Run's course of sandy substrate is typical habitat for this crayfish and further sampling may reveal large populations in this stream and its associated watershed.

Orconectes limosus is native to the region and is known historically to inhabit shallow pools and runs with moderate to no current, sandy substrates, decreased macrophyte growth, and more extreme daily temperature fluctuations (Meredith & Schwartz, 1960). Within the Potomac River and elsewhere, this species is currently undergoing extirpation due to competitive exclusion by *O. virilis* (see Schwartz et al., 1963). Stream microhabitats (pools and runs) historically occupied by *O. limosus* are now occupied exclusively by *O. virilis*. During the BioBlitz, it was observed that habitats typically favored by *O. limosus* were utilized by increased numbers of juvenile *O. virilis*. By occupying these habitats, the juveniles were able to mature by avoiding prime microhabitats occupied by large adult *O. virilis*.

Devil Crayfish, *Cambarus* (*Lacunicambarus*) *diogenes* (Girard). The devil crayfish is a burrowing species that lives in all aquatic habitats within the park except the Potomac River mainstem. Though found primarily in lotic habitats, *C. diogenes* also occurs in some lentic situations in the myriad of ephemeral wetlands throughout the park. Robust populations were present surrounding Clay Pond and in the banks of Mine Run Branch. A thriving population is present in "The Swamp", an ephemeral wetland system dominated by skunk cabbage, *Symplocarpus foetidus* (Linnaeus) and red maple, *Acer rubrum* Linnaeus. This crayfish is also present in sub-optimal habitats such as the lawn around the Visitor Center and the main picnic areas within the park. The burrows of *C. diogenes* consist of a central shaft 0.2-0.7 m deep ending in an enlarged resting chamber. Radiating from the bottom of the chamber are 1-4 ancillary tunnels extending an additional 0.3-0.7 m. Standing water was present in all successfully excavated burrows. Seventy-six percent of

Table 9. Crayfish morphometrics and site information collected in Great Falls Park (GWMP, VA) during the Potomac Gorge BioBlitz, 23-25 June 2006. Carapace length (CPL) is in millimeters. Form I male (IM), Form II male (IIM), and female (F) data are presented. Site numbers as in Table 8. * = Species previously unrecorded in the park; ** = invasive species.

Species	N	Demographics	CPL Range	Mean CPL	Sites
*Cambarus bartonii**	25	14 IIM, 1 IM, 10 F	10.5 – 36.8	23.4	5, 9, 10, 12, 13, 14, 16, 17, 18, 19, 20
Cambarus diogenes	8	3 IIM, 5 F	28.6 – 47.1	36.4	14, 15, 16, 17, 18
*Orconectes limosus**	5	4 IIM, 1 F	3.8 – 31.9	23.7	2, 8
*Orconectes virilis***	53	30 IIM, 1 IM, 21 F	9.7 – 51.4	30.3	1, 2, 3, 4, 5, 6, 7, 11, 12, 13

burrows excavated with crayfish had chimneys.

One burrow excavated at Site 17 (Table 8) was occupied by a female and 50+ neonates. The resting chamber of the burrow contained detritus composed of *Acer* leaves in various stages of decay, with the leaves showing evidence of mastication by the neonates. Given the carapace lengths of the neonates, it is likely that egg extrusion within this population occurs in late winter or early spring. This matches similar extrusion dates for lacunicambarid crayfishes across eastern North America (Hobbs, 1981; Jezerinac et al., 1995; Taylor & Schuster, 2005). Previous research on this species in the region included an analysis of abiotic conditions within burrows on Theodore Roosevelt Island (Grow & Merchant, 1980).

