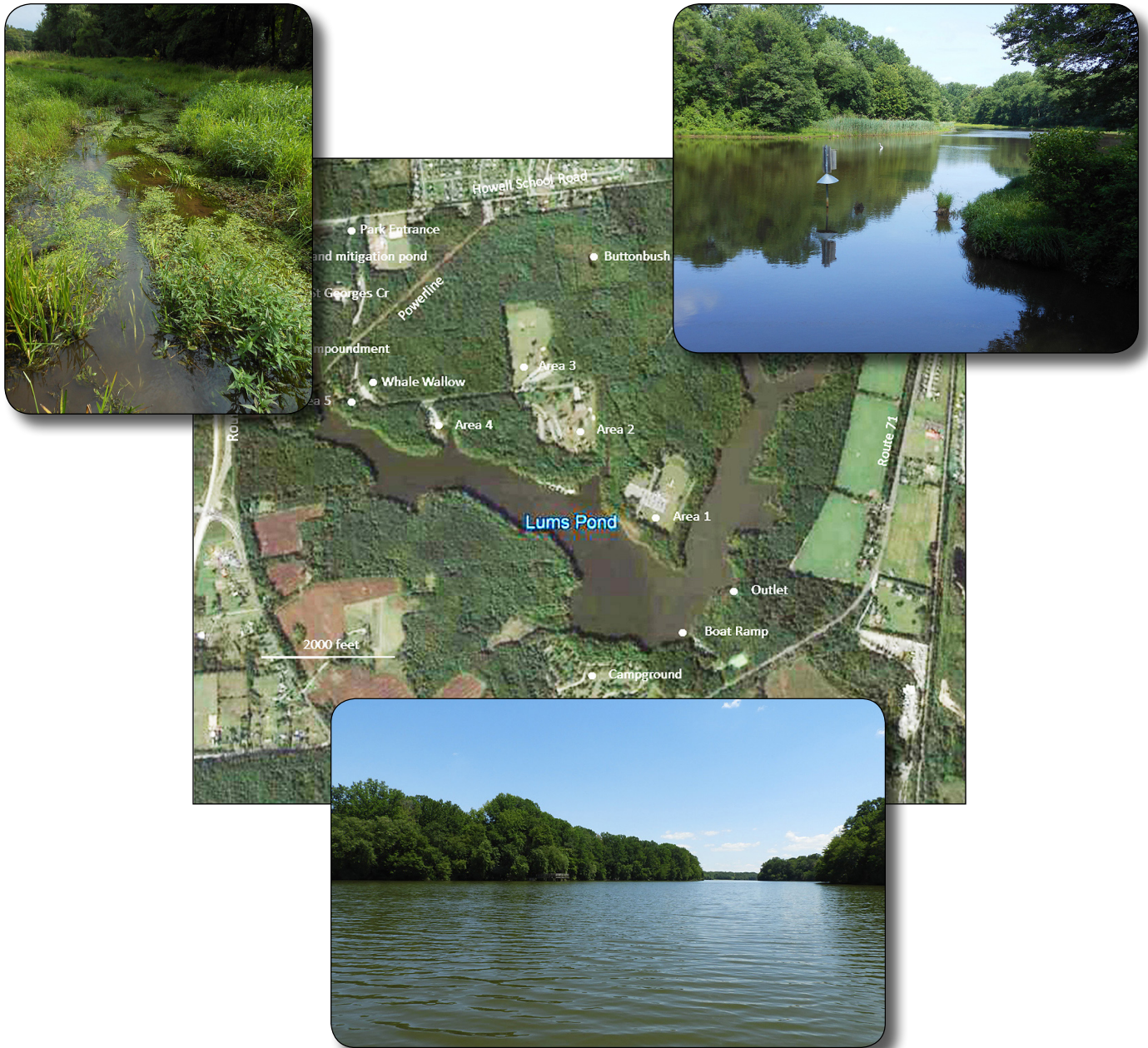


# BULLETIN OF AMERICAN ODONATOLOGY



**White, III, H.B. and M.C. Moore**

21-33 Forty-five-year Record of the Odonata Fauna of Lums Pond State Park, New Castle County, Delaware

**Front cover:** Aerial view of Lums Pond State Park, New Castle County, Delaware with photos of (clockwise from upper left) the northwest tributary of St. Georges Creek, the impoundment, and Lums Pond. Photos by Harold B. White, III.

# Forty-five-year Record of the Odonata Fauna of Lums Pond State Park, New Castle County, Delaware

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## Abstract

We document the Odonata fauna of Lums Pond State Park in northern Delaware based on 45 years of observations with seasonal and yearly distributions for the 67 species observed. While the species composition has remained fairly stable, periods of drought have resulted in large decreases in the abundance or temporary absence of species associated with vernal pond habitats. Recolonization and population recovery often required several years to more than a decade. Various introduced fauna and flora (e.g. beaver, geese, carp, *Phragmites*) have altered permanent pond habitats and are associated with changes in the presence of certain Odonata species and their abundance. Disturbance of one shallow water impoundment by carp and beaver resulted in an abundance of cosmopolitan species associated with degraded habitats. Changes in shoreline vegetation resulting from the spread of *Phragmites* appeared to favor some damselfly species and reduced populations of others.

## Resumen

Documentamos la fauna de Odonata del Parque Estatal Lums Pond en el norte de Delaware en base a 45 años de observaciones con distribuciones estacionales y anuales para las 67 especies observadas. Si bien la composición de las especies se ha mantenido bastante estable, los períodos de sequía han resultado en grandes disminuciones en la abundancia o ausencia temporal de especies asociadas con hábitats de estanques vernaes. La recolonización y la recuperación de la población a menudo requirieron varios años a más de una década. Varias especies de fauna y flora introducidas (castor, gansos, carpas, *Phragmites*) han alterado hábitats permanentes de estanques y están asociadas con cambios en la presencia de ciertas especies de Odonata y su abundancia. La alteración de un embalse de aguas poco profundas por carpas y castores resultó en una abundancia de especies cosmopolitas asociadas con hábitats degradados. Los cambios en la vegetación costera como resultado de la propagación de *Phragmites* parecieron favorecer algunas especies de caballitos del diablo y poblaciones reducidas de otros.

## Introduction

Situated in a region of rapidly growing population and residential development, Lums Pond State Park represents a large protected tract of land that includes a variety of aquatic habitats that support many species of dragonflies and damselflies. Being close to where we live, it has provided a convenient and easily accessible place to visit frequently and observe Odonata over several decades. With the exception of four years (1974, 1978, 1985, and 1987), HBW has visited Lums Pond State Park at least once every year since 1972 to survey the Odonata. Starting in 1994, HBW and recently MCM and others have averaged more than six visits a year, documenting a total of 67 species, which corresponds to approximately 50% of the species known for the Delmarva Peninsula and 70% of those known for New Castle County (White, 2011; Moore, 2018). This report describes the Odonata fauna and the various wetland habitats found in the Park. We also note habitat and faunal changes that have occurred during the past 45 years.

