

DC Fisheries & Wildlife Invertebrate Monitoring in Chesapeake
and Ohio National Historical Park in 2011

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The District of Columbia's Wildlife Action Plan (WAP) requires the District Department of the Environment (DDOE) to monitor invertebrate populations and species abundance trends. DDOE has been implementing the WAP with surveys of dragonflies and damselflies (Odonata) and butterflies (Lepidoptera) and with an inventory of soil invertebrates. These studies are improving the District's knowledge about local insect populations and will inform a long-term monitoring strategy for other invertebrates in the city. The goal of these studies is to collect data about the abundance and diversity of the invertebrate species in the District, and to examine species composition in various habitats in the city in relation to physical and biological habitat variables.

There were three main research objectives for the Odonata and Lepidoptera project: 1) To target various habitats to find Species of Greatest Conservation Need (SGCN); 2) to find species that might function as environmental indicators; 3) to sample across habitats to determine the spatial distribution of species within the city and the correct scale for future sampling, and to survey throughout the summer to determine peak flight periods for various species of adult Odonata.

Surveys began on 14 April and continued through 12 October. Biologists established transects in a variety of habitats using a GIS, targeting specific habitats to yield SGCN. Transects were walked at least once every three weeks, and all individuals within five meters were counted. Unidentified individuals were captured, photographed and released to have a record for identification. Surveys were conducted during the late morning and afternoon hours when most dragonflies, damselflies and butterflies are more active. At the beginning of each site visit, local weather data including ambient temperature, cloud cover and wind speed was recorded.

Data analysis was qualitative and limited to descriptive statistics and measurements. Species richness, species evenness, relative abundance and diversity indices were calculated for each transect site and for the overall location. The Shannon-Wiener diversity index is a measure of site diversity, and can be used to compare diversity between sites. It takes into account the relative abundance of each species at each transect surveyed. It increases as the relative abundance of all species increases, but it can also be reduced by a single dominant species. The index is the sum of the relative abundances, but the total number of species is not used in the calculation. Finally, relative species richness and relative abundance for every site visit were calculated and graphed against time. To calculate the relative richness and relative abundance from each visit to each transect, the total number of species or total number of observed individuals recorded at each site visit was divided by the length of that transect at that site. The resulting values were then normalized to one by dividing each by the value of the highest relative abundance.

The goal for soil invertebrates is to collect data about their abundance and diversity and to examine the species composition in various habitats and in relation to environmental and biological variables. Soil invertebrates are a group that was not included in the WAP, but they reside in forested habitat, a critical habitat that is threatened by invasive plants and an overabundance of white-tailed deer.

Twenty plots were randomly generated in a GIS to include a range of habitats, soil types, forest types and elevations. At each plot a ten-meter circle was established and sampled for soil invertebrates by collecting a 0.25 m² quadrat of organic detritus and O horizon soil, to a depth of 3cm, from the center of the plot. Invertebrates have been extracted using Berlese funnel extraction and are preserved for identification.

Results

DDOE surveyed three transects in C&O Canal Park in 2011: Potomac River riparian forest and vernal pools south of Fletcher's Cove (CFP), along the towpath from Fletcher's Cove to the Capital Crescent Trail Bridge (CTP) and the ponds on the Chain Bridge Flats (CBF).

There were 28 Odonata species and 22 Lepidoptera species recorded in C&O Canal Park in 2011. Three SGCN were recorded: *Danaus plexippus* (Monarch), *Polygonia comma* (Eastern Comma) and *Vanessa atalanta rubria* (Red Admiral). *Enallagma exulans* (Stream Bluet, 163 records), *Pachydiplax logipennis* (Blue Dasher, 100), *Erythemis simplicicollis* (Eastern Pondhawk, 53) and *Ischnura posita* (Fragile Forktail, 48) were the most commonly recorded Odonata species in the park. *Ancyloxypha numitor* (Least Skipper, 69), *Pieris rapae* (Cabbage White, 43) and *Poanes zabulon* (Zabulon Skipper, 26) were the most common Lepidoptera in the park. Finally, a new dragonfly species, *Dromogomphus spinosus* (Black-shouldered Spinyleg), was recorded at CFP. See Tables 1 & 2 for full species lists.

The Shannon-Wiener index (H) for Odonata was 2.57 at C&O Canal Park. The highest H of all six parks surveyed in 2011 was at the National Arboretum (2.73) and lowest was at Oxon Run Park. The total Odonata abundance was 654 records. By transect, H was 2.30 at CBF (469 records), 2.45 at CFP (35) and 2.54 at CTP (150). H for Lepidoptera was 2.34 and total abundance was 220 records. By transect, H for Lepidoptera was 1.56 at CTP (66), 1.90 at CBF (83) and 2.31 at CFP (71).