Crayfish discussion. The crayfish fauna of the Potomac Gorge surveyed during the BioBlitz is not speciose and consists of three native and one invasive species. This is to be expected given the distance of the Gorge's ecoregion from the Southern Appalachians where crayfish diversity reaches its peak in North America (Taylor et al., 1996). The native crayfish fauna of the Potomac Gorge consists of *O. limosus* occupying the Potomac River mainstem and large streams, *C. bartonii* inhabiting headwater and second order streams, and *C. diogenes* fulfilling the primary burrower niche (see Norden, 2008c). This species assemblage and associated habitat preferences are homogeneous throughout the Coastal Plain and Piedmont ecoregions from New York south through northern Virginia (Crocker, 1979).

Virile crayfish (*O. virilis*) demonstrated high microhabitat plasticity and were collected in all lotic environments. Robust populations were present in the Potomac River, Potomac Canal, and Mine Run Branch downstream of the main park road culvert. Individuals took cover beneath slab boulders and various types of debris on the bottom of the Potomac River, whereas macrophyte beds were the preferred microhabitat in the Potomac Canal. Mine Run Branch populations used boulders, crevices on stream bottoms, and detritus beds in pool thalwegs as retreats. Antagonistic interactions were observed between large conspecific males over burrows in Mine Run Branch, indicating a degree of territoriality among adult males.

Orconectes virilis, native to the Midwest, represents a serious threat to the native species of crayfish in the Potomac Gorge, especially *C. bartonii* and *O. limosus*, by occupying preferred microhabitats in streams and forcing native crayfishes into exposed microhabitats (see Hobbs et al., 1989; Lodge et al., 2000a, b). Under these suboptimal conditions native crayfishes are exposed to higher predation rates by fish and other environmental stressors (Capelli & Munjal, 1982). Additionally, invasive orconectids are known to interbreed with native orconectids producing hybrid swarms (Butler, 1988). Future investigations should focus on this phenomenon within the Potomac Gorge to determine if this is also a potential source of imperilment.

Previous work in the Patasco River, Maryland, demonstrated the success of *O. virilis* in extirpating *O. limosus* (Schwartz et al., 1963). *Cambarus bartonii* populations will likely only be impacted in confluences of creeks with the Potomac River because of their secondary burrower life history traits and the reluctance of *O. virilis* to invade headwater streams (Hobbs, 1981). Headwater populations of *C. bartonii* represent potential stock for reintroduction of this species in waters where they have been extirpated by *O. virilis*, assuming that populations of the latter can be controlled or eliminated in some way. Unfortunately, no adequate control methods have been devised to halt the expansion of invasive crayfishes throughout watersheds (Lodge et al., 2000a, b).

Future survey efforts should focus on determining the true extent and nature of *O. virilis* within the Potomac Gorge, surveying for additional species not found during the BioBlitz, and monitoring and managing of the imperiled *O. limosus*. In other parts of its range, *O. limosus* is being extirpated at an accelerated pace due to competition with *O. virilis* and there is no reason to think that this phenomenon is not occurring in Great Falls Park. The headwaters of Difficult Run appear to be a naturally protected refugium blocking the expansion of *O. virilis*. The park's burrowing crayfish populations appear to be stable. As long as "The Swamp" remains undisturbed and intact, *C. diogenes* will continue to thrive within the park's margins.

The Louisiana red crayfish, *Procambarus clarkii* (Girard), commonly raised in aquaculture, is an important invasive species throughout the United States, and is very likely to reside within Great Falls Park (GWMP, VA) (Hobbs et al., 1989). Recent investigations in Maryland and Virginia have documented the escape of this species from controlled situations (J. Kilian, MDNR, pers. comm.). Currently, *P. clarkii* has been documented in the Potomac River mainstem and tributaries throughout the Chesapeake Bay Lowlands. Future survey efforts in the park for this invasive species should focus on the Potomac River mainstem below the Falls. Surveys should also be performed in the CHOH, Maryland to determime if populations are present there. Studies on fish indicate that it is likely that the canal would be utilized by these invasive crayfishes as a corridor given its lentic, slough-like nature (Starnes, 2002).