## History of Lums Pond and Lums Pond State Park

Lums Pond is the largest body of fresh water in Delaware. Its origin goes back to 1736 when a grist mill was constructed by Samuel Clement on the northwest branch of St. Georges Creek. John Lum acquired the mill and its associated mill pond in 1804 (Anon, 1983). By 1829, when the first canal between the Chesapeake Bay and Delaware Bay was completed, Lum's millpond was owned by the Chesapeake and Delaware Canal Company and provided water to fill the highest level (Summit) lock (Heite, 1972). The company was given the right to raise the level of the pond to 25 ft (8 m) above the level of the Summit Lock. As part of the diversion of water to the locks, the outlet was moved closer to the canal (Fig. 7, in Miller, 1983). By 1841 the reconfiguration increased the size of the pond to 217 ac (88 ha), larger than the current Lums Pond of 200 ac (81 ha).

Near the end of the nineteenth century, apparently the pond was no longer needed to sustain the Summit Lock and canal commerce, and it was drained. It remained that way until

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Figure 1. Lums Pond State Park with various wetlands marked. Although fragments of the park extend beyond Howell School Road on the north and Route 71 on the east and south, the main part of the park is bounded by those roads and by Route 896 on the west. Source: "Lums Pond." 39.5538° N and 075.7205° W. Google Earth 15 July 2006. Accessed 1 August 2017. Eye altitude 24,129 ft.

the United States government purchased the canal and associated land in 1919, and the Army Corps of Engineers took over administration of the canal (Ponsell, 1958). In the years that followed, the canal was widened and deepened to establish a much shorter sea-level connection between Baltimore and Philadelphia. Dredging spoils were deposited over land once occupied by the pond creating a dike and a new pond by 1927. The Army Corps of Engineers, which had leased the land to the Delaware Fish and Game Commission, retained ownership as a possible site for future dredge spoils. However, in 1954 they declared the pond and 1000 ac (405 ha) surrounding it as surplus government property. Local advocates lobbied the state to take over the property (Ponsell, 1958). The State of Delaware acquired the property and in 1966 officially opened Lums Pond State Park to the public. In the early 1970s, the Park was extensively developed to promote recreation (Anon, 1971). It now covers 1790 ac (725 ha) and provides a variety of boating, fishing,

hiking, camping, and other recreational resources. Historic maps indicate that in 1961 Lums Pond's 6.0 mi<sup>2</sup> (1550 ha) watershed was dominated by agriculture (50%). By 2008 much of that area was developed leaving only 15.4% to agriculture (Homsey et al., 2008).

#### Odonata Habitats within Lums Pond State Park

Two small permanent streams and a number of seeps and small seasonal tributaries provide water to Lums Pond. Many vernal pools are present in the adjacent woodland, two of which retain water most of the year except during droughts. They and other Odonata habitats found in the park are depicted in Fig. 1.

**Lums Pond** [39.55° N, 075.72° W; elev. 43 ft (13 m), area 200 ac (81 ha), maximum depth 12 ft (4 m)] (Fig. 2). Two arms of this Coastal Plain pond are at right angles to each



Figure 2. Lums Pond looking southeast from near the impoundment, 19 August 2017.

other forming an “L-shaped” body of water with the longest stretch of open water of about 1.2 mi (1.9 km) in the northwest arm. Most of the shoreline exposed to wave action is well-defined with a wadable, firm, consolidated sand and gravel bottom that gently slopes away from the shore. There is little emergent vegetation except along the shore where invasive *Phragmites* has become established. Protected inlets have soft unconsolidated bottoms composed of organic debris. The water is generally turbid with visibility less than 2 ft (0.7 m) in the summer. With the exception of a few open areas at designated recreation locations, the pond is now surrounded by forest to the water’s edge. However, sixty years ago, almost all of the now forested land in the Park was open fields, cultivated fields, or pasture (Ponsell, 1958). The 6.8 mi (10.9 km) Swamp-Forest Trail goes around the pond and provides numerous points of access. The outlet for the pond flows to the Chesapeake and Delaware Canal in a steep-sided, mostly inaccessible channel thickly overgrown with multiflora rose.

**Northwest Tributary of St. Georges Creek** [39.5665° N, 75.7345° W; elev. 47 ft (14 m)] (Fig. 3). This small permanent stream flows in a narrow channel, about five feet (2 m) wide and up to two feet (0.7 m) deep before entering the impoundment. It has a firm sandy bottom in most places. The water temperature is noticeably cooler than that in the pond. It is the major source of water for Lums Pond. The stream flows through a dense grassy meadow that was a beaver pond before 1971. Small seeps exist at various places and cross the meadow making footing and navigation difficult and sometimes treacherous. Two branches of St. Georges Creek flow under Howell School Road from residential areas to the north and west. The two branches are also the source of water to the wetland mitigation pond bounded by the two branches and the now abandoned bed of the old Howell

School Road that was reconfigured in 2017.

#### **Wetland Mitigation Pond**

[39.5698° N, 75.7342° W; elev. 53 ft 916 m), area 8.76 ac (3.55 ha)] (Fig. 4). As part of a project by the Delaware Department of Transportation to mitigate wetlands impacted by projects elsewhere in the state, a sizable excavation with a surrounding dike created a pond and emergent marsh along the south side of Howell School Road in 1997. Large portions of the east and west ends of the pond beyond a shallower wadable lip are about 12 ft (4 m) deep, while the south side is fairly shallow with

areas intended to be no more than a few inches to establish an emergent wetland. Concrete weirs to the east, west, and south connect to the adjacent small branches of St. Georges Creek to control the flow into and out of the wetland at defined water levels. After construction, beaver colonized the pond by 2001 and dammed the outlets, which raised the water level and drowned the planted wetland flora. Dense



Figure 3. Northwest tributary of St. Georges Creek looking southeast where it empties into the impoundment, 26 August 2012.

scrubby thickets of autumn olive, blackberry, multiflora rose, and green briar have grown up on the steep bordering dike, making access to the area difficult. Normally, this area is not open to visitors. Emergent vegetation such as pickerel weed dominates the shoreline in contrast to the shoreline of nearby Lums Pond that experiences frequent wave action.

