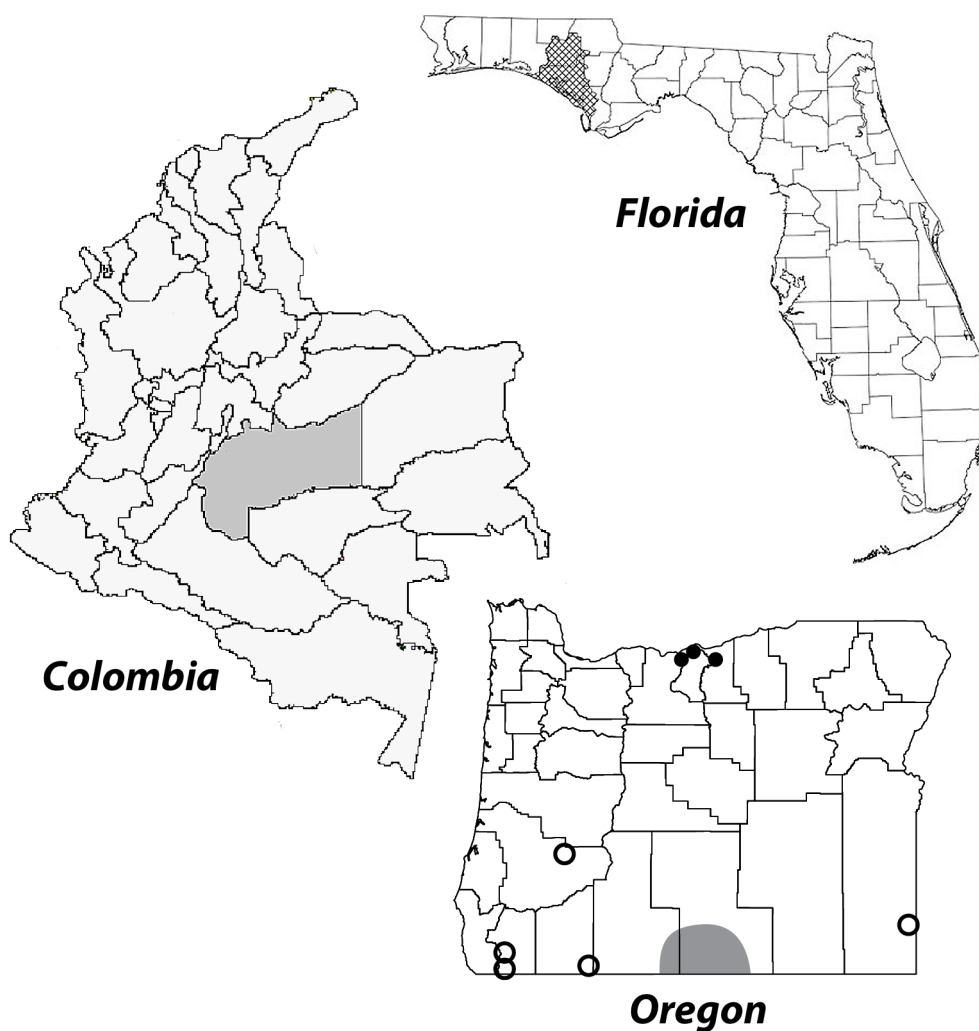


# BULLETIN OF AMERICAN ODONATOLOGY



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# An Updated List of the Dragonflies (Odonata) of Meta Department, Colombia, with Forty-six New Department Records

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Key words: Odonata, Colombia, Meta, Neotropics, records, dragonflies, damselflies

## Abstract

As a result of several years of sampling in Meta Department, Colombia, an updated list of dragonflies species is provided, of which 46 are new department records. A total of 12 families, 60 genera, and 144 species are reported, which represents 85% of the families, 68% of the genera, and 44% of the species recorded from Colombia.

## Resumen

Como resultado de varios años de muestreo en el Departamento del Meta, Colombia, puede proveerse una lista actualizada de sus especies de libélulas, de las cuales 46 constituyen nuevos registros. Un total de doce familias, 60 géneros y 144 especies es reportado, lo que representa al 85% de las familias, 68% de los géneros y 44% de las especies registradas para Colombia.

## Introduction

The study of dragonflies in Colombia started with the ground-breaking work of Williamson (1918a, 1918b, 1918c, 1919a, 1919b, 1920) and some listings provided by Ris (1918), Hincks (1934), and Navás (1935) in the first decades of the twentieth century.

Recently, several contributions by Garrison (2006, 2009), von Ellenrieder (2003, 2008), von Ellenrieder & Garrison (2003, 2007, 2008a, 2008b) and Garrison et al. (2006) have provided new data for the country, while other studies have reported dragonflies species from several departments: Magdalena (Pérez, 2003), Valle del Cauca (Bermúdez, 2005; Urrutia, 2005), Quindío (De Marmels, 2006), Chocó (Pérez et al., 2007), Meta (Rojas & Sánchez, 2009; Amaya, 2009), Boyacá (Palacino, 2009) and Santander (Garzón and Realpe, 2009).

The present updated list provides the first compilation of information on the dragonflies from the Meta Department, including new records for 46 species for this department. Data were obtained from university collections, three months of rice crop monitoring (Palacino & Millán, 2010), and seven years of monitoring 14 sampling areas of savannah, foothill, lower montane forest and gallery forest

(Amaya, 2009). All these studies make the Odonata fauna of Meta Department one of the best known in Colombia.

## Study Area

Meta Department is located between 04° 54' 25" N and 01° 36' 52" N, latitudinally, and between 071° 4' 38" W and 074° 53' 57" W, longitudinally, in the central part of Colombia (Fig. 1). The department has an area of 85,635 km<sup>2</sup>, and includes 29 municipalities and three major physiographic regions. The first of these regions corresponds to mountains of 4000 m ASL, including the foothills and Serranía de la Macarena. The second comprises an almost flat area with elevations less than 200 m ASL and the third includes moorland ecosystems, slopes of the Cordillera Oriental, savannahs and primary forest. This department presents a complex hydrographic system due to the Andes and the Serranía de la Macarena, as well as a seasonal rainfall pattern, all of which generate rivers such as the Meta, Guaitiquía, Ariari and Guaviare (Correa et al, 2006; McNish, 2007). The sampling areas (Table 1, Fig. 1) correspond to landscapes or subregions specific to the Orinoquía region, such as mountain low forest ( $\leq 1,192$  m ASL), alluvial fans (400 m ASL) resulting from seasonal flooding, some areas of high plains, savannahs, savannahs with forest patches, Mauritia palm swamp, swampy plains and gallery forests (Rangel et al., 1997).

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Table 1. Geographical location, altitude and ecosystems sampled in each area from Meta Department. Codes, representing abbreviations of sampled areas, are used in Table 2.

Code	Sampled area	Geographical location		Altitude (m ASL)	Ecosystem
		N	W		
Ac	Acacías	03° 59' 15"	073° 45' 24"	514–660	Savannah
Ap	Apiay	-	-	-	-
Cn	Castilla la Nueva	-	-	-	Stream
Cu	Cumaral	03° 48' 30" to 04° 4' 15"	073° 28' 53" to 073° 16' 29"	215–1120	Savannah, Gallery Forest
Cl	El Calvario	04° 10' 39" to 04° 10' 31"	073° 38' 48" to 073° 40' 14"	550–1192	Lower mountain forest, Foothill
Ft	Fuente de Oro	-	-	300	-
Gd	Granada	-	-	-	Gallery Forest
Gm	Guamal	-	-	460–660	-
Mc	La Macarena	-	-	380–650	-
Pg	Puerto Gaitán	04° 08' 08"	072° 09' 24"	150–330	Savannah, Gallery Forest
Pz	Puerto Lopez	04° 04' 47" to 04° 10' 12" to 04° 03' 37"	073° 27' 40" to 072° 43' 16" to 073° 10' 06"	181–305	Savannah, Gallery Forest, Rice crop
Ps	Puerto Lleras	-	-	-	Savannah
Rt	Restrepo	04° 11' 37" to 04° 16' 07"	073° 26' 39" to 073° 33' 22"	397–750	Savannah, Gallery Forest
Ja	San Juan de Arama	-	-	44–500	Savannah, Gallery Forest
Lc	San Luis de Cubarral	03° 46' 09" to 03° 48' 31"	073° 50' 19" to 073° 28' 53"	558–750	Savannah
St	San Martin	03° 39' 53" to 03° 39' 54"	073° 39' 23" to 073° 34' 23"	385–1200	Savannah, Gallery Forest
Sc	Santa Cecilia	-	-	-	Forest margin
Vo	Villavicencio	04° 03' 43" to 04° 13' 22"	073° 28' 09" to 073° 38' 18"	350–800	Gallery Forest, Foothill
Vh	Vista Hermosa	-	-	-	Forest

## Collected Data

Specimens are deposited in the entomological collections of the Universidad de Bogotá Jorge Tadeo Lozano, the Instituto de Ciencias Naturales of the Universidad Nacional de Colombia, and the Universidad de los Andes, Bogotá, Colombia. Specimens were randomly sampled with entomological nets and were preserved in acetone.

## Results and Discussion

A total of 2000 specimens were identified from an area covering 73% of the department (Fig. 1) collected at altitudes from 215 m ASL (bajo Menegua locality) up to 1192 m ASL (Buenavista locality). The odonates belong to 12 families, 60 genera and 144 species, representing 85% of families, 68% of genera, and 44% of species known for the country. The savannah ecosystem had the highest number of individuals collected (Fig. 2) and the largest series of specimens came from the municipalities of Puerto López, Restrepo, Villavicencio and Cumaral. *Erythrodiplax* (34%) and *Uracis* (22%) were the genera with the most records, and the best represented family is Libellulidae (62% of specimens). Eighty percent of the species collected during this study breed in lentic environments.

We report 46 species for the first time for Meta Department (Table 2), all of which were previously recorded from other departments of Colombia (Pérez-Gutiérrez & Palacino-Rodríguez, 2011). From all the specimens reported here, 76% have a wide distribution throughout South America, 21% are limited to the north zone, and 3% are endemic to Colombia according to the listing of Paulson (2009) for South America.

The high diversity of dragonflies in this region of Colombia probably results from the convergence of unique features of different biogeographic areas, including the Amazonian lowlands, the eastern slope of the northern Andes and the Orinoco region. Nevertheless, more collections are needed in areas surrounding the Serranía de la Macarena and other locations because they have not been sufficiently sampled. These places may yield a greater diversity of dragonflies, since the Serranía de la Macarena is noted for high endemism in other groups (McNish, 2007).

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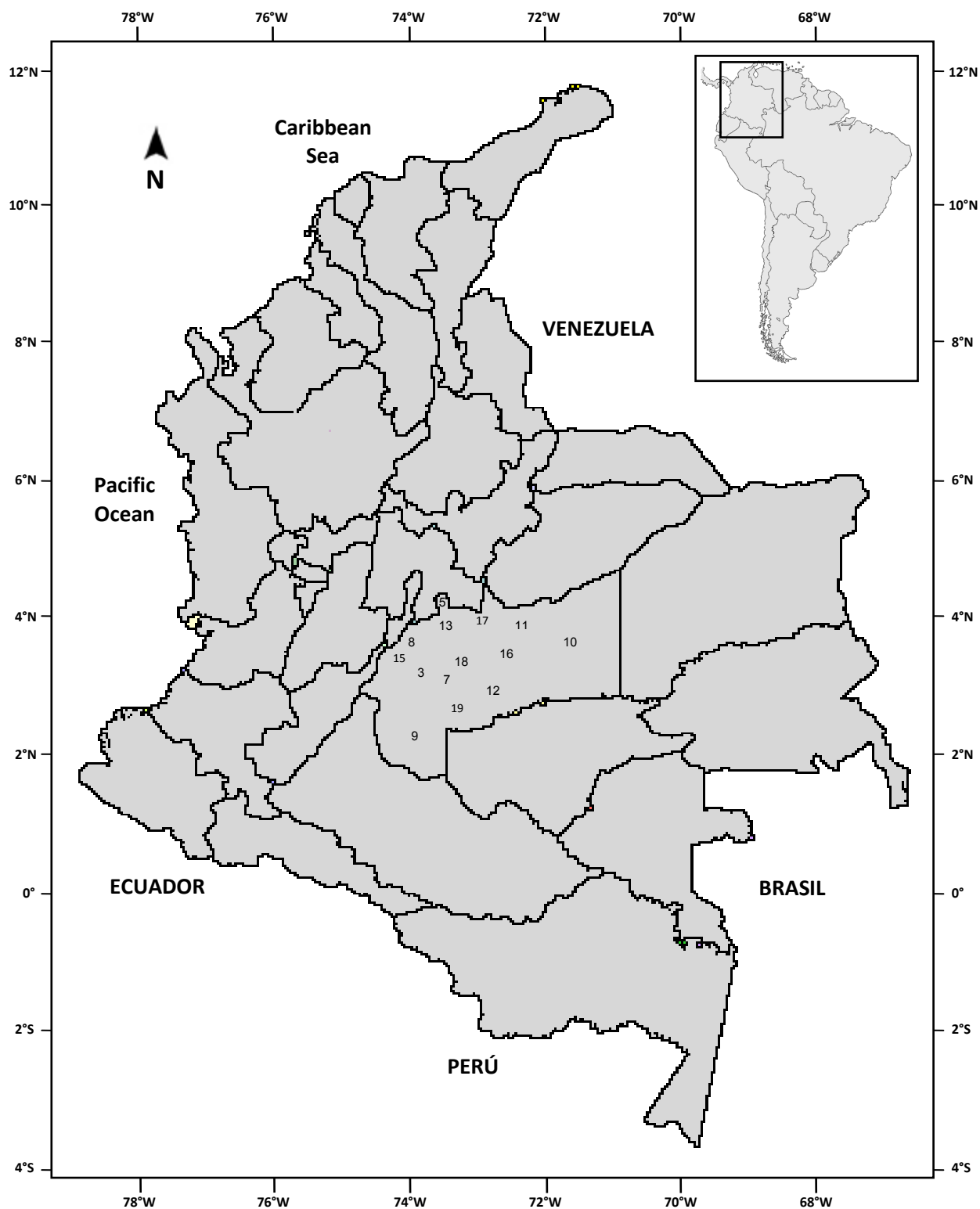


Figure 1. Areas sampled in Meta Department, Colombia: (1) Acacías, (2) Apiay, (3) Castilla La Nueva, (4) Cumaral, (5) El Calvario, (6) Fuente de oro, (7) Granada, (8) Guamal, (9) Macarena, (10) Puerto Gaitán, (11) Puerto López, (12) Puerto Lleras, (13) Restrepo, (14) San Juan de Arama, (15) San Luis de Cubarral, (16) San Martín, (17) Santa Cecilia, (18) Villavicencio, (19) Vista Hermosa.

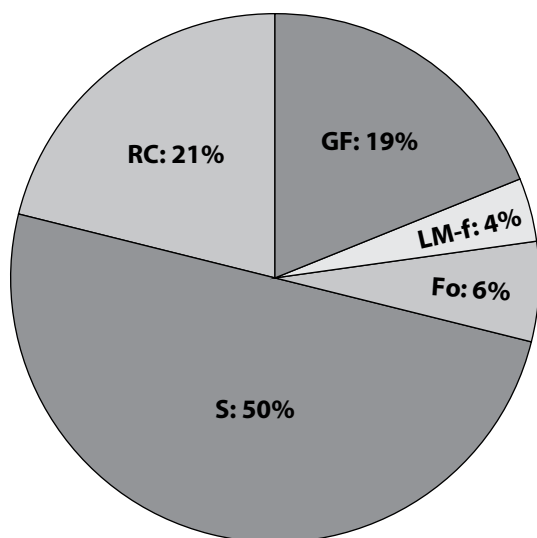


Figure 2. Percentage of species in the different ecosystems sampled. GF: Gallery Forest, LM-f: Lower mountain forest, Fo: Foothill, S: Savannah and RC: Rice Crop.