The digger crayfish, *Fallicambarus fodiens* (Cottle) (formally known as *F. uhleri* [Faxon]), is present throughout the Chesapeake Bay lowlands and Atlantic Coastal Plain ecoregions. Given the close proximity of Great Falls Park to these ecoregions, insular populations may exist in the Potomac Gorge (B. Norden, MDNR, pers. comm.). This native species is a primary burrower and should occur in "The Swamp" and other bottomland environments.

Three additional species of *Procambarus* potentially inhabit the park. *Procambarus acutus* Girard, or White River crayfish, is a secondary burrower associated with wetland sloughs, ponds, and slow-moving streams (Page, 1985; Taylor & Schuster, 2005). This species is present in similar habitats surrounding the park and potentially resides within its borders. Future surveys for this native species should focus on wetlands and ephemeral lentic situations. A closely related species with similar habitat requirements, the Southern White River crayfish (*P. zonangulus*), was recently discovered residing in several wetlands surrounding the greater Washington, DC area in Maryland (J. Kilian, MDNR. pers. comm.). This species is virtually identical to *P. acutus*; distinguishing these two species is difficult.

Copepod results. Twenty species of copepods were found in the samples collected on 23 June (Tables 10, 11). There are no prior records of copepods from Great Falls Park (GWMP, VA), but a review of the Plummers Island fauna was published by Wyngaard & Reid (2008). Brief comments on the local natural history and distribution of each species follows. Further information for many of the species is found in the compendium of Hudson & Lesko (2003).

Table 10. Sites sampled for copepods (Crustacea) in Great Falls Park (GWMP, VA) during the Potomac Gorge BioBlitz, 23 June 2006.

Site	Location	Habitat Type
1	Clay Pond, plankton, 39° 00' 04"N, 77° 15' 25"W	Permanent Pond
2	Clay Pond, mud at edge, 39° 00' 03"N, 77° 15' 25"W	Permanent Pond
3	Clay Pond, damp moss on dead tree limbs just above waterline, 39° 00' 03"N, 77° 15' 25"W	Bottomland Forest
4	Patowmack Canal near north parking lot, plankton, 38° 59' 57"N, 77° 15' 19"W	Canal
5	Culvert entering Patowmack Canal near north parking lot [no copepods]	Canal
6	Slough depression west of path north of Clay Pond [no copepods]	Bottomland Forest
7	Moss on ground beside same slough depression, 39° 00' 20"N, 77° 15' 20"W	Bottomland Forest
8	Boggy depression with skunk cabbage, just west of north parking lot, wet soil, 38° 59' 56"N, 77° 15' 23"W	Bottomland Forest
9	Mine Run, hole dug in sand and gravel bar in streambed, 38° 59' 59"N, 77° 15' 30"W	Second Order Stream
10	Seep GRFA2 entering Mine Run, upper cm of sandy bed, 38° 59' 59"N, 77° 15' 28"W	First-order Seep
11	Seep GRFA2 entering Mine Run, muddy soil, 38° 59' 59"N, 77° 15' 28"W	First-order Seep
12	Seep GRFA2 entering Mine Run, moss, 38° 59' 59"N, 77° 15' 28"W	First-order Seep
13	Seep GRFA4 crossing Swamp Trail, wet leaves in tiny leaf dam, 38° 59' 18"N, 77° 15' 12"W	First-order Seep

Osphranticum labronectum S.A. Forbes. This large, brownish to steel-gray species is the only calanoid that occurred in the samples. It is widespread in North America from central Canada to Central America, inhabiting mainly temporary waters but sometimes occurring in shallow, permanent lakes and swamps. A large population was found in a temporary pool on the Chain Bridge Flats (CHOH, MD) during the 1997 BioBlitz (Reid, 1997). In Virginia, it has been found in Lee and Charlotte counties, Chesapeake and Suffolk cities, and also in Black Pond in Great Falls Park in Fairfax County (Reid, unpub. data).