**Impoundment** [39.5646° N, 75.7326° W; elev. 44 ft (13 m), area 3.8 ac (1.55 ha)] (Fig. 5). The northwest tributary of St. Georges Creek flows into a settling basin formed by a dam topped with a causeway that separates it from Lums Pond. Historically, this was a separate pond upstream from Lums millpond (Figs 7–9 in Miller, 1983) and much older than the current Lums Pond. The bottom is soft and muddy due to many years of siltation. The shallow water sediments are disturbed by carp. Mud flats form in dry years, and grassy vegetation extends away from the surrounding young-growth woodland where farmed fields existed before the park was established. Near the upper end of the impoundment where St. Georges Creek enters are the long-abandoned remains of a beaver dam, last active about 1970. Two or three seepage areas and springs are along the west side of the impoundment.

**Temporary wetlands along a powerline right-of-way** [39.5668° N, 75.7285° W; elev. 70 ft (21 m)]. (Fig. 6) A portion of the 8.1 mi Little Jersey hiking trail follows a powerline right-of-way that crosses the impoundment causeway and the entrance road, and continues northeast toward Howell School Road. Based on USDA aerial photographs, the powerline was constructed about 1960. Along the powerline are several low spots which support marsh vegetation and are flooded in the spring and early summer. In two cases, these are abandoned ditches created to drain vernal ponds in fields when the area was farmed. Every few years (e.g. 2006, 2012), young woody vegetation is cut down, but more recently (2017), it was killed with herbicides. In 2014, the addition of about six inches of crushed rock raised the Little Jersey Trail and retarded surface water drainage in places. The corridor formed in the woods by the powerline is often a place where dragonfly adults feed and mature after emergence.

**Vernal ponds** called Delmarva bays or Carolina bays were historically common on the Coastal Plain in Delaware. Most were filled in or drained by ditches to create rich farmland. While there are many vernal pond depressions in the woods at Lums Pond State Park, most are too ephemeral to support the life cycle of Odonata with the exception of two. One, located at the Nature Center, is known as **The Whale Wallow** [39.5637° N, 75.7295° W; elev. 52 ft (16 m), area 0.11 ac (0.045 ha)] (Fig. 7). The other, deep in the woods and sometimes difficult to locate, we have called **Buttonbush Bay** [39.5689° N, 75.7175° W; elev. 78 ft (24 m), area 0.48 ac (0.19 ha)] (Fig. 7) in reference to the vegetation that dominates it. When filled with water in the early spring, the

water depth in these fishless ponds is about three feet (1 m) deep, a level that is below their historic levels because both have artificial drainage channels. Buttonbush Bay retains water longer than the Whale Wallow, but both are often dry by mid to late summer and refill during the fall and winter. When dry in late summer, the Whale Wallow is mostly a bare leaf-covered pan from which grasses and in some years Beggartick (*Bidens* sp.) grow. By contrast, Buttonbush Bay is covered by a variety of rooted vegetation regardless of the season.

**Meadows** [39.5669° N, 75.7214° W; elev. 70 ft (21 m)]. Area 3 of the Park is devoted to large athletic fields for baseball, soccer, football, and cricket. On the east and north sides



Figure 4. Three Google Earth images of the Wetland Mitigation Pond taken in 2004, 2009, and 2015, top to bottom. The color of the water surface in the earlier images corresponds to differences in depth with the greatest depth of over 10 feet in two deeper excavations, one on the eastern end and the other on the western end. The water level is higher in the most recent image due to beaver obstructing the exit gates.



Figure 5. Impoundment looking northwest toward the stream inlet. Note the stand of *Phragmites* on the western shore.

of these fields, there is a grassy meadow buffer separating the fields from the surrounding woodland. In the tall grass, Odonata species associated with Lums Pond but less often detected at the water can be found feeding and maturing. It is also a place where migratory species sometimes form feeding swarms.

### Habitat Alterations and Succession

Considerable changes have occurred that affect the Park's aquatic habitats since it was opened in 1966 and expanded. Open fields that once surrounded Lums Pond (Fig. 1) have

become woodland over the period of study. Thus Buttonbush Bay and the Whale Wallow that once were surrounded by open fields are now woodland wetlands. Likewise the forest cover surrounding most of Lums Pond inhibits emergent shoreline vegetation because of shade.

Lums Pond has experienced the regional proliferation of the invasive *Phragmites* grass, which has colonized much of the eastern shore of the pond, west side of the impoundment, and the south side of Buttonbush Bay. An attempt to control its spread with herbicide treatment temporarily retarded growth around Lums Pond. However, many areas that supported a variety of native emergent vegetation have been overgrown by

dense stands of *Phragmites* that continue to spread. In the mid-20th century, descendants of captive resident non-migratory Canada Geese bred locally and colonized most ponds in the area. Their high density and droppings on surrounding land has contributed to eutrophication, a condition also influenced by nutrient runoff from the rapid residential growth immediately outside the park. Swimming was a feature of the park until 2002, but is no longer permitted in part due to safety issues associated with water turbidity, lack of lifeguards, and unsubstantiated concerns about pollution. Water quality into, within, and out of Lums Pond



Figure 6. The power line cut where several seasonal wetlands occur and dragonflies frequently forage.

is monitored weekly at five sites (DNREC). Average surface water temperature in Lums Pond reaches a high of 29.8° C (85° F) in July and drops to 0–4° C (32–39° F) when ice-covered. The monthly average pH values range from 7.1–8.2 through the year. Dissolved oxygen is around 10 mg/L in winter and between 8 and 9 mg/L from April through September.

The impoundment once supported a rich variety of shallow-water vegetation. However, after carp were introduced, the muddy bottom is constantly disturbed and emergent vegetation is limited. From time to time, beaver clog the culverts draining the impoundment into Lums Pond. This causes changes in the water level that, along with carp activity, prevents the establishment of stable shoreline vegetation that was present in the 1970s.

A wetland mitigation project completed in early 1997 and carefully designed to manage water levels in a created marsh has been neglected and left to the designs of beaver and natural succession. This area is also home to many resident Canada Geese.

### Survey Methods

The duration and thoroughness of Odonata surveys varied greatly depending on the weather, time of year, and number of different sites that could be explored. Thus, surveys were not systematic. However, the 216 total visits spanning every week of the flight season from late March to early December over a period of 45 years gives a reliable inventory of the Park's Odonata fauna and species' seasonal distributions. Familiarity with the varied habitats and species' habitat preferences in the park improved with time, and as a consequence surveys became more targeted, thorough, and efficient in the past two decades. The Appendix shows the dates on which HBW, MCM, or both visited Lums Pond State Park since 1994.