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Table 2. List of Odonata species from Meta Department, Colombia, including localities (abbreviations in Table 1); new department records (\*), without information (-), lentic environment (Le), lotic environment (Lo).

Family/Species	Local Distribution	Environment
<b>Dictyodidae</b>		
<i>Heliocharis amazona</i> Selys, 1853	Vo	-
<b>Polythoridae</b>		
<i>Cora xanthostoma</i> Ris, 1918	Vo	-
<i>Euthore fasciata</i> (Hagen in Selys, 1853)	Vo	Lo
<i>Polythore gigantea</i> (Selys, 1853)*	Vo	Lo
<i>P. procera</i> (Selys, 1869)	Lc, Mc, Pz, Rt, Vo	Lo
<b>Calopterygidae</b>		
<i>Hetaerina caja caja</i> (Drury, 1773)	Ac, Gm, St, Vo	Le, Lo
<i>H. capitalis</i> Selys, 1873*	Vo	Lo
<i>H. duplex</i> Selys, 1869	St, Vo	Lo
<i>H. occisa</i> Hagen in Selys, 1853	Gm, Vo	Lo
<i>H. sanguinea</i> Selys, 1853	Vo	Lo
<i>H. simplex</i> Selys, 1853	Vo	Lo
<i>Ormenophlebia imperatrix</i> (McLachlan, 1878)	Vo	-
<b>Lestidae</b>		
<i>Lestes forficula</i> Rambur, 1842*	Vo	Le, Lo
<b>Perilestidae</b>		
<i>Perilestes kahli</i> Williamson & Williamson, 1924*	Vo	-
<b>Megapodagrionidae</b>		
<i>Heteragrion breweri</i> De Marmels, 1989*	Vo	Le
<i>Mesagrion leucorrhinum</i> Selys, 1885*	Vo	Le
<i>Teinopodagrion caquetanum</i> De Marmels, 2001*	Vo	Lo
<i>T. epidrium</i> De Marmels, 2001	Vo	-
<i>T. macropus</i> (Selys, 1862)	Vo	-
<b>Pseudostigmatidae</b>		
<i>Mecistogaster jocaste</i> Hagen, 1869	Mc, Vo	-
<i>M. linearis linearis</i> (Fabricius, 1776)	Vo	-
<i>M. modesta</i> Selys, 1886*	Vo	Le
<i>M. ornata ornata</i> Rambur, 1842	Vo	-
<i>Megaloprepus caeruleatus</i> (Drury, 1782)	Vo	Le
<i>Microstigma rotundatum</i> Selys, 1860	Vo	-
<b>Protoneuridae</b>		
<i>Epipleoneura metallica</i> Rácenis, 1955*	Ac, Vo	Lo
<i>Neoneura sylvatica</i> Hagen in Selys, 1886*	Vo	Lo
<i>Psaironeura remissa</i> (Calvert, 1903)*	Vo	Le, Lo
<b>Coenagrionidae</b>		
<i>Acanthagrion abunae</i> Leonard, 1977	Vo	-
<i>A. adustum</i> Williamson, 1916	Vo	Le
<i>A. apicale</i> Selys, 1876	Mc, Pz, Vo	Le, Lo
<i>A. ascendens</i> Calvert, 1909*	Pz, Vo	Le, Lo
<i>A. minutum</i> Leonard, 1977	Vo	Le
<i>A. obsoletum</i> (Förster, 1914)	Ac, Ja, Vo	Lo
<i>A. peruvianum</i> Leonard, 1977	Ac, Rt, Ja, Vo	Lo
<i>A. trilobatum</i> Leonard, 1977	Pz, Vo	Le, Lo
<i>A. vidua</i> Selys, 1876	Mc, Rt	Lo
<i>A. viridescens</i> Leonard, 1977	Vo	Le, Lo
<i>A. williamsoni</i> Leonard, 1977	Ja	-
<i>A. yungarum</i> Ris, 1918	Vo	-
<i>Argia cupraurea</i> Calvert, 1902	Mc	Le
<i>A. cuprea</i> (Hagen, 1861)	Vo	Lo
<i>A. difficilis</i> Selys, 1865	Vo	-

Table 2 continued...

Family/Species	Local Distribution	Environment
<b>Coenagrionidae (cont.)</b>		
<i>A. gerhardi</i> Calvert, 1909	Vo	-
<i>A. oculata</i> Hagen in Selys, 1865*	Vo	Lo
<i>A. pulla</i> Hagen in Selys, 1865	Ac, St, Vo	Le, Lo
<i>A. talamanca</i> Calvert, 1907	Vo	-
<i>A. translata</i> Hagen in Selys, 1865*	Ac, Vo	Le
<i>Homeoura chelifera</i> (Selys, 1876)*	Vo	Le
<i>Ischnura capreolus</i> (Hagen, 1861)	Pz, Vo	Le
<i>I. ramburii</i> (Selys, 1850)	Pz	Le
<i>Neoerythromma cultellatum</i> (Hagen in Selys, 1876)	-	-
<i>Telebasis corallina</i> (Selys, 1876)	Mc, Vo	Le
<i>T. williamsoni</i> Garrison, 2009	Vo	Le
<b>Aeshnidae</b>		
<i>Anax amazili</i> (Burmeister, 1839)*	Pz	Le
<i>A. concolor</i> Brauer, 1865*	Vo	Le
<i>Andaeschna rufipes</i> (Ris, 1918)*	Vo	-
<i>Coryphaeschna adnexa</i> (Hagen, 1861)	Pz	Le
<i>C. viriditas</i> Calvert, 1952	Pg	Lo
<i>Gynacantha membranalis</i> Karsch, 1891	Gm, Vo	Le
<i>G. nervosa</i> Rambur, 1842	Cu, Pz, Rt, Vo	Le
<i>Remartinia luteipennis luteipennis</i> (Burmeister, 1839)	Vo	-
<i>Rhionaeschna cornigera</i> (Brauer, 1865)*	Vo	Le, Lo
<i>R. marchali</i> (Rambur, 1842)	Pz, Vo	Le, Lo
<i>R. planaltica</i> (Calvert, 1952)*	Cl	Le
<i>Staurophlebia reticulata</i> (Burmeister, 1839)*	Pz	Lo
<i>Triacanthagyna caribbea</i> Williamson, 1923*	Cl	Le
<b>Gomphidae</b>		
<i>Aphylla molossus</i> Selys, 1869*	Vo	Le
<i>Phyllocycla volsella</i> (Calvert, 1905)	St, Mc	-
<b>Libellulidae</b>		
<i>Anatya guttata</i> (Erichson, 1848)	Pg, Pz, Vo	Le
<i>Brachymesia furcata</i> (Hagen, 1861)*	Cu	Le
<i>B. herbida</i> (Gundlach, 1889)	Ac, Pz, Ja, Vo	Le, Lo
<i>Brechmorhoga nubecula</i> (Rambur, 1842)*	Vo	Le
<i>B. praecox</i> (Hagen, 1861)	Rt	Le
<i>B. rapax</i> Calvert, 1898	Vo	Le
<i>Cannaphila vibex</i> (Hagen, 1861)	Pg, Rt, Vo	Le, Lo
<i>Dasythemis esmeralda</i> Ris, 1910	Ac, St, Ja	Le
<i>Diatatops intensa</i> Montgomery, 1940	Pz	Le
<i>D. obscura</i> Fabricius, 1775*	Cu, Pz	Le
<i>Dythemis multipunctata</i> Kirby, 1894	Ac, Cu, Gm, Mc, Pz, Rt, Ja	Le, Lo
<i>D. sterilis</i> Hagen, 1861*	Cu, Mc, Pz, Rt, Vo	Le, Lo
<i>Elasmothermis kannacrioides</i> (Calvert, 1906)*	Pz, Ja, Vo	Le
<i>Erythemis credula</i> (Hagen, 1861)	Ja, Vo	Le
<i>E. haematogastra</i> (Burmeister, 1839)	Pz, St	Le
<i>E. peruviana</i> (Rambur, 1842)	Pz	Le
<i>E. plebeja</i> (Burmeister, 1839)	Ja	Le
<i>E. vesiculosa</i> (Fabricius, 1775)	Ac, Cu, Mc, Pg, Pz, Ps, Rt, Ja, Lc, Vo	Le
<i>Erythrodiplex abjecta</i> (Rambur, 1842)	Cu, Pz, Rt, Ja, Vo	Le
<i>E. andagoya</i> Borrer, 1942*	Pz, Rt, Ja	Le
<i>E. attenuata</i> (Kirby, 1889)	Cu, Mc, Pz	Le
<i>E. basalis</i> (Kirby, 1897)*	Cu, Pz, Rt, Ja, Vo	Le
<i>E. castanea</i> (Burmeister, 1839)	Cu, Pz, Rt, Lc, Vo	Le, Lo
<i>E. connata</i> (Burmeister, 1839)	Pz, Rt, Vo	Le
<i>E. famula</i> (Erichson, 1848)	Cu, Rt, Lc, Vo	Le



Table 2 continued...

Family/Species	Local Distribution	Environment
<b>Libellulidae (cont.)</b>		
<i>E. fervida</i> (Erichson, 1848)	Pz, Rt, Vo	Le, Lo
<i>E. fusca</i> (Rambur, 1842)	Cu, Rt, St, Ja, Lc, Vo	Le
<i>E. kimminsi</i> Borrer, 1942	Ac, Cu, Rt, Pz, Ja	Le
<i>E. minuscula</i> (Rambur, 1842)	Pz, Lc, Vo	Le
<i>E. ochracea</i> (Burmeister, 1839)*	Cu, Pz, Rt, Vo	Le
<i>E. paraguayensis</i> (Förster, 1905)	Pz	Le
<i>E. umbrata</i> (Linnaeus, 1758)	Ac, Ap, Cu, Cl, Gd, Mc, Pg, Pz, Rt, Ja, Lc, Sc, St, Vo, Cv	Le, Lo
<i>E. unimaculata</i> (De Geer, 1773)	Pg, Pz, Ja, St	Le
<i>E. venusta</i> (Kirby, 1897)	Rt	Le
<i>Gynothemis pumila</i> (Karsch, 1890)	Pz	-
<i>Libellula herculea</i> Karsch, 1889	Vo	Le
<i>Macrothemis hemichlora</i> (Burmeister, 1839)	Rt, Vo	Le, Lo
<i>M. imitans leucozona</i> Ris, 1913*	Pz	Le
<i>M. inacuta</i> Calvert, 1898*	Pz	Le
<i>M. inequiunguis</i> Calvert, 1895*	Cl, Pz, Vo	Le
<i>M. musiva</i> Calvert, 1898	Vo	Le
<i>Miathyria marcella</i> (Selys in Sagra, 1857)	Pg, Pz, Vo	Le, Lo
<i>Micrathyria dictynna</i> Ris, 1919*	Cl, Lc	Le
<i>M. pseudeximia</i> Westfall, 1992	-	-
<i>M. tibialis</i> Kirby, 1897	Cu, Pz, Rt	Le, Lo
<i>Nephelotia flavifrons</i> (Karsch, 1889)	Pg	-
<i>N. phryne</i> (Perty, 1834)*	Ac, Pz, Vo	Le
<i>Oligoclada heliophila</i> Borrer, 1931*	Pz, Rt	Le, Lo
<i>Orthemis aequilibris</i> Calvert, 1909	Cu, Pz, Rt, Vo	Lo
<i>O. biolleyi</i> Calvert, 1906	Ac, Vo	-
<i>O. cultriformis</i> Calvert, 1899	Cu, Gm, Mc, Pz, Vo	Le, Lo
<i>O. discolor</i> (Burmeister, 1839)	Ac, Cu, Ft, Mc, Pz, Rt, Lc, Vo	Le, Lo
<i>O. ferruginea</i> (Fabricius, 1775)*	Cu, Pz, Rt, Vo	Le, Lo
<i>Pantala flavescens</i> (Fabricius, 1798)	Cu, Mc, Pg, Pz, Rt, Ja, Lc, Vo, Vh	Le, Lo
<i>P. hymenaea</i> (Say, 1840)	Mc, Vo	Le, Lo
<i>Perithemis domitia</i> (Drury, 1773)*	Pz	Le
<i>P. electra</i> Ris, 1930*	Pz	Le
<i>P. lais</i> (Perty, 1834)	Pz, Vo	Le, Lo
<i>P. mooma</i> Kirby, 1889	Cu, Pz, Rt, Ja, St, Vo	Le
<i>Planiplax phoenicura</i> Ris, 1912*	Pz, Vo	Le
<i>Rhodopygia cardinalis</i> (Erichson, 1848)	Ac, Cu, Mc, Pg, Pz, Rt, Vo	Le
<i>Tholymis citrina</i> Hagen, 1867	Ap, Mc, Pz, Rt, Vo	Lo
<i>Tramea abdominalis</i> (Rambur, 1842)*	Pg, Pz, Vo	Le
<i>T. binotata</i> (Rambur, 1842)*	Cu, Pz, Rt, Lc, Vo	Le
<i>T. calverti</i> Muttikowski, 1910	Cu, Mc, Pz, Rt, Vo	Le
<i>T. cophysa</i> Hagen, 1867	Vo	Le
<i>T. rustica</i> De Marmels & Rácenis, 1982	Pg, Pz	Lo
<i>Uracis fastigiata</i> (Burmeister, 1839)	Ac, Cu, Mc, Pz, Rt, Vo	Le
<i>U. imbuta</i> (Burmeister, 1839)	Ac, Ap, Cn, Cu, Cl, Mc, Pg, Pz, Rt, Ja, Lc, St, Vo, Vh, Cv	Le, Lo
<i>Zenithoptera fasciata</i> (Linnaeus, 1758)	Ac, Cu, Gm, Mc, Pz, Lc, St	Le

Table 3. List of new department records of Odonata species from Meta Department, Colombia, including localities, coordinates and altitude (m asl). Sampled area abbreviations are explained in Table 1. Without information (-).