Acanthocyclops einslei Mirabdullayev & Defaye. This species is perhaps the most interesting find of the BioBlitz. It is a recently described morph of the taxonomically confusing and controversial vernalis-robustus group. Its authors reported it from France, Sumatra, Canada (Ontario), and Lake Erie on the New York side (Mirabdullayev & Defaye, 2004). This is the first record in Virginia, although existing collections need to be reexamined.

Ectocyclops phaleratus (Koch) is a small species that creeps along bottom sediments and the surface of water plants, mostly in ponds, sloughs, and bogs. It is supposedly cosmopolitan, with records from nearly every continent, and is widespread in Virginia (Reid, unpub. data).

Eucyclops agilis (Koch) and *E. conrowae* Reid are both small, primarily benthic species that are widespread in both North America and in Virginia (Reid, unpub. data). They are found in a wide range of stillwater habitats, from lakeshores to small creeks and seeps.

Macrocyclops albidus (Jurine) is a cosmopolitan inhabitant of lakes, ponds, and smaller lentic waterbodies. It thrives in eutrophic conditions. It is the most commonly found species in Virginia (Reid, unpub. data).

Mesocyclops americanus Dussart occurs in small, permanent or ephemeral ponds in central and eastern North America, from southeastern Canada to the Florida Everglades. This is the fourth record in Virginia, where it has been found mainly on the Coastal Plain (Reid, unpub. data).

Paracyclops chiltoni (Thomson) is one of the few species of the genus that is considered truly cosmopolitan (Karaytug, 1999). Many records of its similar congener, *P. fimbriatus* (Fischer), in North America undoubtedly refer to this species. *Paracyclops chiltoni* is extremely common in Virginia, where it is a typical inhabitant of small ponds, seeps, and bogs (Reid, unpub. data).

Paracyclops poppei (Rehberg), like its congener *P. chiltoni*, is considered to be cosmopolitan (Karaytug, 1999). Collections in Virginia, where it is widespread, indicate that this species is somewhat more likely to be found in tiny pools, sloughs, seeps, bogs, and wet soil.

Tropocyclops prasinus mexicanus Kiefer is one of the most common, smaller-sized zooplankters in natural lakes and impoundments across North America. Its occasional presence in streams is probably a result of washing from upstream lentic waterbodies. It is present throughout Virginia (Reid, unpub. data).

Attheyella (*Neomrazekiella*) *illinoisensis* (S.A. Forbes) is another species that is widespread in North America. It is the most typical inhabitant of muddy seeps and lake margins in Virginia (Reid, unpub. data).

Bryocamptus (*Bryocamptus*) *zschokkei* (Schmeil) is a small (length ~0.5 mm), widespread, and extremely common harpacticoid that is circumboreal and common in Arctic, boreal, and temperate regions. In southern Virginia, it is restricted to the upper Piedmont, Blue Ridge, and Valley and Ridge provinces; in northern Virginia, it occurs occasionally in the lower Piedmont in the vicinity of Washington, DC (Reid, unpub. data).

All of the species of *Bryocamptus* live in springs and in moist situations such as moss and wet soils. Most species in the genus prefer cold waters. *Bryocamptus* (*Bryocamptus*) *zschokkei alleganiensis* Coker is a small subspecies with almost the same distribution as *B. zschokkei zschokkei*, except that it is found somewhat farther east in the central Virginia Piedmont (Reid, unpub. data).

Bryocamptus (*Bryocamptus*) sp. (hutchinsoni group, Virginia variation described by Carter, 1944) is a morph known previously from the vicinity of Mountain Lake that Carter attributed to a variation of *B.* (*B.*) *hutchinsoni* Kiefer. Later workers have considered that species of the genus *Bryocamptus* are "variable," but this concept has been tested in very few species. This particular morph has been found in a few locations in the central Virginia Piedmont, and even in the Coastal Plain near Richmond (Reid, unpub. data).

Bryocamptus (*Bryocamptus*) sp. of the hutchinsoni group is another morph that does not agree with any previously described taxa.