A thorough survey for adult Odonata on a sunny day in the summer would last for 3–5 hours and start at the Nature Center Parking lot at Area 5 closest the entrance, followed by visits to the Whale Wallow, the nearby shore of Lums Pond, the impoundment, and the last 100 meters of the St. Georges Creek. Then the powerline cut and Buttonbush Bay



Figure 7. Vernal ponds in Lums Pond State Park. Upper images show Buttonbush Bay on 18 May 2017 (left) with high water and lacking standing water on 17 September 2015 (right) in late summer. Lower images show the Whale Wallow in similar states on 11 April 2016 and 26 August 2012.



would be surveyed. From there, a return to the parking lot would be via the grassy fields at Area 3 followed by wading shallow water along the shoreline of Lums Pond from Area 4 to Area 5. The wetland mitigation pond was visited regularly for a few years after its construction but infrequently in the past decade. Likewise, eastern areas of the Park near the campground, boat launch, and recreation areas that attract many people were rarely sampled. Since 2011, MCM has also made similar surveys and his observations have been included here.

While specimens of most species have been collected, in recent years species have been identified by sight and sometimes in the hand and released. Specimens have been photographed or taken as vouchers in instances where positive identification is problematic in the field, as in the case of certain *Sympetrum* and *Lestes* species. All specimens eventually will be deposited in the Academy of Natural Sciences of Drexel University in Philadelphia, Pennsylvania, along with HBW's field notes.

### Species List and Seasonal Distribution of Odonata at Lums Pond State Park

Table 1 lists the 67 species of Odonata (43 species of Anisoptera and 24 species of Zygoptera) with their seasonal distribution. The data are recorded by approximately weekly intervals, four per month with successive lengths of 8, 7, 8, and 7 (or 8) days. Migratory *Anax junius* (Common Green Darner) and *Ischnura posita* (Fragile Forktail) are the first species to appear each year in early April and sometimes late March, if the weather has been warm. Both species can be found throughout the summer into the fall. *Sympetrum vicinum* (Autumn Meadowhawk) is the last species to be seen into early December in years without an early hard frost. In the middle of the season from early June through early August, over 40 species are typically present somewhere in the park, but a number of different habitats need to be visited.

### Long-term Population Trends of Odonata at Lums Pond State Park

Table 2 shows the years in which each species of Anisoptera and Zygoptera, respectively, was observed from 1994 to 2017. With the exception of 1976 and 1982 when there were 6 and 5 visits respectively, there were no more than 2 visits in the other years before 1994. Consequently, sampling was incomplete and biased by flight season, and those data are not presented in Table 2 other than to note the number of years between 1972 and 1993 each species was observed. Between 1994 and 2017, the park was visited 184 times compared to 32 times in the previous 22 years.

Of the species observed before 1994, only two, *Aeshna tuberculifera* (Black-tipped Darner) and *Chromagrion conditum* (Aurora Damsel), have not been observed subsequently. Before our surveys, *A. tuberculifera* may have been a resident of a beaver pond and meadow that was destroyed, but more likely the lone specimen was a stray when collected in 1982. *C. conditum* was last observed in 1988. Its absence is unexpected given superficially favorable habitat.

The greater frequency and greater area covered of surveys since 1994 have discovered 13 species not previously observed in Lums Pond State Park. Many of these species were undoubtedly present but had previously escaped notice due to small populations, limited habitat preference, or flight periods not sampled. While these limitations also exist for particular years and particular species since 1994, the composite records in Table 2 give a good sense of the resident species and those whose populations are low or fluctuate significantly from year to year. An additional indication in Table 2 of the relative abundance of the species is the number of survey visits out of a total of 216 each species was observed. Eleven of the most common species have been observed on over 100 of the surveys. Species not easily identified on sight are underrepresented. For example, there are some sightings of unidentified *Somatochlora*, *Sympetrum*, and *Lestes* that are not entered in the table.

### Resident Species

Species that have been observed more than 8 out of the 24 years in Table 1, representing about two-thirds of the species, are most likely resident species, although some are overlooked because they are restricted to localized habitats that may not be visited every year or at the optimal time of year. For example, *Aeshna umbrosa* (Shadow Darner) can often be found hawking along the powerline in September or October if looked for. Similarly, *Amphiagrion saucium* (Eastern Red Damsel) is restricted to seepage areas along the northwest tributary of St. Georges Creek. It can occur there in large numbers but is often overlooked by its small size, early flight season, and difficult to access habitat.

While many of the species found at Lums Pond State Park are common in the middle Atlantic region, some deserve note. The well-established population of *Macromia taeniolata* (Royal River Cruiser) is the most northern population we know of. Adult males patrol the shore line of Lums Pond with direct and regular beats in July and August. *Enallagma durum* (Big Bluet) is another species found regularly at Lums Pond but is scarce elsewhere in the region. It seems to be most common in dense stands of *Phragmites*. The Park supports sizable populations of *Lestes congener* (Spotted Spreadwing) at Buttonbush Bay and the Whale Wallow. The species is currently not known from other sites in Delaware.

White and Moore Odonata of Lums Pond, Delaware

Table 1. Seasonal distribution of Odonata known from Lums Pond State Park, 1972–2017. Monthly quarters: I = days 1–8; II = days 9–15; III = days 16–23; IV = days 24–31 of the month; x = species observed in that quarter, ? = unconfirmed sight record.