Species	Sampled Area	Locality	Coordinates	m ASL
<i>Polybore gigantea</i>	Vo	Guaitiquía River	-	467
<i>Hetaerina capitalis</i>	Vo	Susumuco affluent	-	500
<i>Lestes forficula</i>	Vo	Buena Vista sidewalk, Juanambú Hacienda	04° 08' 06" N 073° 35' 39" W	400
<i>Perilestes kabli</i>	Pz	CORPOICA, La Libertad station	04° 06' 06" N 073° 03' 26" W	305
<i>Heteragrion breweri</i>	Pz	CORPOICA, La Libertad station	04° 06' 06" N 073° 03' 26" W	305
<i>Mesagrion leucorhinum</i>	Vo	Bavaria Forest, Foothill	04° 10.46' N 073° 39.23' W	525
<i>Teinopodagrion caquetanum</i>	Vo	La Argentina sidewalk	04° 13' 22" N 073° 38' 18" W	594
<i>Mecistogaster modesta</i>	Vo	Bavaria Forest, Foothill	04° 10.46' N 073° 39.23' W	525
<i>Epilemeura metallica</i>	Ac	Ortoy river	-	550
	Vo	Balcario Pozo Azul	04° 10' 40" N 073° 37' 35" W	593
<i>Neoneura sylvatica</i>	Pz	CORPOICA, La Libertad station	04° 06' 06" N 073° 03' 26" W	305
<i>Psaronneura remissa</i>	Pz	CORPOICA, La Libertad station	04° 06' 06" N 073° 03' 26" W	305
<i>Acanthagrion ascendens</i>	Pz	CORPOICA, La Libertad station	04° 06' 06" N 073° 03' 26" W	305
<i>Argia ocellata</i>	Vo	CORPOICA, Taluma station	04° 04' 47" N 073° 27' 40" W	385
<i>Argia translata</i>	Ac	La Argentina sidewalk	04° 13' 22" N 073° 38' 18" W	594
	Vo	Acacias River	-	550
	Vo	Bavaria Forest, Foothill	04° 10.46' N 073° 39.23' W	525
<i>Homeoura chelifera</i>	Vo	Buena Vista sidewalk, Juanambú Hacienda	04° 08' 06" N 073° 35' 39" W	400
<i>Anax amazili</i>	Pz	CORPOICA, La Libertad station	04° 06' 06" N 073° 03' 26" W	305
<i>Anax concolor</i>	Pz	Menegua Hacienda, Savannah	04° 10' 12" N 072° 43' 17" W	215
<i>Andaeschna rufipes</i>	Vo	Buena Vista sidewalk, Juanambú Hacienda	04° 08' 06" N 073° 35' 39" W	445
<i>Rhionaeschna cornigera</i>	Vo	Susumuco affluent	-	500
<i>Rhionaeschna planaltica</i>	Cl	Susumuco affluent	-	500
<i>Staurorhynchia reticulata</i>	Pz	Buenavista Hacienda, Low Mountain Forest	04° 10' 32" N 073° 40' 15" W	1120
	Pz	CORPOICA, La Libertad station, near a affluent	04° 06' 06" N 073° 03' 26" W	305
<i>Triacanthagyna caribbea</i>	Pz	Menegua Hacienda, drainage basin, Gallery forest	04° 10' 12" N 072° 43' 17" W	215
<i>Aphylla molossus</i>	Vo	Bavaria Forest, Foothill	04° 10' 40" N 073° 38' 49" W	550
<i>Brachymesia furcata</i>	Vo	Buena Vista sidewalk, Juanambú Hacienda	04° 08' 06" N 073° 35' 39" W	445
<i>Brechmorhoga nubecula</i>	Cu	Fishpond	04° 05' 10" N 073° 29' 58" W	474
<i>Diatatops obscura</i>	Vo	-	04° 09' N 073° 38' W	467
<i>Dythemis sterilis</i>	Cu	San Antonio Hacienda, Wetland	04° 00' 43" N 073° 26' 00" W	320
	Ac	La Esmeralda sidewalk, Cecerros Hacienda	03° 59' 06" N 073° 45' 38" W	514
	Pz	CORPOICA, La Libertad station, Lagoon	04° 06' 06" N 073° 03' 26" W	305
	Vo	Buena Vista sidewalk, Juanambú Hacienda	04° 08' 06" N 073° 35' 39" W	400
	Cu	Con Esto Tengo Hacienda; Gallery Forest	04° 12' 47" N 073° 25' 02" W	450
	Rt	Santa Ana Hacienda	04° 11' 37" N 073° 26' 39" W	397
	Pz	CORPOICA, La Libertad station, Savannah	04° 06' 06" N 073° 03' 26" W	305
	Mc	Near Güejar river	03° 12' 18" N 073° 38' 59" W	500
<i>Elasmothermis cannucrioides</i>	Vo	Buena Vista sidewalk, Juanambú Hacienda	04° 08' 06" N 073° 35' 39" W	400
<i>Erythrodiplax andagoya</i>	Pz	CORPOICA, La Libertad station, Gallery forest	04° 06' 06" N 073° 03' 26" W	305
	Cu	Con Esto Tengo Hacienda; Gallery Forest	04° 12' 47" N 073° 25' 02" W	450

Table 3 continued...

Species	Sampled Area	Locality	Coordinates	m ASL
<i>Erythrodiplax basalis</i>	Pz	Menegua Hacienda, Savannah	04° 10' 12" N 072° 43' 17" W	215
	Cu	San Antonio Hacienda, Savannah	04° 00' 43" N 073° 26' 00" W	320
	Cu	Con Esto Tengo Hacienda; Gallery Forest	04° 12' 47" N 073° 25' 02" W	450
	Cu	Marsella Hacienda, Savannah	04° 08' 43" N 073° 14' 30" W	510
	Pz	CORPOICA, La Libertad station, Savannah	04° 06' 06" N 073° 03' 26" W	305
<i>Erythrodiplax ochracea</i>	Rt	Santa Ana Hacienda	04° 11' 37" N 073° 26' 39" W	397
	Vo	Kirpas wetland	04° 07' 13" N 073° 36' 02" W	467
	Cu	San Antonio Hacienda, Savannah	04° 00' 43" N 073° 26' 00" W	320
	Cu	Con Esto Tengo Hacienda; Gallery Forest	04° 12' 47" N 073° 25' 02" W	450
	Cu	Marsella Hacienda, Savannah	04° 08' 43" N 073° 14' 30" W	510
<i>Macrothemis imitans leucozona</i>	Cu	La Esperanza Hacienda, Savannah	04° 11' 54" N 073° 11' 06" W	351
	Rt	Santa Ana Hacienda	04° 11' 37" N 073° 26' 39" W	397
	Pz	CORPOICA, La Libertad station, Savannah	04° 06' 06" N 073° 03' 26" W	305
	Pz	CORPOICA, Taluma station	04° 04' 47" N 073° 27' 40" W	385
	Pz	CORPOICA, La Libertad station, Savannah	04° 06' 06" N 073° 03' 26" W	305
<i>Macrothemis inequilinguis</i>	Pz	CORPOICA, La Libertad station, Savannah	04° 06' 06" N 073° 03' 26" W	305
<i>Microthyria dictynna</i>	Pz	Menegua Hacienda, Savannah	04° 10' 12" N 072° 43' 17" W	215
	Cl	Buenavista Hacienda, Low Mountain Forest	04° 10' 32" N 073° 40' 15" W	1120
	Cl	Buenavista Hacienda, Low Mountain Forest	04° 10' 32" N 073° 40' 15" W	1120
<i>Nephepeltia phryne</i>	Lc	La Arboleda Hacienda, Savannah	03° 48' 31" N 073° 28' 53" W	558
	Vo	La Argentina sidewalk	04° 13' 22" N 073° 38' 18" W	594
	Ac	Acacias River	-	550
<i>Oligoclada heliophila</i>	Ac	Brisas de Oro sector	-	555
	Pz	CORPOICA, La Libertad station, Lagoon	04° 06' 06" N 073° 03' 26" W	305
	Rt	Santa Ana Hacienda	04° 11' 37" N 073° 26' 39" W	397
<i>Orthemis ferruginea</i>	Pz	CORPOICA, La Libertad station, Savannah	04° 06' 06" N 073° 03' 26" W	305
	Ac	La Esmeralda sidewalk, Versalles Hacienda	03° 59' 06" N 073° 45' 38" W	500-514
	Cu	Con Esto Tengo Hacienda; Gallery Forest	04° 12' 47" N 073° 25' 02" W	450
	Cu	Fishpond	04° 05' 10" N 073° 29' 58" W	474
	Gd	Puerto Caldas inspection, Los Tapos drainage basin, Gallery Forest	03° 33' 37" N 073° 42' 28" W	350
<i>Perithemis domitia</i>	Mc	La Macarena National Park	02° 10' 29" N 073° 47' 21" W	580
	Mc	Near Güejar river	03° 12' 18" N 073° 38' 59" W	500
	Pg	Carimagua Hacienda	04° 34' 00" N 071° 19' 00" W	150
	Rt	Santa Ana Hacienda	04° 11' 37" N 073° 26' 39" W	397
	Rt	Alto Caney	04° 15' 42" N 073° 33' 49" W	570
	Ja	El Rosal sidewalk, El Camello, Curia pond	03° 22' N 073° 52' W	500
	Pz	CORPOICA, La Libertad station, pond near a Oil Palm Forest	04° 06' 06" N 073° 03' 26" W	305
	Pz	Menegua sidewalk, El Lagunazo Hacienda	04° 05' 00" N 072° 54' 00" W	400
	Pz	Pachaquero sidewalk, Providencia Hacienda and Maricata Hacienda	04° 03' N 073° 10' W	770
	Vo	-	04° 09' 00" N 073° 37' 00" W	515
	Pz	CORPOICA, La Libertad station, Lagoon	04° 06' 06" N 073° 03' 26" W	305

Table 3 continued...

Species	Sampled Area	Locality	Coordinates	m ASL
<i>Perithemis electra</i>	Pz	CORPOICA, La Libertad station, Lagoon	04° 06' 06" N 073° 03' 26" W	305
<i>Planiplex phoenicura</i>	Pz	CORPOICA, La Libertad station, Gallery forest	04° 06' 06" N 073° 03' 26" W	305
<i>Tramea abdominalis</i>	Pg	Cafam Los Llanos, Savannah	04° 08' 09" N 072° 09' 24" W	220
	Pz	CORPOICA, La Libertad station, Savannah	04° 06' 06" N 073° 03' 26" W	305
<i>Tramea binotata</i>	Pz	CORPOICA, La Libertad station, Savannah	04° 06' 06" N 073° 03' 26" W	305
	Pz	Menegua Hacienda, Savannah	04° 10' 12" N 072° 43' 17" W	215
	Cu	Fishpond	04° 05' 10" N 073° 29' 58" W	474
	Rt	Santa Ana Hacienda	04° 11' 37" N 073° 26' 39" W	397
	Lc	La Arboleda Hacienda, Savannah	03° 48' 31" N 073° 28' 53" W	558

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# Update of The Odonata of Oregon

Jim Johnson<sup>1</sup> and Steve Valley<sup>2</sup>

Key words: Odonata, United States, Oregon, records, dragonflies, damselflies

## Abstract

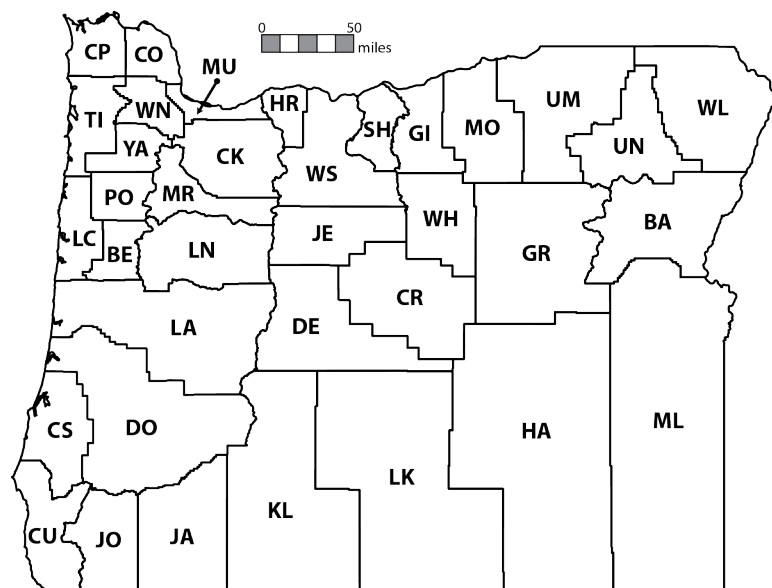
Ninety-two species are currently recorded in Oregon. Additional and updated records since Johnson & Valley (2005) are summarized for 28 species and one hybrid with some range maps updated. The current county records and early/late flight dates for all known species in Oregon are presented.

## Introduction

Johnson and Valley (2005) reported 87 species of Odonata occurring in Oregon—26 Zygoptera and 61 Anisoptera, with a total of 1416 county records (however 1415 records were indicated in the introduction). Since then five species have been added for a total of 92 (29 Zygoptera and 63 Anisoptera). Four of these are additions to the known state fauna: *Aeshna tuberculifera* Walker, *Leucorrhinia proxima* Calvert, *Lestes forcipatus* Rambur, and *Ischnura barberi* Currie. A fifth species, *Lestes stultus* Hagen, was treated as

conspecific with *L. dryas* Kirby in Johnson & Valley (2005), but is currently treated as a valid species. We currently have 1591 county records total (178 additions and 3 removals; Appendix 2), and 60 species with updated early and/or late flight dates (Appendix 1) since Johnson & Valley (2005).

Some species maps which appeared in Johnson & Valley (2005) have been updated. New locations are indicated with open circles (○) and, in some cases, questionable records (previously indicated with a question mark) have been changed to solid dots to reflect current understanding; otherwise, the maps are as they appeared previously. Gray shaded areas depict the known and presumed range within Oregon based on records at the time of Johnson & Valley (2005); outlying records (populations or individuals) away from the primary range are indicated with black dots (•); question marks (?) indicate outlying records for which some doubt exists, either because reported specimens are not extant or because of the possibility that specimens were mislabeled.



BA Baker	DO Douglas	LA Lane	SH Sherman
BE Benton	GI Gilliam	LC Lincoln	TI Tillamook
CO Columbia	GR Grant	LK Lake	UM Umatilla
CK Clackamas	HA Harney	LN Linn	UN Union
CP Clatsop	HR Hood River	ML Malheur	WH Wheeler
CR Crook	JA Jackson	MO Morrow	WL Wallowa
CS Coos	JE Jefferson	MR Marion	WN Washington
CU Curry	JO Josephine	MU Multnomah	WS Wasco
DE Deschutes	KL Klamath	PO Polk	YA Yamhill

Figure 1. Oregon counties and their abbreviations.

## Abbreviations

BG: Bugguide—number refers to image identifier at <<http://Bugguide.net/>>.

Co./Cos.: County/Counties

OC: OdonataCentral—number refers to the submission identifier at <<http://OdonataCentral.org/>>.

## Name Changes

*Enallagma cyathigerum* (Charpentier) ⇒ *Enallagma annexum* (Hagen), the latter split from the former (Turgeon et al., 2005; Paulson, 2005).

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*Sympetrum occidentale* Bartenev  $\Rightarrow$  *Sympetrum semicinctum* (Say), the former synonymized with the latter (Pilgrim & von Dohlen, 2007; Paulson, 2007).

## Errata

*Anax junius* (Drury). In Johnson & Valley (2005), a transcription error resulted in the abbreviation for Lake Co. ("LK") listed twice—one of those should have been the abbreviation for Klamath Co. ("KL").

*Plathemis lydia* (Drury). In Johnson & Valley (2005), the late flight date for this species should have been 3 Oct, not 30 Oct.

## Additional/Updated Records

*Hetaerina americana* (Fabricius). One female was observed 15 Jun 2005 on the Willamette River near the mouth of the Calapooia River, Albany, Linn Co. (Gordon & Kerst, 2005). Previously only historic records from the 1930s were known from the Willamette Valley north of Lane Co.

*Lestes forcipatus* Rambur. New state record for Oregon. Found at multiple sites in the Blue Mountains in 2009 (Johnson, 2009b): at shallow ponds about 15 miles north of Enterprise, Wallowa Co., 2 Aug (J. Johnson & C. Kerst collection; OC 314568); at a small borrow pit north of Elgin, Union Co., 3 Aug (J. Johnson collection; OC 314573; multiple records since); and Mud Lake, Clear Lake Ridge Preserve, Wallowa Co., 4 Aug (C. Kerst collection; OC 314741). Figure 2.