Bryocamptus (*Limocamptus*) *morrisoni elegans* (Chappuis) is a relatively rare species known from very few locations in the eastern US. This is only the third record in Virginia, where it occurs also in Montgomery and Pittsylvania counties (Reid, unpub. data).

Bryocamptus (*Limocamptus*) *nivalis* (Willey) is relatively common in the Blue Ridge and upper Piedmont provinces (Reid, unpub. data), but its presence in Virginia has never been published.

Elaphoidella bidens (Schmeil) is a weedy species, common in disturbed locations and especially organically enriched waters. It develops large

populations in such habitats throughout Virginia (Reid, unpub. data). It does not closely resemble any other North American species, and may have been introduced onto this continent.

Moraria laurentica Willey, a member of a typically boreal genus, occurs in Virginia from the Valley and Ridge to the Coastal Plain provinces.

Phyllognathopus viguieri (Maupas) is the most "semiterrestrial" of all of the copepod species found during the BioBlitz. It is found in lake-bottom sediments, but more typically occurs among wet leaves, damp moss, and seeps. It occurs in these habitats all across Virginia (Reid, unpub. data).

Copepod discussion. As with the crayfishes, the assemblage of copepods observed during the BioBlitz is typical for the region and the kinds of habitats that were sampled. As usual, most of the species occur not in the plankton of open waters, but rather are associated with bottom sediments of open bodies of water, and various kinds of saturated to moist, semiterrestrial substrates. The prominence of members of the harpacticoid genus *Bryocamptus* is typical for such habitats.

Certainly this collection did not reveal all of the species that may be present in Great Falls Park. One potential habitat that was not thoroughly investigated is the sandy interstitial, "hyporheic" sediments of seeps and creeks. Furthermore, many species, especially those of ephemeral surface waterbodies, but also those of springs and seeps, are seasonal and may appear and disappear again within the span of a few weeks. Nevertheless, it is apparent that the Park harbors a wide array of subhabitats and a reasonable copepod fauna, including a few such as *Mesocyclops americanus* and *Bryocamptus morrisoni elegans* that, although widespread, are not often collected. The record of *Acanthocyclops einslei* is also rather surprising, and valuable, extending as it does the known distribution of this morph into Virginia.

Table 11. Copepod species collected in Great Falls Park (GWMP, VA) during the Potomac Gorge BioBlitz, 23-25 June 2006. None of the species was previously recorded in the park.

SPECIES	SITES*
Osphranticum labronectum S. A. Forbes	1
Acanthocyclops einslei Mirabdullayev & Defaye	2, 8
Ectocyclops phaleratus (Koch)	2, 8
Eucyclops agilis (Koch)	2
Eucyclops conrowae Reid	2
Macrocyclops albidus (Jurine)	2
Mesocyclops americanus Dussart	1
Paracyclops chiltoni (Thomson)	2, 3, 8, 11
Paracyclops poppei (Rehberg)	3, 8
Tropocyclops prasinus mexicanus Kiefer	2, 4
Attheyella (*Neomrazekiella*) *illinoisensis* (S. A. Forbes)	9, 10
Bryocamptus (*Bryocamptus*) *zschokkei* (Schmeil, 1893)	10
Bryocamptus (*Bryocamptus*) *zschokkei alleganiensis* Coker	7, 12, 13
Bryocamptus (*Bryocamptus*) sp. (hutchinsoni group)	3
Bryocamptus (*Bryocamptus*) sp. (hutchinsoni group, another morph)	8
Bryocamptus (*Limocamptus*) *morrisoni elegans* (Chappuis)	12
Bryocamptus (*Limocamptus*) *nivalis* (Willey,)	9, 11
Elaphoidella bidens (Schmeil)**	8
Moraria laurentica Willey	12
Phyllognathopus viguieri (Maupas)	7, 12

* See Table 10 for collection sites.
**Probably an invasive species.

Management practices for copepods should include avoiding the use of molt-inhibiting insecticides, and preventing silting and contamination by oils and other pollutants. Maintaining the natural forest cover over woodland pools is essential. Alterations to natural drainage patterns should be avoided.