Scientific Name	Common Name	Month Week	Mar IV	April				May				June				July				Aug	
				I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II				
<i>Aeshna tuberculifera</i>	Black-tipped Darner																				
<i>Aeshna umbrosa</i>	Shadow Darner																				
<i>Aeshna verticalis</i>	Green-striped Darner																				
<i>Anax junius</i>	Common Green Darner	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
<i>Anax longipes</i>	Comet Darner												x							x	
<i>Basiaeschna janata</i>	Springtime Darner			x			?	x				?									
<i>Boyeria vinosa</i>	Fawn Darner																				
<i>Epiaeschna heros</i>	Swamp Darner							x	x	x	x	x	x	x	x	x	x	x	x	x	
<i>Nasiaeschna pentacantha</i>	Cyrano Darner										x	x	x	x	x	x	x	x	x	x	
<i>Arigomphus villosipes</i>	Unicorn Clubtail										x	x	x	x	x	x	x	x	x	x	
<i>Phanogomphus exilis</i>	Lancet Clubtail					x		x	x	x	x	x	x	x							
<i>Phanogomphus lividus</i>	Ashy Clubtail										x	x	x								
<i>Macromia taeniolata</i>	Royal River Cruiser												x	x			x	x	x	x	
<i>Epietheca costalis</i>	Slender Baskettail									x	x	x	x	x							
<i>Epietheca cynosura</i>	Common Baskettail					?			x	x	x	x	x	x							
<i>Epietheca princeps</i>	Prince Baskettail								x	x	x	x	x	x	x	x	x	x	x		
<i>Somatochlora linearis</i>	Mocha Emerald														x	x				x	
<i>Somatochlora tenebrosa</i>	Clamp-tipped Emerald												x				?	?	?		
<i>Celithemis elisa</i>	Calico Pennant										x			x	x	x	x	x	x	x	
<i>Celithemis eponina</i>	Halloween Pennant												x	x	x	x	x	x	x	x	
<i>Celithemis verna</i>	Double-ringed Pennant										x						x				
<i>Erythemis simplicicollis</i>	Eastern Pondhawk								x	x	x	x	x	x	x	x	x	x	x	x	
<i>Ladona deplanata</i>	Blue Corporal						x														
<i>Libellula axilena</i>	Bar-winged Skimmer										x	x	x	x	x	x	x	x	x	x	
<i>Libellula cyanea</i>	Spangled Skimmer								x	x	x	x	x	x	x	x	x	x	x	x	
<i>Libellula incesta</i>	Slaty Skimmer										x	x	x	x	x	x	x	x	x	x	
<i>Libellula luctuosa</i>	Widow Skimmer										x	x	x	x	x	x	x	x	x	x	
<i>Libellula needhami</i>	Needham's Skimmer														x					x	
<i>Libellula pulchella</i>	Twelve-spotted Skimmer								x	x	x	x	x	x			x	x	x	x	
<i>Libellula semifasciata</i>	Painted Skimmer				x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	
<i>Libellula vibrans</i>	Great Blue Skimmer										x	x	x	x	x	x	x	x	x	x	
<i>Pachydiplax longipennis</i>	Blue Dasher										x	x	x	x	x	x	x	x	x	x	
<i>Pantala flavescens</i>	Wandering Glider				x								x				x			x	
<i>Pantala hymenaea</i>	Spot-winged Glider												?	x	x	x	x	x	x	x	
<i>Perithemis tenera</i>	Eastern Amberwing										x	x	x	x	x	x	x	x	x	x	
<i>Plathemis lydia</i>	Common Whitetail		x		x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	
<i>Sympetrum ambiguum</i>	Blue-faced Meadowhawk												x	x	x	x				x	
<i>Sympetrum internum</i>	Cherry-faced Meadowhawk																x	?	x		
<i>Sympetrum rubicundulum</i>	Ruby Meadowhawk													x							
<i>Sympetrum semicinctorum</i>	Band-winged Meadowhawk																				
<i>Sympetrum vicinum</i>	Autumn Meadowhawk																			x	
<i>Tramea carolina</i>	Carolina Saddlebags										x	x	x	x	x	x	x	x	x	x	
<i>Tramea lacerata</i>	Black Saddlebags										x	x	x	x	x	x	x	x	x	x	
<i>Calopteryx maculata</i>	Ebony Jewelwing										x	x	x	x	x	x	x	x	x	x	
<i>Archilestes grandis</i>	Great Spreadwing																				
<i>Lestes australis</i>	Southern Spreadwing							x		x			x	x	x						
<i>Lestes congener</i>	Spotted Spreadwing												x	x	x	x				x	
<i>Lestes forcipatus</i>	Sweetflag Spreadwing												x	x	x	x	x	x	x	x	
<i>Lestes inaequalis</i>	Elegant Spreadwing																			x	
<i>Lestes rectangularis</i>	Slender Spreadwing																			x	
<i>Amphiagrion saucium</i>	Eastern Red Damsel					x														x	
<i>Argia apicalis</i>	Blue-fronted Dancer																			x	
<i>Argia fumipennis violacea</i>	Violet Dancer																			x	
<i>Chromagrion conditum</i>	Aurora Damsel																			x	
<i>Enallagma aspersum</i>	Azure Bluet																			x	
<i>Enallagma basidens</i>	Double-Striped Bluet																			x	
<i>Enallagma civile</i>	Familiar Bluet				x															x	
<i>Enallagma divagans</i>	Turquoise Bluet																			x	
<i>Enallagma durum</i>	Big Bluet																			x	
<i>Enallagma geminatum</i>	Skimming Bluet																			x	
<i>Enallagma signatum</i>	Orange Bluet					x														x	
<i>Enallagma triviatum</i>	Slender Bluet																			x	
<i>Enallagma vesperum</i>	Vesper Bluet																			x	
<i>Ischnura bastata</i>	Citrine Forktail																			x	
<i>Ischnura posita</i>	Fragile Forktail	x		x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	
<i>Ischnura ramburii</i>	Rambur's Forktail																			x	
<i>Ischnura verticalis</i>	Eastern Forktail																			x	
	<b>Visits</b>	3	6	5	9	6		6	7	7	9	9	6	10	10	9	7	4	10	7	
	<b>Species</b>	2	4	3	8	8		9	15	24	34	42	37	47	46	42	45	38	41	38	

Continued next page...

Table 1 continued . . .