*Lestes stultus* Hagen. Treated as conspecific with *Lestes dryas* Kirby in Johnson & Valley (2005) based on a lack of morphological differences (Johnson, 2006), but because it has not yet been formally synonymized we currently treat the taxon as a valid species. Individuals matching this taxon were first found near Drain, Douglas Co., 21 Jul 2000 (Johnson et al., 2002); subsequently found near Eight Dollar Mountain, Josephine Co., 18 Jun 2003, 15 Jun 2007, and 29 Jun 2012 (J. Johnson collection), and near White City, Jackson Co., 13 Jun 2009 (S. Gordon collection; OC 314917). The elevations of these sites range from about 360 to 1375 feet.

Individuals appearing to be *Lestes stultus* were also collected at about 2855 feet elevation in the Coast Range at Fanno Meadows, Polk Co., 17 Sep 2000 (Johnson et al., 2002), however these became green after preservation using acetone, thus appearing very similar to *L. dryas*. These have narrow pale antehumeral stripes on the thorax which is more consistent with *L. stultus*. At this time we consider the identity of the Polk Co. individuals inconclusive, but if they are determined to be *L. stultus* they would be the northernmost individuals of the species found thus far, and at an uncharacteristically high elevation. Figure 3.

*Lestes unguiculatus* Hagen. An early flight date of 14 Mar was reported previously based on Oregon State Arthropod Collection specimen data, but this is considered highly unlikely for any *Lestes* in Oregon. We assume that the date is an error. The current earliest flight date for this species is 25 May.

*Argia agrioides* Calvert. Additional sites at Mickey Hot Spring, Harney Co., 28 Jul 2006 (D. Paulson collection; OC 7191), and Twentymile Creek, south of Adel, Lake Co., 5 Aug 2007 (J. Johnson collection; OC 262890; multiple records since) where the species flies with the extremely similar *Argia nahuana*. Figure 4.

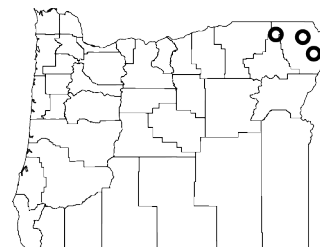


Fig. 2. *Lestes forcipatus*.

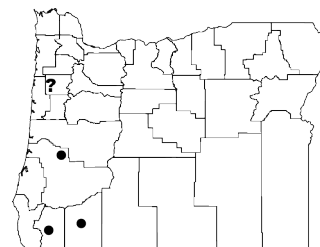


Fig. 3. *Lestes stultus*.

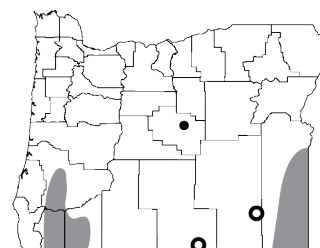


Fig. 4. *Argia agrioides*.

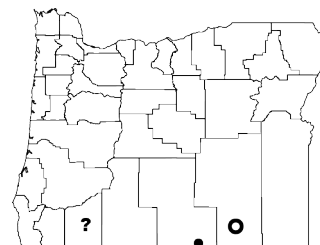


Fig. 5. *Argia nahuana*.

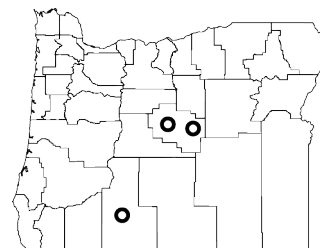


Fig. 6. *Enallagma anna* x *carunculatum*.

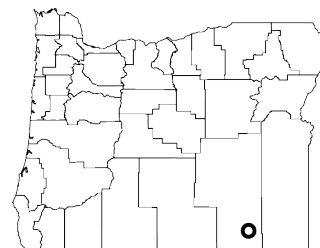


Fig. 7. *Ischnura barberi*.

*Argia nahuana* Calvert. Confirmed at a second location in Oregon where a single male was collected: Skull Creek, Harney Co., on 27 Jul 2010 (J. Johnson collection; OC 323301). Figure 5.

*Enallagma anna* Williamson × *carunculatum* Morse. Individuals presumed to be hybrids of this species pair have been found on the Crooked River drainage in Crook Co. (Johnson, 2009a) on 10 Aug 1994 (K. Tennessen collection) and 25 Aug 2007 (J. Johnson collection); another individual was collected on the Sprague River near Chiloquin, Klamath Co., 25 Jul 2010 (J. Johnson collection). Figure 6.

*Ischnura barberi* Currie. New state record for Oregon. A single female was collected at Borax Lake, Harney Co., 18 Sep 2010 (Johnson, 2010; OC 323402). Thus far, no other individuals have been found. Figure 7.

*Ischnura denticollis* (Burmeister). Additional site on the west side of the Cascades at a pond near White City, Jackson Co., 17 Sep 2005 (J. Johnson collection; OC 6977). This supports a historic record from Canyonville, Douglas Co., which we previously questioned on ecological grounds, but which we now have no reason to doubt. A single male photographed at approximately 6400 feet elevation (Lost Lake, Newberry Caldera, Deschutes Co., 14 Aug 2010; J. Johnson collection; OC 323309) was a new county record and surpassed the previous known maximum elevation by 1900 ft. Figure 8.

*Ischnura erratica* Calvert. Records from Grant (OC 7205) and Morrow (OC 7153) Cos. (multiple individuals at both areas; J. Johnson collection) indicate more widespread occurrence in the Blue Mountains. Previously only a single specimen was known from this region (Union Co.) Figure 9.

*Nehalennia irene* (Hagen). Additional sites in Jackson Co. (Beaver Pond Creek, 3 Jul 2005 [J. Johnson collection; OC 6319]), Klamath Co. (a wetland alongside Sprague River near Chiloquin, 25 Jul 2010 [J. Johnson collection; OC 322685] and Bull Swamp, 20 Aug 2010 [J. Johnson photo; OC 323335]), and Deschutes Co. (Lost Lake, Newberry Caldera, 14 Aug 2010 [J. Johnson photo; OC 323310]). Figure 10

*Tanypteryx hageni* (Selys). Previously, the only known Coast Range site was on Mary's Peak, Benton Co., but the species has not been observed there for many years and the exact location is not currently known. Now known from the Coast Range at two Clatsop Co. sites: Onion Peak where many individuals were seen and photographed on 27 Jul 2009 (M. Patterson photo; OC 314325) and 4 Aug 2011 (fide M. Patterson), and Saddle Mountain where one individual was photographed 29 Jul 2011 (M. Patterson photo; OC 330758). Figure 11.

*Aeshna canadensis* Walker. Previously known only from the Cascade Mountains south to Douglas Co. and northern Klamath Co.; additional sites in Jackson Co. (Beaver Dam Creek, 7 Aug 2005; J. Johnson collection; OC 6459), southern Klamath Co. (Lake of the Woods, 18 Sep 2005 and 20 Aug 2010; J. Johnson collection; OC 371565 & 372321; multiple records since), and the Wallowa Mountains, Wallowa Co. (Duck Lake, 31 Jul 2012, C. Kerst collection). Figure 12.

*Aeshna constricta* Say. Previously only a historic record from Baker Co. (location of specimen unknown); several additional sites found, most notably Rainbow Bay, Lake of the Woods, Klamath Co., where multiple individuals were collected 7 Aug 2005 (Gordon & Kerst, 2006; OC 6465), and multiple individuals have been collected or photographed most years since. Singles were also found at Jack Springs, Jackson Co., 2 Aug 2009 (N. Barrett photo; OC 315773), at two locations in the Corvallis vicinity,

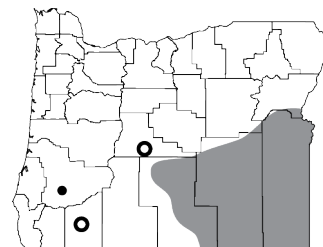


Fig. 8. *Ischnura denticollis*.

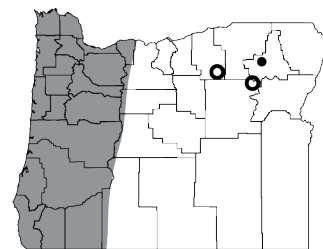


Fig. 9. *Ischnura erratica*.

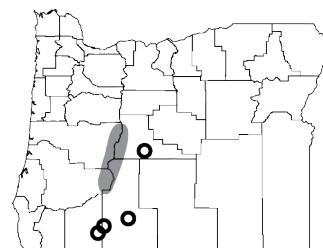


Fig. 10. *Nehalennia irene*.

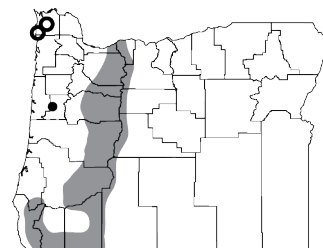


Fig. 11. *Tanypteryx hageni*.

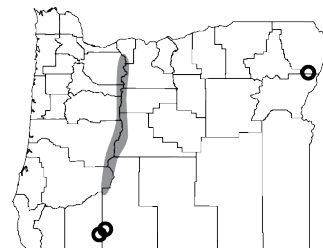


Fig. 12. *Aeshna canadensis*.

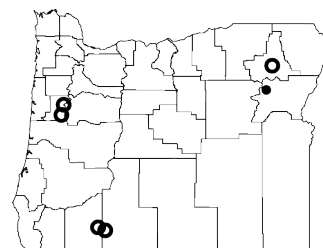


Fig. 13. *Aeshna constricta*.

Benton Co., 5 Jul 2009 and 15 Jul 2011 (J. Simmons & H. Herlyn photos; OC 320622, 330060, 330250), and Ladd Marsh Wildlife Area, Union Co., 11 Aug 2011 (Lyons, 2011; M. Kaplan photo; OC 331857). The previously reported Baker Co. record, included but questioned by Johnson & Valley (2005), is now assumed to be valid although the location of the specimen is still unknown. Figure 13.

***Aeshna subarctica*** Walker. Additional site at Camas Prairie, Wasco Co., where first discovered 9 Sep 2007 (J. Johnson collection; OC 262893); large population present with many adults, nymphs, and exuviae collected or photographed most years since. Figure 14.

***Aeshna tuberculifera*** Walker. New state record for Oregon. Several were collected at a small, but well-vegetated borrow pit near Fry Meadow north of Elgin, Union Co., 3 Aug 2009 (Johnson, 2009b; OC 314572). Individuals subsequently collected at that site on 5 Aug 2009, 15 Aug 2011 and 2 Aug 2012 (C. Kerst collection). A single female was photographed at a small pond east of Medford, Jackson Co., 19 Aug 2012 (N. Barrett photos; OC 381248). The few dates of collection undoubtedly do not reflect this species' complete flight season in Oregon. Figure 15.

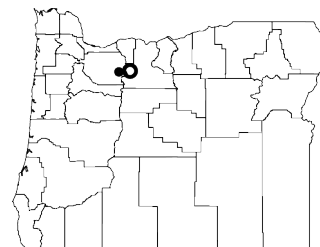
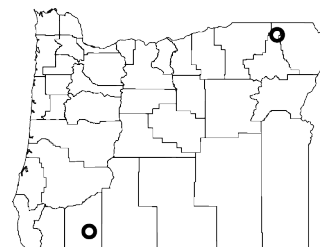
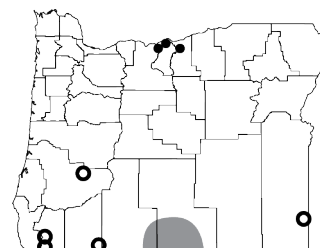
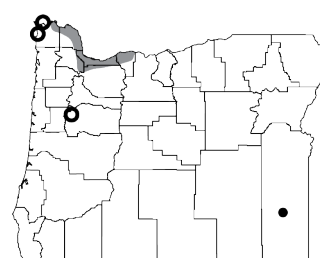
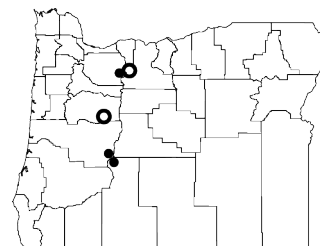
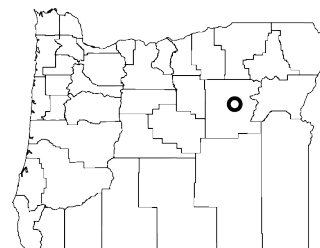
***Aeshna walkeri*** Kennedy. Previously unknown from west of the Cascades crest. Found in Douglas Co. (near Steamboat Creek, 24 Jul 2003 [J. Balaban photo; BG 13206–13208; OC 334596]), Jackson Co. (Jenny Creek, 6 Aug 2005 [J. Johnson collection; OC 6461; multiple records since]), and Josephine Co. (a small tributary of Josephine Creek, 14 Sep 2008 [C. Kerst collection; OC 283921] and West Fork Illinois River near O'Brien, 16 Oct 2010 [J. Johnson collection; OC 372353]). Also recorded well east of the Cascades at Three Forks on the Middle Fork Owyhee River, Malheur Co., 27 Jul 2012 (J. Johnson collection; OC 378205). Figure 16.

***Stylurus olivaceus*** (Selys). Found as far up the Willamette Valley as Freeway Lakes, Albany, Linn Co., 17 Jul 2008 (P. Yechout photo; OC 312613), but records between that location and the mouth of the Clackamas River are lacking—presumably due to lack of survey effort. On the Oregon side of the Columbia River, exuviae have been found as far west as Alderbrook Lagoon, Astoria, Clatsop Co., 5 Aug 2011 (M. Patterson photo; OC 331044); however, exuviae have been found even closer to the Pacific Ocean on the Washington side of the Columbia at Chinook, Pacific Co. (OC 331080). One adult was photographed in Seaside, Clatsop Co., 1 Sep 2011 (D. Bailey photo; OC 334602), about 12 mi. south of the Columbia River. It is unknown whether this individual wandered from the Columbia River or if it emerged from a more local stream or estuary. Figure 17.

***Cordulegaster dorsalis*** Hagen. Found on additional streams in the Basin and Range province: Stonehouse Creek on the east slope of Steens Mountain (J. Johnson collection) and Arizona Creek on the east slope of Pueblo Mountains (J. Johnson, S. Valley, C. Kerst, observations) in Harney Co.; Little Whitehorse Creek, Trout Creek Mountains (C. Kerst, observation) in Malheur Co. In this region, previously known only from Little Cottonwood Creek, Pueblo Mountains (see discussion of this stream's name under *Paltotthemis lineatipes*).

***Somatochlora walshii*** (Scudder). Found at two additional sites in the Cascade Mountains: Gordon Lakes, Linn Co. 2 Sep 2006 (J. Johnson collection; OC 7382) and Camas Prairie, Wasco Co., 9 Sep 2007 (J. Johnson collection; OC 262895; multiple records since that date). Figure 18.

***Leucorrhinia budsonica*** (Selys). Previously reported as occurring in Polk, Washington, and Yamhill Cos., but these are considered most likely misidentified *L. intacta* (Hagen). These areas are outside of the ecoregions that are known to be inhabited by *L. budsonica*.

Fig. 14. *Aeshna subarctica*.Fig. 15. *Aeshna tuberculifera*.Fig. 16. *Aeshna walkeri*.Fig. 17. *Stylurus olivaceus*.Fig. 18. *Somatochlora walshii*.Fig. 19. *Leucorrhinia proxima*.



*Leucorrhinia proxima* Calvert. New state record for Oregon. Found at Magone Lake, Grant Co., 30 Jul 2008 (Vlach, 2008; S. Gordon collection; OC 283459); subsequently collected at that location 31 Jul 2008, 2 Jul 2009, and 21 Jun 2011 (J. Johnson collection; final instar nymphs only on the last date). Figure 19.