The relative species richness curves for Odonata had similar shapes for all three transects, with a peak in mid-June followed by a steady decline through the end of the survey. Richness was highest at CBF throughout the study, and was more than twice as high as richness at both of the other transects. Relative abundance was highest at CBF and peaked in mid-June when there were many adult Stream Bluets at the pond edges. Abundance was low at the other sites throughout the summer (Figure 1a, b).

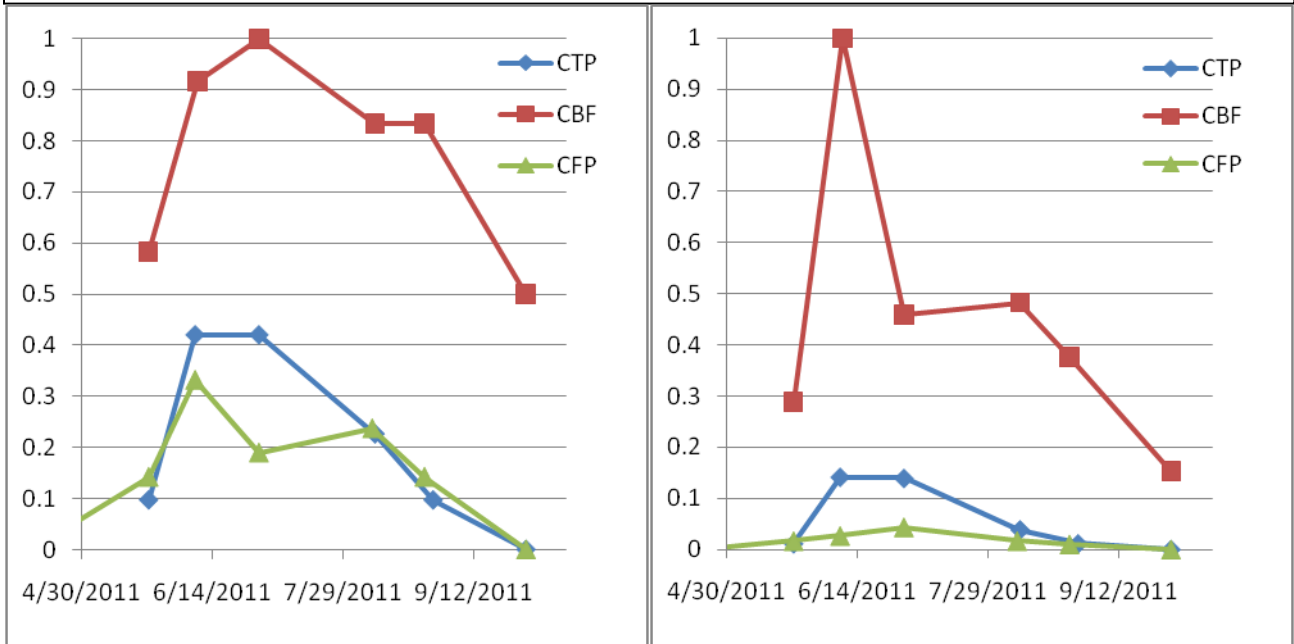
Transect CBF had the highest relative Lepidoptera richness, which peaked in late August. The other two transects had lower richness, but for both richness peaked in late August. Relative abundance followed a similar pattern, with the highest abundance appearing at CBF in late August (Figure 1c, d).

DDOE collected one soil invertebrate samples in C&O Canal Park. The plot was located near the vernal pool south of Fletcher's Cove. Soil invertebrates have been extracted from the samples, but have not yet been identified. Specimens are stored in ethanol in sample jars housed at the District Department of the Environment, 1200 First St. NE Fifth Floor Washington, DC 20002. Specimens will be dissected for identification and may be destroyed during analysis in winter 2012.

Table 1. Species list of Odonata recorded in C&O Canal Park in DC in 2011		
Canal Towpath	Chain Bridge Flats	Fletcher's Vernal Pools
Blue Dasher	Black Saddlebags	Big Bluet
Blue-fronted dancer	Blue Dasher	Black-shouldered Spinyleg
Blue-tipped Dancer	Blue-fronted dancer	Blue Dasher
Citrine Forktail	Common Green Darner	Blue-fronted dancer
Common Whitetail	Common Whitetail	Blue-tipped Dancer
Eastern Amberwing	Eastern Amberwing	Common Whitetail
Eastern Forktail	Eastern Forktail	Eastern Pondhawk
Eastern Pondhawk	Eastern Pondhawk	Elegant Spreadwing
Familiar Bluet	Familiar Bluet	Fragile Forktail
Fragile Forktail	Fragile Forktail	Great Blue Skimmer
Orange Bluet	Orange Bluet	Great Spreadwing
Prince Baskettail	Prince Baskettail	Powdered Dancer
Slaty Skimmer	Slaty Skimmer	Southern Spreadwing
Stream Bluet	Stream Bluet	Spot-winged Glider
Swamp Darner	Violet Dancer	Stream Bluet
Violet Dancer	Widow Skimmer	
Widow Skimmer		