Scientific Name	Common Name	Month Week	Aug		Sept				Oct				Nov				Dec	Early-Late Dates
			III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV		
<i>Aeshna tuberculifera</i>	Black-tipped Darner									X							10.03	
<i>Aeshna umbrosa</i>	Shadow Darner		X		X	X	X	X	X	X	X	X	X	X	X		8.23 – 11.13	
<i>Aeshna verticalis</i>	Green-striped Darner						?			X							9.13 – 10.03	
<i>Anax junius</i>	Common Green Darner		X	X	X	X	X	X	X	X	X	X	X	X			3.26 – 11.01	
<i>Anax longipes</i>	Comet Darner																6.20 – 8.07	
<i>Basiaeschna janata</i>	Springtime Darner																4.03 – 6.04	
<i>Boyeria vinosa</i>	Fawn Darner		X		X		X	X									8.22 – 9.24	
<i>Epiaeschna heros</i>	Swamp Darner		X	X	X												5.08 – 9.07	
<i>Nasiaeschna pentacantha</i>	Cyrano Darner		X	X													5.27 – 8.29	
<i>Arigomphus villosipes</i>	Unicorn Clubtail																5.27 – 7.14	
<i>Gomphus exilis</i>	Lancet Clubtail																4.17 – 7.12	
<i>Gomphus lividus</i>	Ashy Clubtail																5.20 – 6.16	
<i>Macromia taeniolata</i>	Royal River Cruiser		X	X	X		?										6.18 – 9.16	
<i>Epiheca costalis</i>	Slender Baskettail																5.25 – 6.25	
<i>Epiheca cynosura</i>	Common Baskettail																4.17 – 7.02	
<i>Epiheca princeps</i>	Prince Baskettail		X	X													6.01 – 8.27	
<i>Somatochlora linearis</i>	Mocha Emerald			X	?	X	X										7.05 – 9.20	
<i>Somatochlora tenebrosa</i>	Clamp-tipped Emerald		X		X	X											6.16 – 9.15	
<i>Celithemis elisa</i>	Calico Pennant							X		X							6.05 – 10.09	
<i>Celithemis eponina</i>	Halloween Pennant		X	X	X	X	X	X	X								6.18 – 10.03	
<i>Celithemis verna</i>	Double-ringed Pennant																6.07 – 7.09	
<i>Erythemis simplicicollis</i>	Eastern Pondhawk		X	X	X	X	X	X	X								5.14 – 10.15	
<i>Ladona deplanata</i>	Blue Corporal																4.26	
<i>Libellula axilena</i>	Bar-winged Skimmer		X														5.30 – 8.16	
<i>Libellula cyanea</i>	Spangled Skimmer																5.13 – 8.07	
<i>Libellula incesta</i>	Slaty Skimmer		X	X	X	X	X	X	X	X	X						5.27 – 10.18	
<i>Libellula luctuosa</i>	Widow Skimmer		X	X	X	X	X	X	X								6.01 – 10.03	
<i>Libellula needhami</i>	Needham's Skimmer		X														6.25 – 8.17	
<i>Libellula pulchella</i>	Twelve-spotted Skimmer		X	X	X	X	X	X	X								5.13 – 10.13	
<i>Libellula semifasciata</i>	Painted Skimmer																4.16 – 8.08	
<i>Libellula vibrans</i>	Great Blue Skimmer		X	X	X	X			X								5.28 – 10.21	
<i>Pachydiplax longipennis</i>	Blue Dasher		X	X	X	X	X	X	X	X	X						5.19 – 10.22	
<i>Pantala flavescens</i>	Wandering Glider		X	X	X	X	X	X	X		X						4.16 – 10.22	
<i>Pantala hymenaea</i>	Spot-winged Glider		X		X	X											6.06 – 9.09	
<i>Perithemis tenera</i>	Eastern Amberwing		X	X	X	X	X	X	X	X							5.25 – 10.09	
<i>Plathemis lydia</i>	Common Whitetail		X	X	X	X	X	X	X	X	X						4.08 – 10.22	
<i>Sympetrum ambiguum</i>	Blue-faced Meadowhawk		X	X	X	X	X	X	X	X	X		X	X			6.05 – 11.01	
<i>Sympetrum internum</i>	Cherry-faced Meadowhawk		X	X	X	X	X	X	X	X							7.05 – 10.13	
<i>Sympetrum rubicundulum</i>	Ruby Meadowhawk		X	X	X	X			X								6.19 – 10.03	
<i>Sympetrum semicinctum</i>	Band-winged Meadowhawk				?												7.09 – 9.04	
<i>Sympetrum vicinum</i>	Autumn Meadowhawk		X		X	X	X	X	X	X	X	X	X	X	X		6.24 – 12.01	
<i>Tramea carolina</i>	Carolina Saddlebags			X							X						5.27 – 10.14	
<i>Tramea lacerata</i>	Black Saddlebags		X	X	X	X	X	X	X								5.20 – 10.03	
<i>Calopteryx maculata</i>	Ebony Jewelwing		X	X	X	X											5.08 – 9.21	
<i>Archilestes grandis</i>	Great Spreadwing								X	X	X						10.03 – 10.22	
<i>Lestes australis</i>	Southern Spreadwing																5.08 – 6.27	
<i>Lestes congener</i>	Spotted Spreadwing				X	X	X	X	X	X	X		X	X			6.08 – 11.12	
<i>Lestes forcipatus</i>	Sweetflag Spreadwing		X	X	X	X	X		X								5.13 – 10.15	
<i>Lestes inaequalis</i>	Elegant Spreadwing																6.19 – 8.08	
<i>Lestes rectangularis</i>	Slender Spreadwing		X	X	X	X	X	X	X	X							5.23 – 10.22	
<i>Amphiagrion saucium</i>	Eastern Red Damsel																4.26 – 7.05	
<i>Argia apicalis</i>	Blue-fronted Dancer		X	X	X	X	X	X	X	X							5.25 – 10.22	
<i>Argia fumipennis violacea</i>	Violet Dancer		X		X		X	X									5.25 – 10.02	
<i>Chromagrion conditum</i>	Aurora Damsel																6.12 – 6.20	
<i>Enallagma aspersum</i>	Azure Bluet		X	X													5.19 – 8.24	
<i>Enallagma basidens</i>	Double-Striped Bluet				X												6.24 – 9.13	
<i>Enallagma civile</i>	Familiar Bluet		X	X	X	X	X	X	X	X	X						4.17 – 10.22	
<i>Enallagma divagans</i>	Turquoise Bluet																6.06	
<i>Enallagma durum</i>	Big Bluet		X	X	X	X	X	X	X	X							5.09 – 9.26	
<i>Enallagma geminatum</i>	Skimming Bluet		X		X		X										5.09 – 9.09	
<i>Enallagma signatum</i>	Orange Bluet		X	X	X	X	X	X	X	X							4.30 – 10.22	
<i>Enallagma traviatum</i>	Slender Bluet																6.07 – 7.26	
<i>Enallagma vesperum</i>	Vesper Bluet																5.20 – 6.08	
<i>Ischnura bastata</i>	Citrine Forktail		X		X	X	X	X	X								5.25 – 10.15	
<i>Ischnura posita</i>	Fragile Forktail		X	X	X	X	X	X	X	X							3.28 – 10.22	
<i>Ischnura ramburii</i>	Rambur's Forktail		X		X	X	X	X	X								5.25 – 10.09	
<i>Ischnura verticalis</i>	Eastern Forktail		X	X	X	X	X	X	X	X							-	
	<b>Visits</b>		6	9	7	9	10	6	9	5	6	2	4	3	3	1	2	
	<b>Species</b>		38	32	32	32	29	29	29	24	17	3	5	4	1	1	1	
																	216	

White and Moore Odonata of Lums Pond, Delaware

Table 2. Yearly distribution of Odonata known from Lums Pond State Park, 1994–2017. x = species observed in that year, ? = unconfirmed sight record.