*Libellula nodisticta* Hagen. Additional sites in the southern Oregon Cascades at Klamath River Canyon, Klamath Co., 13 Jun 1987 (S. Summers collection; OC 6978), and at two sites in the vicinity of Willow Lake, Jackson Co., 10 Jul 2009 (G. Shaffer photos; OC 318826 & 318827). Figure 20.

*Libellula saturata* Uhler. Now known from southern coastal areas, north at least to Shore Acres State Park, Coos Co., 18 Sep 2005 (D. Hull photo; OC 6976); also found at Storm Ranch, New River, Curry Co., 29 Aug 2007 (Lyons, 2012) and 11 Jul 2012 (R. Lyons, pers. comm.), and Arizona Beach State Park, Curry Co., 23 Aug 2010 (C. Kerst collection; OC 322632). A record at Wickiup Reservoir, Deschutes Co., 8 Aug 2009 (D. Deck photo; OC 315774), suggests possible expansion into the Deschutes River drainage where the species is otherwise unrecorded. Additional records from the northern Willamette Valley: Salem, Marion Co., 2 Aug 2006 (M. Kleinbaum photo; OC 7383) and 24 Jul 2007 (M. Kleinbaum photo; BG 130248), and southwest Portland, Multnomah Co., 1 Aug 2009 (S. & G. Davidson photo; OC 321973). All of the above records involved singles during the latter part of the season (mostly August and later) and it seems likely that they were wanderers rather than from locally established populations. Figure 21.

*Paltothermis lineatipes* Karsch. Previously reported as occurring on “Cottonwood Creek” in Harney Co.—the only known location in the state. The stream’s name is actually “Little Cottonwood Creek” (USGS, Tumtum Lake 7.5-minute topographic quad), however the former name is commonly used. This species has not been observed at that location (or anywhere in Oregon) since 16 Jun 2003 (E. Coombs, pers. comm.; Johnson, 2011).

*Pantala flavescens* (Fabricius). Multiple individuals, including copulating and ovipositing pairs, were observed at Sandpiper Pond, Eugene, Lane Co., 13 Aug 2005 (Gordon & Kerst, 2005), through 1 Sep 2005 (C. Kerst, pers. comm.) Previous records were of individuals only. No records since 2005.

*Sympetrum corruptum* (Hagen). Previously flight dates ranged 15 Feb to 23 Oct, but now recorded every month of the year and current early/late flight dates (Appendix 1) may not be truly representative for the species. Particularly notable are December, January, and early February records in recent years (Table 1). Whether the species is able to successfully overwinter in the state is speculative, but multiple individuals observed in Waldport, Lincoln Co., from December 2011 to February 2012 suggest that it is likely.

*Sympetrum internum* Montgomery. A single male was collected in Eugene, Lane Co., 7 Sep 2005, at about 400 ft elevation (C. Kerst; OC 6641; specimen in J. Johnson col-

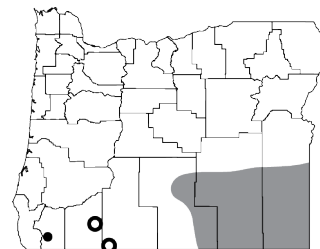


Fig. 20. *Libellula nodisticta*.

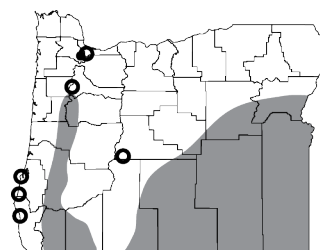


Fig. 21. *Libellula saturata*.

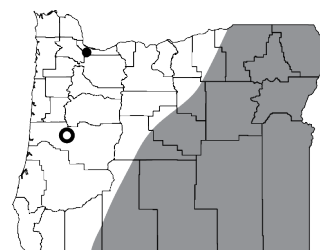


Fig. 22. *Sympetrum internum*.

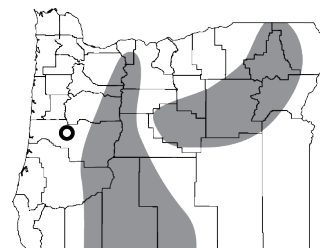


Fig. 23. *Sympetrum obtrusum*.

Table 1. Winter records of *Sympetrum corruptum* in Oregon.

Date	Location	Source	Comment
18 Jan 2005	Eugene, Lane Co.	M. Benotsch, pers. comm.	one observed; unidentified, presumed to be this species
08 Jan 2006 or 2007	Eugene, Lane Co.	fide S. Gordon	one observed
11 Jan 2008	Corvallis, Benton Co.	J. Young, pers. comm.	one collected
01 Feb 2010	Lookingglass, Douglas Co.	E. Pugh, pers. comm.	one observed
01 Dec 2011	Waldport, Lincoln Co.	R. Wescott, pers. comm.	multiple observed
09 Dec 2011	Waldport, Lincoln Co.	R. Wescott, pers. comm.	multiple observed, two photographed
03 Jan 2012	Corvallis, Benton Co.	L. Millbank, pers. comm.	one observed
07 Jan 2012	Waldport, Lincoln Co.	R. Wescott, pers. comm.	one observed
06 Feb 2012	Waldport, Lincoln Co.	R. Wescott, pers. comm.	three observed

lection). This is outside of areas known to be inhabited by the species (primarily non-forested areas east of the Cascades above about 2500 ft elevation) and is considered a wanderer (similar to situation of *S. obtrusum* below). Figure 22.

***Sympetrum obtrusum*** (Hagen). A single male was collected in Eugene, Lane Co., 20 Sep 2005, at about 400 ft elevation (C. Kerst; OC 371572; specimen in J. Johnson collection). This is outside of areas known to be inhabited by the species (the Cascade and Blue Mountains above about 3000 ft elevation) and is considered a wanderer (similar to situation of *S. internum* above). Figure 23.

### Acknowledgements

We thank Ken Tennessen and two anonymous reviewers for many very helpful comments on our manuscript. We also appreciate the many people who have submitted reports, directly and indirectly, which contribute to our understanding of the state's fauna.

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Appendix 1. Early and late flight dates of Odonata in Oregon as of 21 August 2012. Dates in italicized bold typeface supersede the corresponding early or late flight date reported in Johnson and Valley (2005).

**Calopterygidae**

<i>Calopteryx aequabilis</i>	15 May – 14 Sep
<i>Hetaerina americana</i>	02 May – 03 Oct

**Lestidae**

<i>Archilestes californicus</i>	18 Jun – 14 Nov
<i>Lestes congener</i>	22 May – <b>24 Nov</b>
<i>Lestes disjunctus</i>	30 May – <b>17 Oct</b>
<i>Lestes dryas</i>	11 May – 03 Nov
<i>Lestes forcipatus</i> †	02 Aug – 10 Sep
<i>Lestes stultus</i> †	15 Jun – 21 Jul
<i>Lestes unguiculatus</i>	<b>25 May – 06 Oct</b>

**Coenagrionidae**

<i>Amphiagrion abbreviatum</i>	24 Apr – 24 Aug
<i>Argia agrioides</i>	<b>15 Jun</b> – 19 Sep
<i>Argia alberta</i>	30 Apr – <b>18 Sep</b>
<i>Argia emma</i>	22 May – 23 Sep
<i>Argia lugens</i>	<b>15 Jun</b> – 17 Oct
<i>Argia nahuana</i>	<b>26 Jul – 25 Sep</b>
<i>Argia vivida</i>	06 May – <b>17 Oct</b>
<i>Coenagrion resolutum</i>	<b>27 May</b> – 28 Aug
<i>Enallagma anna</i>	07 Jun – 05 Oct
<i>Enallagma annexum</i>	<b>17 May</b> – 17 Oct
<i>Enallagma boreale</i>	01 May – <b>04 Nov</b>
<i>Enallagma carunculatum</i>	<b>06 Apr</b> – 17 Nov
<i>Enallagma civile</i>	26 May – 18 Oct
<i>Enallagma clausum</i>	26 May – <b>18 Sep</b>
<i>Ischnura barberi</i> †	18 Sep
<i>Ischnura cervula</i>	<b>30 Jan</b> – 28 Oct
<i>Ischnura denticollis</i>	30 Apr – 13 Oct
<i>Ischnura erratica</i>	<b>13 Mar – 26 Aug</b>
<i>Ischnura perparva</i>	<b>06 Apr – 02 Nov</b>
<i>Nehalennia irene</i>	27 Jun – <b>27 Aug</b>

**Petaluridae**

<i>Tanypteryx hageni</i>	24 May – 07 Sep
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**Aeshnidae**

<i>Aeshna canadensis</i>	<b>22 Jun</b> – 07 Oct
<i>Aeshna constricta</i>	<b>05 Jul – 13 Sep</b>
<i>Aeshna interrupta</i>	30 May – <b>08 Oct</b>
<i>Aeshna juncea</i>	<b>12 Jul</b> – 07 Oct
<i>Aeshna palmata</i>	21 Jun – 13 Nov
<i>Aeshna sitchensis</i>	21 Aug – 17 Sep
<i>Aeshna subarctica</i>	<b>24 Jun</b> – 07 Oct
<i>Aeshna tuberculifera</i> †	02 Aug – 19 Aug
<i>Aeshna umbrosa</i>	28 May – <b>10 Dec</b>
<i>Aeshna walkeri</i>	<b>15 Jul – 18 Oct</b>
<i>Anax junius</i>	<b>27 Apr – 08 Dec</b>
<i>Rhionaeschna californica</i>	15 Apr – 09 Sep
<i>Rhionaeschna multicolor</i>	<b>23 May</b> – 18 Oct

**Gomphidae**

<i>Erpetogomphus compositus</i>	19 Jun – 13 Sep
<i>Gomphus kurilis</i>	<b>15 May – 04 Sep</b>

<i>Gomphus lynnae</i>	17 Jun – 17 Aug
<i>Octogomphus specularis</i>	29 May – <b>02 Sep</b>
<i>Ophiogomphus bison</i>	<b>02 Jun – 03 Aug</b>
<i>Ophiogomphus morrisoni</i>	<b>31 May</b> – 23 Sep
<i>Ophiogomphus occidentis</i>	<b>01 Jun</b> – 13 Aug
<i>Ophiogomphus severus</i>	15 May – 15 Aug
<i>Stylurus olivaceus</i>	<b>24 Jul – 18 Oct</b>

**Cordulegastridae**

<i>Cordulegaster dorsalis</i>	01 Jun – 20 Sep
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**Macromiidae**

<i>Macromia magnifica</i>	12 Jun – <b>26 Aug</b>
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**Corduliidae**

<i>Cordulia shurtleffii</i>	<b>08 Apr – 06 Sep</b>
<i>Epithea canis</i>	05 May – 28 Jul
<i>Epithea spinigera</i>	<b>18 Apr – 26 Aug</b>
<i>Somatochlora albicincta</i>	21 Jun – 14 Sep
<i>Somatochlora minor</i>	27 Jun – <b>12 Aug</b>
<i>Somatochlora semicircularis</i>	19 Jun – 22 Sep
<i>Somatochlora walshii</i>	<b>24 Jun</b> – 22 Sep

**Libellulidae**

<i>Erythemis collocata</i>	30 Apr – <b>09 Oct</b>
<i>Ladona julia</i>	<b>31 May – 06 Sep</b>
<i>Leucorrhinia glacialis</i>	04 Jun – <b>13 Sep</b>
<i>Leucorrhinia hudsonica</i>	12 May – 14 Sep
<i>Leucorrhinia intacta</i>	01 May – <b>04 Sep</b>
<i>Leucorrhinia proxima</i> †	02 Jul – 31 Jul
<i>Libellula comanche</i>	26 May – <b>18 Sep</b>
<i>Libellula composita</i>	<b>27 May – 18 Sep</b>
<i>Libellula forensis</i>	01 May – 23 Oct
<i>Libellula luctuosa</i>	06 Jun – <b>17 Oct</b>
<i>Libellula nodisticta</i>	24 May – 24 Aug
<i>Libellula pulchella</i>	30 May – <b>08 Oct</b>
<i>Libellula quadrimaculata</i>	12 May – <b>19 Sep</b>
<i>Libellula saturata</i>	<b>23 May – 20 Oct</b>
<i>Pachydiplax longipennis</i>	14 May – <b>13 Oct</b>
<i>Paltothermis lineatipes</i>	16 Jun – 26 Aug
<i>Pantala flavescens</i>	07 Jun – <b>01 Sep</b>
<i>Pantala hymenaea</i>	<b>18 May – 28 Aug</b>
<i>Plathemis lydia</i>	01 May – 03 Oct
<i>Plathemis subornata</i>	19 May – <b>17 Sep</b>
<i>Sympetrum corruptum</i> *	<b>03 Jan – 09 Dec</b>
<i>Sympetrum costiferum</i>	03 Jul – <b>06 Nov</b>
<i>Sympetrum danae</i>	25 Jun – <b>08 Oct</b>
<i>Sympetrum illotum</i>	26 Mar – <b>04 Nov</b>
<i>Sympetrum internum</i>	08 Jul – <b>18 Sep</b>
<i>Sympetrum madidum</i>	14 May – 17 Sep
<i>Sympetrum obtrusum</i>	14 Jul – <b>14 Oct</b>
<i>Sympetrum pallipes</i>	06 Jun – 22 Nov
<i>Sympetrum semicinctum</i>	<b>20 Jun</b> – 03 Oct
<i>Sympetrum vicinum</i>	04 Aug – <b>10 Dec</b>
<i>Tramea lacerata</i>	<b>14 May – 20 Oct</b>

\* overwintering is possible; early/late flight dates may not be representative

† species not reported in Johnson & Valley (2005); dates are not considered representative due to limited records

Appendix 2. All Oregon county records as of 21 Aug 2012. See footnote for county abbreviations. \* = species not reported by Johnson & Valley (2005); • = county record reported by Johnson & Valley (2005) and currently considered valid; ○ = county record added since Johnson & Valley (2005); X = county record reported by Johnson & Valley (2005), but subsequently removed.