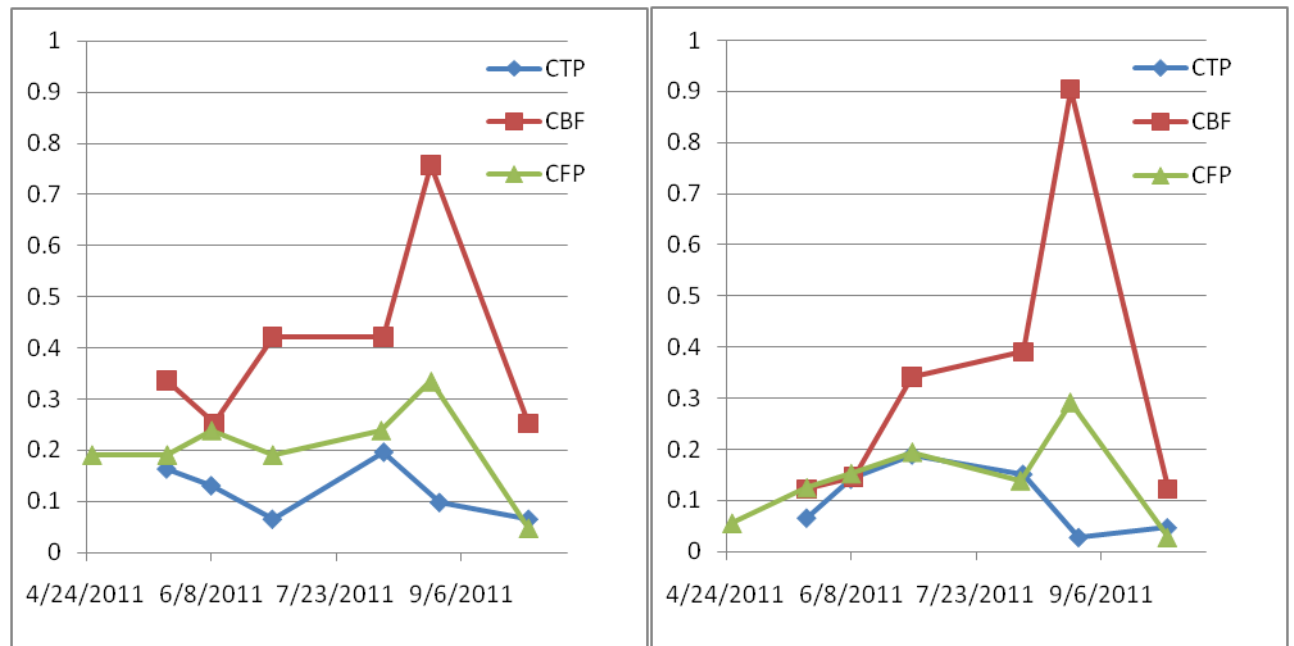
Table 2. Species list of butterflies recorded in C&O Canal Park in DC in 2011		
Canal Towpath, N Fletchers	Chain Bridge Flats	Fletcher's Vernal Pools
Black Swallowtail	Cabbage White	Cabbage White
Cabbage White	Clouded Sulphur	Comma
Clouded Sulphur	Comma	Common Buckeye
Least Skipper	Eastern Tailed Blue	Common Sootywing
Pearl Crescent	European Skipper	Common Wood-nymph
Silver-spotted Skipper	Least Skipper	Eastern Tailed Blue
Spicebush Swallowtail	Monarch	Least Skipper
Summer Azure	Orange Sulphur	Monarch
Tiger Swallowtail	Pearl Crescent	Northern Pearly Eye
Zabulon Skipper	Red Admiral	Pearl Crescent
	Red-spotted Purple	Red Admiral
	Silver-spotted Skipper	Skippers, Unid.
	Spicebush Swallowtail	Zabulon Skipper
	Zabulon Skipper	Zebra Swallowtail
	Zebra Swallowtail	

Figure 1. Time series graphs of (a) relative Odonata species richness, (b) relative Odonata abundance, (c) relative butterfly species richness and (d) relative butterfly abundance at three transects in C&O Canal Park. Data were relativeized by transect length and normalized (to 1) to compare between different transect lengths. X-axis = date; Y-axis = normalized relative species richness. CBF=Chain Bridge Flats; CTP=Canal Towpath; CFP=Fletcher's Vernal Pools



(a)

(b)



(c)

(d)