Species	Year	1972–1993	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	1994–2017	Tot Obs				
<i>Aeshna tuberculifera</i>	1																										0	1				
<i>Aeshna umbrosa</i>	5		x		x	x	x					x	x	x		x	x	x		x			x	x	x	x	12	27				
<i>Aeshna verticalis</i>	1																			x							1	3				
<i>Anax junius</i>	12		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	24	148				
<i>Anax longipes</i>	0							x																			1	2				
<i>Basiaeschna janata</i>	0			x											x							x	x				4	4				
<i>Boyeria vinosa</i>	0													x												x	3	6				
<i>Epiaeschna heros</i>	2			x		x			x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	19	57				
<i>Nasiaeschna pentacantha</i>	2		x	x				x	x		x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	17	32				
<i>Arigomphus villosipes</i>	3		x			x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	19	31				
<i>Phanogomphus exilis</i>	2			x		x			x	x				x	x	x	x	x		x	x	x	x	x	x	x	15	25				
<i>Phanogomphus lividus</i>	0														x		x					x		x			5	5				
<i>Macromia taeniolata</i>	5		x					x	x		x	x	x	x		x	x	x	x	x	x	x		x	x	x	17	41				
<i>Epitheca costalis</i>	1																										3	8				
<i>Epitheca cynosura</i>	1					x							?	x	?	x				x	x	x	x		x	x	9	18				
<i>Epitheca princeps</i>	7		x	x	x			x	x	x		x	x	x	x	x	x	x	x	x	x	x		x	x	x	19	36				
<i>Somatochlora linearis</i>	1											x	x				x						x		x	x	6	9				
<i>Somatochlora tenebrosa</i>	2													?	x								x		x	x	4	9				
<i>Celithemis elisa</i>	0					x		x	x	x		x		?		x				x	x					x	9	16				
<i>Celithemis eponina</i>	4							x	x	x		x	x	x	x	x	x	x	x	x	x					x	16	34				
<i>Celithemis verna</i>	0																								x	x	2	2				
<i>Erythemis simplicicollis</i>	14		x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	24	112				
<i>Ladona deplanata</i>	0																										1	1				
<i>Libellula axilena</i>	0			x				x		x			x	x	x	x	x	x						x	x	x	15	32				
<i>Libellula cyanea</i>	4		x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	22	55				
<i>Libellula incesta</i>	12		x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	24	113				
<i>Libellula luctuosa</i>	11		x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	24	90				
<i>Libellula needhami</i>	0							x				x		?	x								x	x			5	7				
<i>Libellula pulchella</i>	5		x	x	x	x		x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	20	55				
<i>Libellula semifasciata</i>	3				x	x		x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	20	60				
<i>Libellula vibrans</i>	0			x	x									x	x	x	x	x	x	x	x	x	x	x	x	x	16	56				
<i>Pachydiplax longipennis</i>	12		x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	24	137				
<i>Pantala flavescens</i>	4					x								x	x	x	x								x	x	9	21				
<i>Pantala hymenaea</i>	2		x					x	x	x				x												x	x	11	21			
<i>Perithemis tenera</i>	10		x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	24	110				
<i>Plathemis lydia</i>	14		x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	24	153				
<i>Sympetrum ambiguum</i>	6		x	x	x	x		x	x	x	x			x	x	x	x	x	x	x	x	x	x	x	x	x	22	78				
<i>Sympetrum internum</i>	6		x	x	x	x		x	x	x	x			x	x											x	13	22				
<i>Sympetrum rubicundulum</i>	3		x																								6	11				
<i>Sympetrum semicinctum</i>	0		x											?													1	2				
<i>Sympetrum vicinum</i>	8		x		x	x		x	x	x	x			x	x	x	x	x	x	x	x	x	x	x	x	x	20	54				
<i>Tramea carolina</i>	2					x		x		x				x	x	x	x										17	36				
<i>Tramea lacerata</i>	10		x	x		x		x	x	x	x			x	x	x	x	x	x	x	x	x					22	74				
<i>Calopteryx maculata</i>	3		x			x		x	x	x	x			x	x	x	x	x	x	x	x	x	x	x	x	x	22	62				
<i>Archilestes grandis</i>	1		x		x					x																	3	3				
<i>Lestes australis</i>	2																										2	10				
<i>Lestes congener</i>	6		x		x	x		x	x	x				x	x	x	x										18	47				
<i>Lestes forcipatus</i>	1		x	x	x	x		x																			15	32				
<i>Lestes inaequalis</i>	3													x	x												2	7				
<i>Lestes rectangularis</i>	5		x	x		x		x	x	x	x			x	x	x	x	x	x	x	x	x	x	x	x	x	21	85				
<i>Amphiagrion saucium</i>	4					x				x																	9	18				
<i>Argia apicalis</i>	9		x	x	x	x		x	x	x	x			x	x	x	x	x	x	x	x	x	x	x	x	x	24	112				
<i>Argia fumipennis violacea</i>	3			x		x		x	x	x	x			x													15	29				
<i>Chromagrion conditum</i>	2																										0	2				
<i>Enallagma aspersum</i>	4			x		x								x													14	36				
<i>Enallagma basidens</i>	2					x		x		x																	3	7				
<i>Enallagma civile</i>	14		x	x	x	x		x	x	x	x			x	x	x	x	x	x	x	x	x	x	x	x	x	23	102				
<i>Enallagma divagans</i>	0							x																			1	1				
<i>Enallagma durum</i>	1		x	x	x			x		x				x	x	x	x	x	x	x	x	x	x	x	x	x	19	49				
<i>Enallagma geminatum</i>	8		x	x				x						x													10	30				
<i>Enallagma signatum</i>	12		x	x	x	x		x	x	x	x			x	x	x	x	x	x	x	x	x	x	x	x	x	24	101				
<i>Enallagma traviatum</i>	4		x			x								x													9	24				
<i>Enallagma vesperum</i>	0																										1	2				
<i>Ischnura bastata</i>	1					x		x	x																		13	20				
<i>Ischnura posita</i>	11		x	x	x	x		x	x	x	x			x	x	x	x	x	x	x	x	x	x	x	x	x	24	143				
<i>Ischnura ramburii</i>	3					x								x													12	20				
<i>Ischnura verticalis</i>	16		x	x	x	x		x	x	x	x			x	x	x	x	x	x	x	x	x	x	x	x	x	24	133				
<b>Visits Species</b>	<b>32</b>		<b>5</b>	<b>4</b>	<b>3</b>	<b>3</b>		<b>3</b>	<b>5</b>	<b>5</b>	<b>3</b>		<b>4</b>	<b>7</b>	<b>6</b>	<b>5</b>		<b>5</b>	<b>8</b>	<b>9</b>	<b>10</b>		<b>8</b>	<b>14</b>	<b>16</b>	<b>9</b>	<b>8</b>	<b>18</b>	<b>16</b>	<b>10</b>	<b>216</b>	
			<b>33</b>	<b>31</b>	<b>24</b>	<b>39</b>		<b>39</b>	<b>33</b>	<b>37</b>	<b>26</b>		<b>29</b>	<b>33</b>	<b>37</b>	<b>41</b>		<b>31</b>	<b>38</b>	<b>41</b>	<b>34</b>		<b>39</b>	<b>41</b>	<b>38</b>	<b>41</b>	<b>37</b>	<b>39</b>	<b>48</b>	<b>48</b>		

Among those species that are now resident, significant population changes have occurred. Robust populations of *Libellula vibrans* (Great Blue Skimmer) and *L. axilena* (Bar-winged Skimmer) exist at Buttonbush Bay and at wetlands along the powerline. Both species were first observed at the park in 1995, the year they first appeared in several places in southern New England (Carpenter, 1995; Soltez, Barber, & Carpenter, 1995). Following 1995, both species were found most years. Initially, *axilena* was more frequent, but *vibrans* is more common recently.