Species	BA	BE	CK	CP	CO	CS	CR	CU	DE	DO	GI	GR	HA	HR	JA	JE	JO	KL	LK	LA	LC	LN	ML	MR	MO	MU	PO	SH	TI	UM	UN	WL	WS	WN	WH	YA	C/S		
<i>Calopteryx aequalis</i>	○	•	•	•	•	○	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	30	
<i>Hetaerina americana</i>		•	•	•	•	•	•	○	•	•	•	•	•	•	○	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	6	
<i>Archilestes californicus</i>	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	28	
<i>Lestes congener</i>		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	26	
<i>Lestes disjunctus</i>	•	○	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	28	
<i>Lestes dryas</i>	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	26	
<i>Lestes forcipatus</i> *																																				2			
<i>Lestes stultus</i> *									○						○		○																			3			
<i>Lestes unguiculatus</i>	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	○	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	22	
<i>Amphiagrion abbreviatum</i>		•	•	•			•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	30	
<i>Argia agrioides</i>								•					○		○		•	•	○	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	7	
<i>Argia alberta</i>																																				3			
<i>Argia emma</i>	○	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	25	
<i>Argia lugens</i>													○				•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	2	
<i>Argia nahuana</i>																																				2			
<i>Argia vivida</i>																																				•	•	28	
<i>Coenagrion resolutum</i>																																					12		
<i>Enallagma anna</i>	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	10	
<i>Enallagma annexum</i>	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	30	
<i>Enallagma boreale</i>	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	36
<i>Enallagma carunculatum</i>	○	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	34
<i>Enallagma civile</i>																																					5		
<i>Enallagma clausum</i>																																					6		
<i>Ischnura barberti</i> *														○																							1		
<i>Ischnura cervula</i>	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	36
<i>Ischnura denticollis</i>									○						○																						7		
<i>Ischnura erratica</i>	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	19	
<i>Ischnura perparva</i>	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	36
<i>Nehalennia irene</i>								○							○																						5		
<i>Tanypteryx hageni</i>		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	13	
<i>Aeshna canadensis</i>			•	•					•	•	•				•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	10	
<i>Aeshna constricta</i>	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	5	
<i>Aeshna interrupta</i>	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	31	
<i>Aeshna juncea</i>	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	○	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	10	
<i>Aeshna palmata</i>		•	•	•	•																																36		
<i>Aeshna stichensis</i>			•	•					•																												3		
<i>Aeshna subarctica</i>		•																																○			2		
<i>Aeshna tuberculifera</i> *															○																						2		
<i>Aeshna umbrosa</i>	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	35	
<i>Aeshna walkeri</i>																																					8		
<i>Anax junius</i>								○																													34		
<i>Rhionaeschna californica</i>	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	33	
<i>Rhionaeschna multicolor</i>	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	36	
<i>Erpetogomphus compositus</i>																																					7		
<i>Gomphus turilis</i>	•								•	•					•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	10	
<i>Gomphus lynnae</i>																																					4		
<i>Octogomphus specularis</i>		•																																			13		

## Appendix 2 continued . . .

Species	BA	BE	CK	CP	CO	CS	CR	CU	DE	DO	GI	GR	HA	HR	JA	JE	JO	KL	LK	LA	LC	LN	ML	MR	MOM	MU	PO	SH	TI	UM	UN	WL	WS	WN	WH	YA	C/S
<i>Ophiogomphus bison</i>									•	•						•		•	•																		4
<i>Ophiogomphus morrisoni</i>																	•	•	•																		5
<i>Ophiogomphus occidentis</i>																	•	•	•																		20
<i>Ophiogomphus severus</i>									•	•								•	•	•																	23
<i>Stylurus olivaceus</i>																																					7
<i>Cordulegaster dorsalis</i>																																					22
<i>Macromia magnifica</i>																	•	•	•														•			18	
<i>Cordulia shurtleffi</i>																	•	•	•																	24	
<i>Epitheca canis</i>																																					13
<i>Epitheca spinigera</i>																		•	•																	14	
<i>Somatoclora albicincta</i>																																					19
<i>Somatoclora minor</i>																																					2
<i>Somatoclora semicircularis</i>																																					23
<i>Somatoclora walshii</i>																																					5
<i>Erythemis collocata</i>																																					33
<i>Ladona julia</i>																																					9
<i>Leucorrhinia glacialis</i>																																					10
<i>Leucorrhinia hudsonica</i>																																					20
<i>Leucorrhinia intacta</i>																																					27
<i>Leucorrhinia proxima*</i>																																					1
<i>Libellula comanche</i>																																					1
<i>Libellula composita</i>																																					1
<i>Libellula forensis</i>																																					36
<i>Libellula luctuosa</i>																																					16
<i>Libellula nodisticta</i>																																					6
<i>Libellula pulchella</i>																																					34
<i>Libellula quadrimaculata</i>																																					32
<i>Libellula saturata</i>																																					18
<i>Pachydiplax longipennis</i>																																					32
<i>Palaethemis lineatipes</i>																																					1
<i>Pantala flavescens</i>																																					4
<i>Pantala hymenaea</i>																																					16
<i>Plathemis lydia</i>																																					35
<i>Plathemis subornata</i>																																					3
<i>Sympetrum corruptum</i>																																					36
<i>Sympetrum costiferum</i>																																					17
<i>Sympetrum danae</i>																																					20
<i>Sympetrum illotum</i>																																					30
<i>Sympetrum internum</i>																																					13
<i>Sympetrum madidum</i>																																					22
<i>Sympetrum obtusum</i>																																					15
<i>Sympetrum pallipes</i>																																					36
<i>Sympetrum semicinctum</i>																																					21
<i>Sympetrum vicinum</i>																																					22
<i>Tramea lacerata</i>																																					28
Species per county	49	49	52	35	26	43	43	31	59	68	32	50	60	31	65	41	55	66	56	66	34	59	49	53	38	38	35	27	16	41	45	40	45	29	41	24	

BA = Baker, BE = Benton, CK = Clackamas, CP = Clatsop, CO = Columbia, CS = Coos, CR = Crook, CU = Curry, DE = Deschutes, DO = Douglas, GI = Gilliam, GR = Grant, HA = Harney, HR = Hood River, JA = Jackson, JE = Jefferson, JO = Josephine, KL = Klamath, LK = Lake, LA = Lane, LC = Lincoln, LN = Linn, ML = Malheur, MR = Marion, MO = Morrow, MU = Multnomah, PO = Polk, SH = Sherman, TI = Tillamook, UM = Umatilla, UN = Union, WL = Wallowa, WS = Wasco, WN = Washington, WH = Wheeler, YA = Yamhill, C/S = total number of counties per species.



# Odonata Records from Bay and Washington Counties and the St. Andrew Bay Drainage Basin, Florida

Edwin J. Keppner<sup>1</sup>

Key words: Odonata, United States, Florida, records, dragonflies, damselflies

## Abstract

An annotated list of the Odonata occurring in Bay and Washington counties and the St. Andrew Bay drainage basin, Florida, is presented based on collections of adults and nymphs from 2003–2012. This survey, combined with reports from the literature, resulted in 114 species of Odonata (36 Zygoptera and 78 Anisoptera) being reported from the survey area with 94 species of odonates reported for Bay County (31 Zygoptera and 63 Anisoptera), 92 for Washington County (28 Zygoptera and 64 Anisoptera), and 99 for the St. Andrew Bay drainage basin (31 Zygoptera and 68 Anisoptera). The Florida Natural Areas Inventory lists 20 of the species reported from the survey area as imperiled and the Florida Fish and Wildlife Conservation Commission lists 13 of those species as Species of Greatest Conservation Need.

## Introduction

My interest in the Odonata of Bay and Washington counties and the St. Andrew Bay drainage basin (SAB) located in the central portion of the Florida Panhandle began in 2003. Since then, I have collected odonate adults and nymphs primarily on public property such as that owned and managed by the Northwest Florida Water Management District (NFWFMD), county parks in Bay and Washington counties, public access areas to creeks and lakes, road right-of-ways, and private property where permission was granted to collect.

The sources of information used to document the species in the survey area included the collection and identification of adults and nymphs and a search of the literature. Dunkle (1992) reviewed the extensive literature regarding the Odonata of Florida and provided a distribution of 162 species by county (44 species of Zygoptera and 118 species of Anisoptera). He reported seven species of Zygoptera and 30 species of Anisoptera from Bay County and seven species of Zygoptera and 22 species of Anisoptera from Washington County.

Donnelly (2004a,b,c) provided dot maps of the Odonata of North America including Florida. The OdonataCentral website

(Abbott, 2011) lists 169 species of Odonata for the state (46 species of Zygoptera and 123 species of Anisoptera), with 42 species from Bay County (8 species of Zygoptera and 34 species of Anisoptera) and 32 species from Washington County (9 species of Zygoptera and 23 species of Anisoptera).

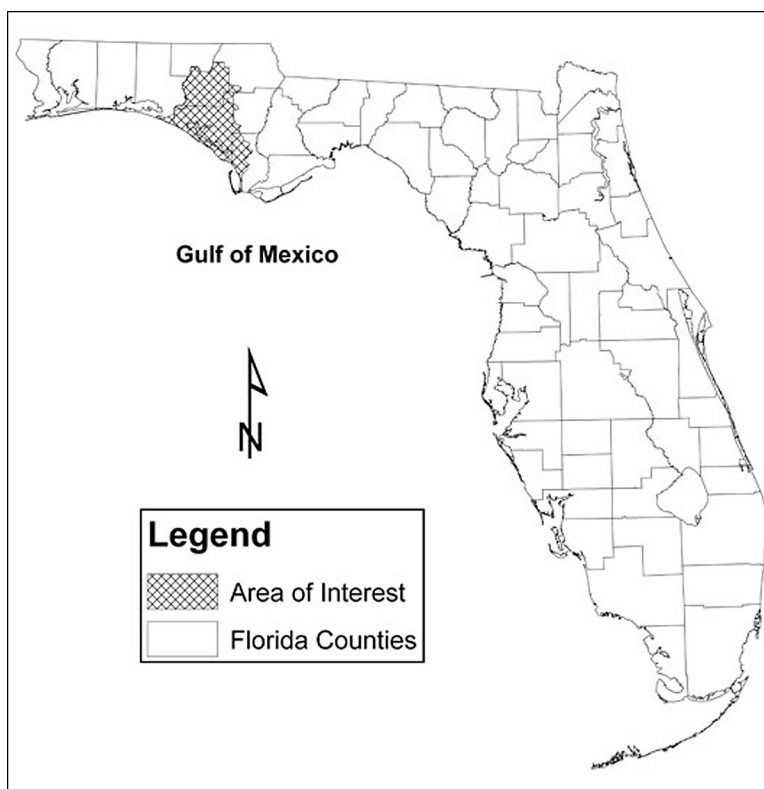


Figure 1. Location of the survey area within Florida.

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Richardson (2003) provided a key to the nymphs of Anisoptera of Florida and provided county maps for 114 species; 44 species were recorded from Bay County, 35 from Washington County. Richardson (2010) provided a key to the nymphs of the Zygoptera of Florida and provided county maps for 45 species, with 23 species from Bay County and 15 species from Washington County. His records were based largely on information in the Florida Department of Environmental Protection's Statewide Biological Database (SBIO) and information provided by individual odonatists. Keppner and Keppner (2007) provided a preliminary list of 77 species of odonates (29 species of Zygoptera and 48 species of Anisoptera) from Bay County based on adult specimens collected between 2003 and 2007. This preliminary list is incorporated into the following list for Bay County.

### Study Area

The region of the Florida Panhandle between the Choctawhatchee River valley on the west, the Chipola River valley on the east, and from the Gulf of Mexico north to the Alabama border (Fig. 1) is an area of diverse topography and aquatic habitats. The area includes all of Bay and Washington counties and parts of Jackson, Holmes, Calhoun, and Gulf counties. Also included in this area are portions of the extensive Choctawhatchee River drainage basin that extends into Alabama, the smaller SAB that is located entirely in Florida, and a portion of the Chipola River drainage basin.

The land in Bay and Washington counties is mostly privately owned. The primary use of rural land is silviculture involving sand pine (*Pinus clausa*) in the xeric areas and slash pine (*P. elliottii*) in the mesic to hydric areas. The NFWFMD owns and manages the largest amount of public land in the area and permission was obtained from the District to collect on that property. The District owns and manages about 43,000 acres in Bay and Washington counties (Fig. 2) as the Econfin Creek Water Management Area (ECWMA). The primary purpose of the ECWMA is the protection of water quality in the many lentic and lotic waters on the property as well as the aquifer that supplies water to Econfin Creek and the Deer Point Reservoir. Other goals of the District are the restoration of pine silviculture to the natural biotic community of longleaf pine (*P. palustris*) and wiregrass (*Aristida stricta*), providing recreational use for the public, and pro-

tecting rare and imperiled flora and fauna. The NFWFMD also owns and manages the Choctawhatchee Water Management Area (CWMA), about 63,000 acres of land along the Choctawhatchee River and Holmes Creek in Washington, Walton, and Holmes counties.

In 2008, I received permission from two landowners to collect odonates at a variety of lentic and lotic habitats in the Greenhead Slope and Choctawhatchee Gap physiographic regions discussed below. The properties were large and provided a variety of habitats to search for odonates including steephead ravines, seepage streams, sandhill lakes and ponds, and sinkhole lakes as well as the Choctawhatchee River swamps, ponds, and river bluff seepage areas.

The survey area experienced multiple severe episodes of drought from 1999 to the present resulting in many lakes and ponds becoming dry or experiencing very low water levels for extended periods of time. Based on aerial photography and field observations, many of the karst ponds and lakes that had water in 2004–2005 were dry or much

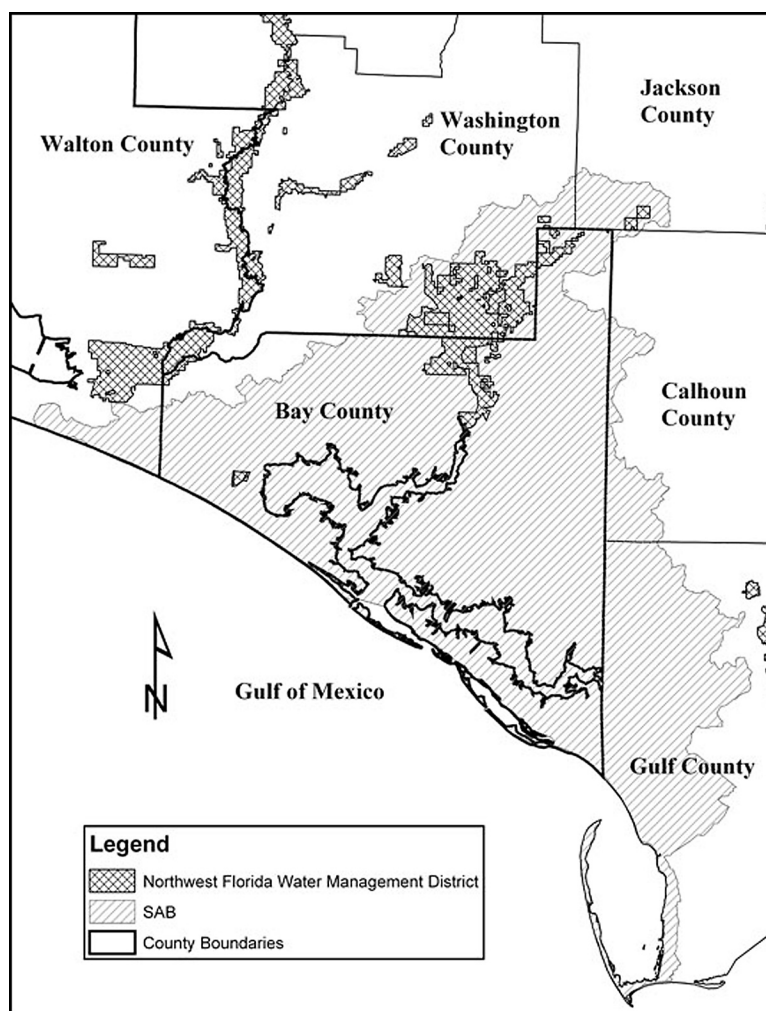


Figure 2. St. Andrew Bay Drainage Basin (SAB).



reduced in water level by 2007. Lotic waters in the area were similarly low and some streams were completely dry during the period. By April of 2010 most water bodies in the area had recovered, but by fall of 2011 water levels were again much reduced.

The SAB is located entirely in the State of Florida and is about 1,249 square miles in area (Beck et al., 2000). According to NFWMD (2000), portions of six counties are included in the SAB: Bay comprises 61%, Washington 9%, Gulf 20%, Calhoun 4%, Walton 4%, and Jackson 2%. Bay and Washington counties comprise about 70% of the SAB. Bay County contains the entire tidally influenced portion of the SAB estuary (about 69,000 acres) and all of the subdrainage basins to the estuary with the exception of the Econfina Creek subdrainage basin which extends a short distance into Jackson, Calhoun, and Washington counties. The southeastern corner of Washington County is included in the SAB and has numerous sinkhole and sandhill lakes and ponds many of which are linked to the aquifer and the springs along Econfina Creek. The remainder of Washing-

ton County, especially the portion immediately west of the SAB boundary, is similar to the northern part of the SAB in physiography, although it is a part of the much larger Choctawhatchee River drainage basin that extends north into Alabama.