Four species of crayfish and 20 species of copepods (Table 11) were recorded during the BioBlitz. None of the species encountered are listed as threatened, endangered, or globally or state rare.

The members of the crustacean survey team were Zachary Loughman (team leader), Janet Reid, Alex Kim, Laura Kimpel, Kathy Loughman, Stephanie Nelson, Tabitha Viner, and Christopher Vopal. Estimates of the total number of hours spent in the field, and specimen preparation and identification were not available.

Arachnids

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According to Brent Steury, Supervisory Biologist at Turkey Run Park (GWMP, VA), as well as a literature search, no previous work by amateur or professional workers has been conducted specifically on the arachnids of the Potomac Gorge region. However, many spiders have been collected in the Washington, DC area over the years and those results have appeared in monographs of individual families and genera and published in a wide variety of scientific journals.

The timing of the BioBlitz was not particularly favorable for arachnid collecting. Many species of spiders are immature in early summer and thus more difficult to identify. We did not find as many species as expected, perhaps at least partly due to the heavy visitor use of the park. Many of the species found are widespread in disturbed areas.

Most of the team members had no prior field experience conducting arachnid surveys. As a result, the team remained together in the field, sampling only Great Falls Park (GWMP, VA). This limited our geographical coverage and the amount of time we could collect and identify specimens in the field.

A total of 45 species of spiders and other arachnids were recorded during the BioBlitz, including four unidentified species each of harvestmen (Opiliones) and pseudoscorpions (Pseudoscorpiones) that are not listed in Table 12. Ticks and mites were not identified nor are they included in the species count. None of the species encountered are listed as threatened, endangered, or globally or state rare. All of the species collected were indigenous to the region.

The members of the Arachnid survey team were Barbara Abraham (team leader), James Forbes, Carolyn Marks, Peter Munroe, Sarah Abboud, Gerard Gomes, and Colin Funaro, Jr. They contributed a combined total of 96 hours in the field (including travel time), and 40 hours on specimen preparation and identification (including data entry, report writing, and specimen transfer to NPS) for a grand total of 136 hours (Table 25).

Dragonflies and damselflies

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Unlike most other arthropod groups in the Potomac Gorge, the dragonflies and damselflies have been surveyed several times over the past century. Orr (2005) provided the most recent and complete survey of the region, which includes all of the historical data.

During the 2006 Potomac Gorge BioBlitz, all of the odonates encountered were identified either by observed or collected adults or cast larval skins (exuviae). No fieldwork was undertaken on 25 June due to heavy rains.

Forty-six species of dragonflies and damselflies were recorded during the BioBlitz (Table 13), all of which are native to the region. None are listed as threatened, endangered, or globally rare. However, six species are of special interest in the District of Columbia, Maryland, and Virginia, including *Argia sedula* (Hagen) (MD-S3 natural heritage rank), *Enallagma traviatum* Selys (MD-S3), *Tachopteryx thoreyi* (Hagen) (DC-concern, MD-S2), *Erpetogomphus designatus* (Hagen) (MD-S2), *Gomphus fraternus* (Say) (MD-S2, VA-S2), *Neurocordulia obsoleta* (Say) (DC-concern, MD-S3), and *Neurocordulia yamaskanensis* (Provancher) (MD-S2, VA-S2).

The members of the Odonata survey team were Richard Orr (team leader), Michael Bean, Paul Bedell, Ken Clayton, Cathy and Angela Hutto, ZoAnn Lapinsky, Susan Muller, Steve, Tim, and Ben Roble, Charles and Karen Sheffield, Bob and Jo Solem, Ashley and Kate Traut, and June Tveekrem. They contributed a combined total of 242 hours in the field (including preparation and travel time) and 25 hours on specimen preparation and identification (including data entry, report writing, specimen transfer to NPS) for a grand total of 267 hours (Table 25).