*Sympetrum ambiguum* (Blue-faced Meadowhawk) occurs at Buttonbush Bay most years but is rarely seen at Lums Pond itself except in deep coves. During drought years of 1999, 2002, and 2003, when vernal ponds were dry most of the year, it disappeared or was scarce. Subsequently, its population has grown, and it is a prominent resident of Buttonbush Bay and the Whale Wallow. A similar pattern was seen with other species associated with vernal ponds, such as *Epiaeschna heros* (Swamp Darner). Among damselflies associated with fishless vernal ponds, *Lestes congener* (Spotted Spreadwing) and *L. forcipatus* (Sweetflag Spreadwing) were absent or scarce in drought (e.g. 1999) and following years, but their populations have rebounded. *L. australis* (Southern Spreadwing) is another species in this group that has reestablished populations at the vernal ponds.

For some species, especially those that are associated with flowing water such as *Basiaeschna janata* (Springtime Darner), *Boyeria vinosa* (Fawn Darner), *Phanogomphus lividus* (Ashy Clubtail), and *Somatochlora* (Emeralds), seasonal distribution records are sparse because their habitat was not sampled sufficiently during their flight season. This might also explain the absence of any species of *Cordulegaster* (Spiketails) despite the apparent suitable habitats. On the other hand, species such as *Ladona deplanata* (Blue Corporal) and *Enallagma basidens* (Double-striped Bluet) are rarely encountered, although both are sometimes abundant at dredge-spoil ponds north of the Chesapeake and Delaware Canal a mile or two (1.5–3 km) from the Park.

Two species recorded from Lums Pond State Park represent the only records for those species on the Delmarva Peninsula. Both *Aeshna tuberculifera* (Black-tipped Darner) and *A. verticalis* (Green-striped Darner) were documented on 3 October 1982 in the abandoned beaver meadow area flanking the St. Georges Creek. While one or both species were seen occasionally around that time, they have not been found elsewhere within 50 mi since, except for one male *A. verticalis* photographed by MCM at Buttonbush Bay in 2011. Among the undocumented sight records are *Dorocordulia lepida* (Petite Emerald) and *Tramea onusta* (Red Saddlebags). Because neither species is known from Delaware, those species have not been included in Tables 1 and 2 and need to be confirmed.

## Discussion

While many people interested in Odonata have favorite habitats they visit repeatedly for many years, few have published summaries of their long-term monitoring of Odonata populations at particular sites. Such studies provide a historical record for future reference. The work of Shiffer and coauthors on three sites in central Pennsylvania addresses issues that short-term studies cannot such as: colonization of sites, local extinctions, long and short-term population fluctuations, effects of habitat disturbances, and environmental influences such as climate change (Shiffer & White, 1995, 2014; Shiffer, Leppo, & White, 2014, 2015).

While there have been isolated undocumented sight records of species not listed for Lums Pond State Park, it is likely few, if any, resident species have been overlooked. The only species that has been added recently to the list is *Celithemis verna* (Double-ringed Pennant). It was seen first in 2015 and was observed breeding at Buttonbush Bay in 2017. There are no known nearby established source populations, although the species has been found occasionally at other sites in the area. Prior to that, the next most recent addition was a single individual of *Ladona deplanata* in 2008 and that species has not been seen again since even though there is a large population less than three miles (5 km) to the west. *Lestes australis* (Southern Spreadwing), which had last been observed in 1991 before several droughts, has recently recolonized the park. Undoubtedly, there will be an occasional stray or migratory species that may appear; however, the current Odonata fauna is well documented and fairly constant from year to year.

On the other hand, there are a few species, such as *Chromagrion conditum* (Aurora Damselfly), and *Archilestes grandis* (Great Spreadwing), that have disappeared despite efforts to find them. These two species seem to be disappearing more generally in the area. Other species noticeably less common than in the past include *Aeshna umbrosa* (Shadow Darner) and *Amphiagrion saucium* (Eastern Red Damselfly). In years after the extreme drought of 1999, vernal pond species such as *Epiaeschna heros* (Swamp Darner), *Libellula semifasciata* (Painted Skimmer), *L. vibrans* (Great Blue Skimmer), *Tramea carolina* (Carolina Saddlebags), *Sympetrum ambiguum* (Blue-faced Meadowhawk), *Lestes forcipatus* (Sweetflag Spreadwing), and *L. congener* (Spotted Spreadwing) were extremely rare or absent. *L. inaequalis* (Elegant Spreadwing) occurred at the impoundment area in the 1970s but disappeared there after disruption of the shoreline vegetation by carp and beaver. It then was found occasionally at the wetland mitigation pond, but has not been found elsewhere in the Park. In contrast, the population of *Plathemis lydia* (Common Whitetail) at the impoundment is huge, whereas individuals of that species are not common

elsewhere in the Park except along the power line where they mature and feed after emergence. *Enallagma civile* (Familiar Bluet) also occurs commonly at the impoundment. *E. durum* (Big Bluet) and *Ischnura verticalis* (Eastern Forktail) are most frequently found among the stands of *Phragmites* along the shore of Lums Pond. White (2011) speculated that *E. durum* might be favored by runoff from road salt in the winter, because it is often associated with Coastal occasionally brackish environments. That seems unlikely based on the salinity measurements done over the years (DNREC).

Within New Castle County, Lums Pond State Park lies on the Coastal Plain about five miles south of the edge of the Piedmont physiographic province defined roughly by the Interstate 95 Highway. Therefore, species such as *Argia moesta* (Powdered Dancer) or *Macromia i. illinoensis* (Swift River Cruiser), which are associated with swift flowing rocky streams found on the Piedmont nearby, are not in Lums Pond State Park. Similarly, a number of species with southern affinities that reside in southern parts of the Coastal Plain in Delaware are not found within the Park.

Overall, more than half of the species of Odonata known for Delaware (White, 2011; Moore, 2018) can be found in the varied habitats of Lums Pond State Park. The Park stands as the legacy of those visionaries who successfully lobbied in the 1950s for the preservation of the more than 1000 ac (405 ha) of land and water for the benefit of the public, long before the housing developments that now surround the Park sprung up. It provides a place for recreation and provides environments where Odonata and other wildlife persist in the face of rapid residential development.

### Acknowledgements

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# The Dragonfly Society Of The Americas

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