The SAB is not defined by county boundaries. This makes it difficult to determine the location of a record for a species of Odonata within a particular county in the absence of a well-defined location that can be demonstrated to be within the SAB boundary. Bay County is almost entirely within the SAB with the exception of a very small area in northwest part of the county (Fig. 2). Walton, Calhoun, and Jackson counties have small areas within the SAB, and Washington and Gulf counties have larger areas within the SAB. As a result, it was decided that all records from Bay County would be included in the SAB odonate list. Personal collections and literature records for odonate species from the other counties that could be determined from the databases to be located in the SAB would be included in the list. This decision, and the absence of collecting on large areas of private property in the SAB, likely results in an under-statement of the number of odonate species in the SAB as well as in the counties involved in the survey.

The survey area has a variety of aquatic habitats with some interesting and rare habitats for Florida that support endemic species of vascular plants, namely those associated with karst features such as sinkhole and sandhill lentic water bodies and steephead ravines. Some odonates associated with these habitats are of interest, because they are considered rare or endemic to Florida.

Puri and Vernon (1964) recognized three primary physiographic divisions in the Panhandle of Florida, namely Coastal Lowlands, Northern Highlands, and Marianna Lowlands. They characterized the Coastal Lowlands Division as land adjacent to the coast that is low in elevation, poorly drained, and the characterizing features are parallel to the coast. They characterized the Northern Highlands Division as an almost continuous highland parted by larger stream valleys. The marginal slopes are well drained by dendritic streams but the tops are gently sloping plateaus. The larger stream valleys have combined their erosional and depositional cycles with solution to form the Marianna Lowlands that breaks the higher land surface. The Marianna Lowlands Division is well

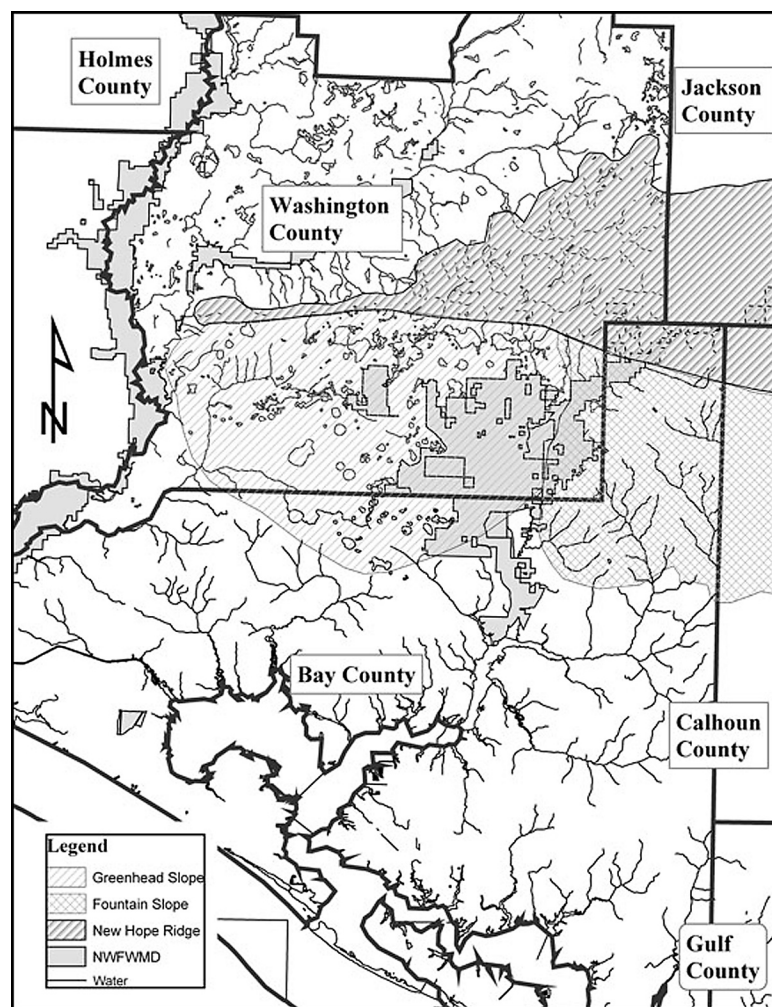


Figure 3. Physiography of the survey area.

drained with a well-developed dendritic stream pattern. It is pocked by sinks interspersed with rolling hills and abrupt ridges. The ridges are bounded by stream channels or sink rims. Broad, shallow basins are generally present, and some are filled with water.

Wolfe et al. (1988) provided a detailed description of the physiography of the Florida Panhandle (Fig. 3) based on that of Puri and Vernon (1964). Their system divided the portion of the Panhandle that includes the survey area into the Coastal Lowlands, Greenhead Slope, Fountain Slope, New Hope Ridge (which they considered an isolated portion of the Northern Highlands), and the Marianna Lowlands which lie immediately north of the New Hope Ridge and extend into Alabama. They called the area excised by the Choctawhatchee River the Choctawhatchee Valley Gap and included it within the Coastal Lowlands.

**Coastal Lowlands.** Wolfe et al. (1988) placed the portion of the survey area south of the New Hope Ridge in the Gulf Coastal Lowlands physiographic division. The region of the Coastal Lowlands south of the Greenhead Slope and Fountain Slope is low in elevation, flat, and poorly drained in many areas. Much of the uplands and many wetland areas have been converted to predominantly slash pine (*Pinus elliotii*) with some sand pine (*P. clausa*) silviculture in the drier areas. This part of the Coastal Lowlands contains seepage streams, blackwater streams, cypress domes, swamps, permanent and temporary flatwoods ponds, shrub and herb bogs. Streams are primarily sand-bottomed with narrow floodplain, titi (*Cyrtilla racemiflora* and *Cliftonia monophylla*) dominates the stream corridors, and many are tidally influenced as they approach the estuary such as Burnt Mill Creek, Callaway Creek, and Sandy Creek in Bay County.

**Greenhead Slope and Fountain Slope (Sandhills).** According to Wolfe et al. (1988), the Greenhead Slope and Fountain Slope are massive ancient coastal sand deposits that may have been formed during the high sea level of the Pliocene and were stranded inland by present-day lower sea levels. Vernon (1942) identified three definite levels in the Greenhead-Fountain Slope area that could be old ocean bottoms as they are marked by seaward-facing scarps (115-150 foot terrace, 150-220 foot terrace, and 250-320 foot terrace). The Slopes are dominated by well-drained sandy soils.

Wolfe et al. (1988) stated that the Greenhead Slope exhibits extensive karst features and is a massive deposit of sand that is pocked by circular depressions and round lakes. It is characterized by steep slopes to the lakes and ponds, numerous steephead ravines and other ravines ending in lakes, streams, and creeks, and seepage streams flowing downslope. The Fountain Slope is also a large deposit of sand pocked with numerous circular depressions and round lakes of vary-

ing sizes. However the topography is less pronounced and ravines are far fewer than in the Greenhead Slope.

Many of the sandhill lakes and sinkhole lakes on the two Slopes are considered to be involved in the recharge of the underlying aquifers and do not have inlets and outlets. The water level in these lakes and ponds can fluctuate significantly both seasonally and annually, and many become completely dry during severe drought. The lakes and ponds on the Greenhead Slope generally have steep slopes with hardwood forest on the slopes with a border of *Hypericum lissophloeus* (smoothbark St. Johns-wort) around the lake or pond. The lakes and ponds of the Fountain Slope generally have more gradual slopes with titi and/or pines or xeric shrubs on the slopes, and many have a border of *H. lissophloeus* around the water body. The uplands in both Slopes are dominated by sand pine silviculture with some areas in the process of restoration to the historic natural community of longleaf pine-wiregrass particularly on NFWFMD property.

The Greenhead and Fountain Slopes also have seepage streams and seepage wetlands that are formed by water seeping from the deep sand soils that dominate both Slopes. Many seepage streams feed tributaries to the major creeks. A few steephead ravines drain to sandhill lakes or Econfina Creek, the major creek, in the Fountain Slope. The Greenhead Slope has more numerous steephead ravines draining to karst ponds and many seepage streams that drain to the Choctawhatchee River. Xeric to mesic hardwood forests occur along slopes to creeks, slopes along steepheads and other ravines. The major creek in the Greenhead Slope is Pine Log Creek which drains to the Choctawhatchee River.

**New Hope Ridge.** Wolfe et al. (1988) stated that the New Hope Ridge is a subdivision of the Northern Highlands that exists between the Choctawhatchee River on the west, the Chipola River on the east, the Coastal Lowlands on the south, and the Holmes Valley Escarpment of the Marianna Lowlands on the north. The New Hope Ridge has low, wet karst depressions (small to large), hillside seepage streams, and seepage bogs. The headwaters of Econfina Creek are in the Jackson County portion of the New Hope Ridge, and the headwaters of Pine Log Creek are in the Washington County part of the New Hope Ridge.

**Marianna Lowlands.** According to Wolfe et al. (1988), the Marianna Lowlands exhibit karst features and is a limestone dominated rectangular area between the New Hope Ridge on the south, the Western Highlands on the west, Grand Ridge on the east, and extends into Alabama and Georgia along the principal streams on the north. The land surface is well-drained and has a well-developed dendritic stream pattern. It is pocked by sinks interspersed with rolling hills and abrupt ridges bounded by stream channels. Broad, shal-

low basins are generally present, some filled by water. The major creek system in Washington County portion of the Marianna Lowlands is Holmes Creek which drains to the Choctawhatchee River. The Marianna Lowlands and the Greenhead and Fountain Slopes are the only land features of the Panhandle that exhibit karst features.

**Choctawhatchee Valley Gap.** Wolfe et al. (1988) depicted the Choctawhatchee Valley Gap as an extension of the Coastal Lowlands that includes the main channel and floodplain of the Choctawhatchee River. The Washington County side of the river has floodplain swamp and bottom-land hardwood forests. Bluffs occur along the channel and landward of the forested wetlands and support mesic hardwood forest with seepage streams flowing from the bluffs to the floodplain in many places.

## Methods

A GPS device (Garmin GPSmap 76 CSx; accuracy ca. 14 feet) was used to determine the latitude and longitude of the collecting sites. Typical methods were employed to collect adults and nymphs (Needham et al., 2000). Aerial insect nets were used for catching adults, and nymphs were collected with dip-nets. Adults were killed in acetone, dried, and placed in clear plastic envelopes. Nymphs were killed and preserved in 70% isopropyl alcohol. All specimens of adults and nymphs are in the author's collection.

Scientific and common names were obtained from Paulson and Dunkle (2011). The keys provided by Needham et al. (2000), Westfall and May (2006), Daigle (1991, 1992), and Richardson (2003, 2010) were used to identify specimens as well as the field guides provided by Dunkle (2000), Beaton (2007), Lam (2004), and Paulson (2011). Flight dates were taken from Dunkle (1992) and are for all of Florida. Flight season for some species in the Panhandle may differ.

The records accumulated during this survey are based mostly on adult specimens, but some are based only on nymphs. Two species were recorded only from nymphs collected during this survey (*Cordulegaster obliqua* and *Stylurus potulentus*), and the identifications of these and other nymphs were confirmed by R. Stephen Krotzer. The remaining species recorded only from nymphs are from Richardson (2003, 2010). These records are offered to provide a more complete list of the species that have been reported to occur in the survey area. Records of occurrence of some adults were provided by The Florida Natural Areas Inventory (FNAI) from the SBIO records and are included for completeness. An asterisk after the county name in the species accounts means that the species is a new record for that county.

## Collection Sites

Most collecting sites in Bay County were on NFWFMD land, at public access points, and road right-of-way crossings of creeks and streams. Permission was obtained from the Florida Department of Transportation to collect at some stormwater ponds along State Route (SR) 77 in Bay County, and the St. Joe Company provided permission to collect on some of their land in the survey area. Many collection sites in Washington County were on NFWFMD property and a very large area of private property whose owners wish to remain anonymous. However, large areas of private property and NFWFMD property remain unexamined in both counties.

Adult specimens were collected at and away from aquatic habitats throughout the year. Nymphs were collected mostly during the fall, winter, and spring. An attempt was made to collect adults and/or nymphs at sites representative of various habitat types and at different seasons of the year. Lentic habitats sampled included sandhill and sinkhole lakes, ponds, and depressions and flatwoods lakes, ponds, temporary ponds, and stormwater ponds. Lotic habitats included seepage streams, blackwater streams, ravine seeps, steephead ravine seeps, and the main channels of Econfinna Creek, Holmes Creek, and the Choctawhatchee River. In each area the roads and trails leading to and along the water body were searched for adults.

One hundred and thirty-two sites were visited in Washington County and 71 sites were visited in Bay County during the survey. The majority of the collection sites were in the Greenhead Slope and Fountain Slope physiographic areas, because the majority of the NFWFMD property and the private property available for collection were in these two areas. Each site was visited at least once, and many sites were visited a number of times. One hundred eleven of the sites visited were in the SAB including eight sites in Gulf County near Wetappo Creek and three sites in Jackson County at headwaters of Econfinna Creek.

## List of Species

The survey resulted in the collection of 103 species of odonates as adults and/or nymphs (33 Zygoptera including *Enallagma dubium* from Jackson County and 70 Anisoptera including *Arigomphus pallidus* from Gulf County). An additional three Zygoptera and eight Anisoptera species not collected during the survey were obtained from the various databases bringing the total number of species to 114. Appendix I is a summary list of the species of Odonata collected by county and SAB during this survey and reported by others from the survey area.

Distributional data were taken from Dunkle (1992), Abbott (2011) and Richardson (2003, 2010). The source of the data for each species reported from the survey area is provided in Appendix I. Flight seasons were taken from Dunkle (1992). Habitat data for each species range in Florida was taken from Dunkle (1992) but is supplemented in some cases from Beaton (2007), Krotzer et al. (2008), and Paulson (2011).

## Zygoptera

### CALOPTERYGIDAE

Two species of *Calopteryx* and one species of *Hetaerina* were collected along creeks and streams in both counties. A second species of *Hetaerina*, not collected during this survey, has been reported from the survey area.

*Calopteryx dimidiata* Burmeister (15 Feb–11 Nov). Adults were observed or collected in Washington County at White Oak Creek, Pine Log Creek, and at some seepage tributaries to these creeks and in Bay County at Buckhorn Creek, Moccasin Creek, Mill Branch, Sweetwater Branch, and number of sites along Econfinia Creek including a site at the headwaters of Econfinia Creek in Jackson County. Uncommon on clear forest streams.

*Calopteryx maculata* (Palisot de Beauvois) (7 Feb–3 Dec). Adults were collected or observed in Washington County at tributaries to Holmes Creek, Pine Log Creek, a number of ravine seepage streams, and Tumble Creek, and in Bay County at Moccasin Creek, Mill Branch, Bear Creek and a number of sites along Econfinia Creek. Common on forest streams.

*Hetaerina americana* (Fabricius) (12 Apr–15 Aug). This species was not observed or collected during this survey. FNAI lists two locations in Bay County on Econfinia Creek that are close together but from widely separated dates (1971, 1991), and Richardson (2010) reported it from Washington County and other Panhandle counties. Tennessen (2004) reported it from Okaloosa County. Krotzer et al. (2008) stated that the habitat of this species is clear, flowing streams of varying size usually with streamside vegetation.

*Hetaerina titia* (Drury) (possibly all year except Feb). Adults were collected in Bay County at the County Road (CR) 388 bridge over Econfinia Creek. Uncommon on permanently flowing streams and rivers.

### LESTIDAE

Three species of *Lestes* were collected in both counties primarily along the edges of lakes and ponds with abundant herbaceous vegetation and/or titi (*Cliftonia monophylla* and/or *Cyrtilla racemiflora*).

*Lestes australis* Walker (16 Mar–15 Jan). Adults were collected or observed at a number of ponds in Bay County including ponds along south Enfinger Road, along Hobbs Pasture Road, north of West Bay, and at three unnamed ponds in southern Washington County near the Bay County border. Common at grassy ponds.

*Lestes vidua* Hagen (20 Feb–8 Dec). Adults were collected and observed in Bay County\* at ponds along south Enfinger Road, at certain stormwater retention ponds along SR 77, and in southwestern Washington County\* at three unnamed sandhill ponds. Uncommon at temporary grassy ponds.

*Lestes vigilax* Hagen (20 Mar–16 Dec). Adults were collected at a number of locations in Bay County including ponds off south Enfinger Road, Hobbs Pasture Road, Garrison Road and in Washington County at a number of sandhill ponds and Howard Swamp. Common at swampy waters.

### COENAGRIONIDAE

Twenty-nine species in five genera were collected or reported by others from the survey area. The genus *Argia* is represented by six species, *Enallagma* by 15 species, *Ischnura* by five species, *Nehalennia* by two species, and *Telebasis* by one species.

*Argia apicalis* (Say) (12 Apr–22 Aug). Not collected during the present survey but reported from Washington County by Dunkle (1992), Abbott (2011), and Richardson (2010). Common at larger rivers in northern Florida.

*Argia bipunctulata* (Hagen) (3 Mar–17 Aug). Adults were collected in Bay County at a seepage slope along Callaway Creek and in Washington County\* from a number of ravine seepage streams and seepage slopes. Scarce at seepage areas.

*Argia fumipennis* (Burmeister) (all year). Adults were collected or observed at or near most ponds, lakes, and slow streams in the survey area. It was probably the most widespread species observed. Common at both flowing and still waters.

*Argia moesta* (Hagen) (27 Mar–15 Nov). Adults were collected in Bay County at Moccasin Creek, several places along Econfinia Creek, and Mill Branch and in Washington County at White Oak Creek, Holmes Creek, Pine Log Creek, and the Choctawhatchee River. Common at streams and rivers.

*Argia sedula* (Hagen) (all year). Adults were collected from a number of locations along Econfinia Creek in Bay County, and nymphs were collected in Washington County from White Oak Creek and Holmes Creek at Hightower Springs

Landing, Live Oak Landing and other locations along the creek. Common on streams.

*Argia tibialis* (Rambur) (3 Mar–26 Oct). Adults were collected in Washington County at a seepage tributary to a sandhill lake and from several locations along Holmes Creek including Hightower Springs Landing, Live Oak Landing, Spurling Landing, and other locations along the Creek and in Bay County at Econfina Creek, Moccasin Creek, and Cal-laway Creek. Common at streams.

*Enallagma cardenium* Selys (all year). Adults were collected in Bay County at Moccasin Creek. Common at flowing waters.

*Enallagma civile* (Hagen) (all year). Adults were collected in Bay County at a pond along Hobbs Pasture Road, storm-water ponds along SR 77, a West Bay Preservation Area pond, and Lynn Haven Recreational Complex pond and in southern Washington County\* at two un-named ponds. Found throughout mainland Florida at almost any lentic water, especially newly created ponds.

*Enallagma concisum* Williamson (6 Feb–23 Dec). Adults were collected in Bay County at a newly constructed storm-water pond along SR 77 and two ponds on south Enfinger Road. Uncommon at oligotrophic lakes and ponds.

*Enallagma daeckii* (Calvert) (6 Apr–11 Sep). Adults were collected in Bay County\* along the edge of Deer Point Reservoir, at Hobbs Pasture, and at a pond near Hobbs Pasture. Uncommon at shady, swampy waters.

*Enallagma davisii* Westfall (23 Jan–12 Apr). Adults were collected in Washington County\*, at Henry Lee Pond, and in Bay County\* an adult was collected at the Panama City Beach Conservation Area. Uncommon at sand bottom lakes.

*Enallagma divagans* Selys (3 Apr–4 Sep). Adults were collected in Bay County at a bridge across a creek entering Deer Point Reservoir, at Hobbs Pasture, and Buckhorn Creek and in Washington County\* at Cotton Landing and Curry Ferry Landing along Holmes Creek. Uncommon at slowly flowing waters.

*Enallagma doubledayi* (Selys) (all year). Adults were collected from a number of sandhill lakes and ponds in Bay County\* such as the ponds along SR 20 west of Econfina Creek, and in Washington County at a number of sandhill lakes and ponds on private property. Common at ponds.

*Enallagma dubium* Root (20 Mar–11 Sep). An adult of this species was collected in the Jackson County portion of the SAB from a large pond located on the northeast side of

Compass Lake with abundant emergent vegetation. It was not collected from Bay or Washington counties during this survey, but it has been reported from both counties by Richardson (2010). Krotzer et al. (2008) stated that the habitat is heavily vegetated waters, including swamps, ponds, and sluggish streams often with water lilies and other floating aquatic plants.

*Enallagma geminatum* Kellicott (23 Feb–18 Oct). Adults were collected in Bay County\* at Hobbs Pasture and in Washington County\* at a large pond along Cedar Tree Landing Road. Scarce at swampy waters.

*Enallagma pallidum* Root (6 Apr–30 Aug). Adults were collected in Bay County\* at an artificial pond off Garrison Road with the shoreline of grasses, ferns, wax myrtle, and herbaceous wetland plants. It was reported for Washington County by Richardson (2010). Scarce at swampy lakes.

*Enallagma pollutum* (Hagen) (all year). Adults were collected at Hobbs Pasture in Bay County. Common at mesotrophic still waters.

*Enallagma signatum* (Hagen) (all year). Adults were collected in Bay County at a ponded area along Econfina Creek. Common at mesotrophic still waters but not as common as *E. pollutum*.

*Enallagma sulcatum* Williamson (25 Feb–15 Nov). An adult was collected in Washington County\* from the shoreline of a sandhill lake. Fairly common at sand-bottomed lakes.

*Enallagma vesperum* Calvert (25 Feb–7 Nov). Adults were collected in Bay County\* in a pine plantation about 200 feet from a pond with titi (*Cliftonia monophylla*) along Enfinger Road and around the edge of Hobbs Pasture. Uncommon at lakes in Florida.

*Enallagma weewa* (25 Feb–7 Nov). This species was not collected during the present survey, but Dunkle (1992) and Abbott (2010) have reported it from Washington County. Common at swampy streams.

*Ischnura hastata* (Say) (all year). Adults were collected or observed at many lakes and ponds with marshy borders in both Bay and Washington\* counties. Abundant at marshy waters.

*Ischnura kellicotti* Williamson (3 Feb–16 Dec). Adults were collected in Bay County at a water lily-choked bay off Deer Point Reservoir and in Washington County\* at a large sandhill pond supporting *Brasenia* sp. and at a large beaver pond with abundant water lilies. Found in association with water lilies.

*Ischnura posita* (Hagen) (all year). Adults were collected in Bay County at a number of marshy ponds, lakes, and slow streams such as Deep Springs Park stream, Garrison Road pond, and ponds along Hobbs Pasture Road and in Washington County at Hammock Lake, Howard Swamp, and a pond along Pine Log Creek. Abundant at marshy waters.

*Ischnura prognata* (Hagen) (probably all year). Adults were collected in Bay County at a pond near Moccasin Creek, at Hobbs Pasture, and a pond near a swamp in Lynn Haven. Scarce inhabitant of shady seepage areas.

*Ischnura ramburii* (Selys) (all year). Adults were collected or observed at a large number of lakes and ponds in Bay and Washington\* counties. Abundant at lentic waters.

*Nehalennia integricollis* Calvert (3 Mar–21 Nov). Adults were collected in Bay County at a number of marshy edged ponds and in Washington County\* at Henry Lee Pond and unnamed ponds where it was usually collected by sweeping the shoreline vegetation with a net. Fairly common at lentic waters.

*Nehalennia pallidula* Calvert (all year). Keppner et al. (2007) reported the occurrence of this species in Bay County along the edge of Deer Point Reservoir at Hobbs Pasture on NFWMD property. It was first collected on 30 Apr 2007, and the population has persisted through October 2011. The adult habitat in Bay County is the forested edge of Deer Point Reservoir along the shore dominated by sawgrass (*Cladium jamaicense*). *Nehalennia pallidula* is probably endemic to Florida; the record for Galveston County, Texas (Flint, 2000) is based on a specimen collected in 1918, and no other specimens have been found there since.

*Telebasis byersi* Westfall (probably all year). Adults were collected in Washington County\* at a single unnamed pond with abundant duckweed. Common at semi-shaded still waters covered with duckweed or water fern.

## Anisoptera

### PETALURIDAE

Adults and a nymph of the single North American species in the genus *Tachopteryx* were collected from Bay and Washington counties.

*Tachopteryx thoreyi* (Hagen) (8 Mar–19 Jun). Adults were collected in Bay County\* along Moccasin Creek, near a small seepage stream near Hobbs Pasture, and along Enfinger Road south of SR 20. In Washington County\*, a nymph was collected from damp leaf litter at the head of a seepage stream in a steephead ravine, and adults were observed

twice, but not collected, along a forest road upslope from a seepage area. Very local species recorded from scattered seepages.

### AESHNIDAE

Ten species in eight genera were collected as adults or nymphs or have been previously reported from the survey area. *Basiaeschna*, *Boyeria*, *Coryphaeschna*, *Epiaeschna*, *Nasiaeschna*, and *Triacanthagyna* are represented by one species each; *Anax* and *Gomphaeschna* are each represented by two species.

*Anax junius* (Drury) (all year). This species is very common in Bay and Washington\* counties and was collected and observed at many locations in both counties. Strong-flying and migratory species that can be expected anywhere in Florida.

*Anax longipes* Hagen (23 Feb–23 Nov). Adults were collected or observed in Bay County\* at ponds along SR 20, ponds along Hobbs Pasture Road, and two stormwater ponds. In Washington County\*, it was collected or observed at two ponds on private property. Uncommon at semi-permanent ponds.

*Basiaeschna janata* Say (13 Mar–10 Apr). Adults were collected in Washington County along Cedar Tree Landing Road near a seepage stream, at a swamp on Holmes Creek at the end of Potter Springs Road, and nymphs were collected from Holmes Creek at Spurling and Hightower Springs Landings. Uncommon at streams in the western Panhandle.

*Boyeria vinosa* Say (11 May–4 Dec). Nymphs were collected in Washington County from two seepage stream tributaries to Pine Log Creek. Common at streams.

*Coryphaeschna ingens* (Rambur) (6 Feb–19 Oct). Adults were collected in Washington County\* along forest roads near sandhill lakes and ponds, and a single adult was observed in Bay County near Deer Point Reservoir. Common at densely vegetated lentic waters.

*Epiaeschna heros* (Fabricius) (27 Feb–1 Nov). Adults were observed and/or collected at a number of locations in both Bay\* and Washington\* counties primarily along forest roads near swamps, rivers, and streams. Common at swampy habitats.

*Gomphaeschna antilope* (Hagen) (13 Jan–9 Jun). Adults were collected in Bay County\* along a forest road north of the West Bay portion of the St. Andrew Bay estuary and along a forest road in southern Washington County\*. Rare at swampy habitats.

*Gomphaeschna furcillata* (Say) (8 Jan–22 Apr). Adults were collected in Washington County\* from an open area at Gum Creek Swamp along the Choctawhatchee River. Uncommon at swamps and bogs.

*Nasiaeschna pentacantha* (Rambur) (2 Mar–28 Dec). Dr. Neil Lamb collected a single adult specimen from a freshwater pond in his yard in Bay County (specimen in his collection). Common at swampy waters.

*Triacanthagyna trifida* (Rambur) (10 July–15 Feb). Five adults were present at dusk feeding over a lawn near a small stream and pond in Bay County\* for three consecutive evenings in October 2005. Two specimens were collected, and the site was visited in October of 2006–2011 without observing it again; possibly a vagrant west of the Apalachicola River. Common at temporary forest pools east of the Apalachicola River.

#### GOMPHIDAE

Twenty species in seven genera were collected as adults and/or nymphs or were reported by others from the survey area. The genera *Aphylla*, *Arigomphus*, and *Hagenius* are each represented by one species, *Dromogomphus* by two, *Gomphus* by eight, *Progomphus* by three, and *Stylurus* by four.

*Aphylla williamsoni* (Gloyd) (7 Apr–7 Nov). Adults were collected in Bay County from the Hobbs Pasture area and along south Enfinger Road and in Washington County at Hicks Lake. Common at lentic waters.

*Arigomphus pallidus* (Rambur) (20 Mar–11 Oct). I did not collect this species during the survey, but it was reported from Washington County by Richardson (2003). I collected it in Gulf County within the boundary of the SAB near Wetappo Creek. Common at lentic waters; Beaton (2007) added that the habitat of this species is ponds, lakes and slow edges of streams and rivers.

*Dromogomphus armatus* Selys (9 Jun–20 Nov). An adult of this species was collected in Bay County along a forest road to Hobbs Pasture, and nymphs were collected in Washington County\* at White Oak Creek, seepage stream tributaries to Pine Log Creek, Pine Log Creek, and a seepage stream on Cedar Tree Landing Road. Undoubtedly rare because the preferred habitat of clear water flowing over deep muck is scarce. FNAI (2011f) provided 81 records of occurrence of this species in a number of counties.

*Dromogomphus spinosus* Selys (14 Apr–11 Nov). I did not collect this species in either county, but it has been reported from Bay County by Richardson (2003) and Washington County by Dunkle (1992), Abbott (2011), and Richardson (2003). Common at lotic waters.

*Gomphus australis* (Needham) (14 Mar–27 Apr). Two nymphs were collected in Washington County from the Gap Lake boat launch ramp area. Uncommon at sand-bottomed lakes in Florida.

*Gomphus cavillaris* Needham (20 Jan–24 May). Adults were collected in Bay County\* near two ponds along south Enfinger Road and were collected and/or observed in Washington County\* along a number of forest roads, at numerous sandhill lakes and ponds; nymphs were collected from four ponds including Grisset Pond, and it appears to be common in the sandhills area of both counties. Dunkle (1992) stated that two subspecies occur in Florida, *G. c. brimleyi* in the Panhandle and *G. c. cavillaris* in the Florida Peninsula. Paulson (2011) stated that the habitat is sand-bottom, clear lakes where it can be abundant.

*Gomphus dilatatus* Rambur (3 Mar–27 Aug). Adults and nymphs were collected in Bay County from locations along Econfinia Creek and Moccasin Creek, and in Washington County from Spurling Landing along Holmes Creek, Pine Log Creek at SR 20 bridge, and the Choctawhatchee River at Cedar Tree Landing. Common inhabitant of lotic waters.

*Gomphus exilis* Selys (11 Apr–30 May). This species was not collected during the survey. It was reported from Washington County by Dunkle (1992), Abbott (2011) and Richardson (2003). Paulson (2011) stated that the habitat is slow streams, ponds, sandy lakes, and bogs.

*Gomphus geminatus* Carle (3 Mar–12 Jun). Adults were collected in Bay County from a tributary to Callaway Creek, Mill Branch, and Moccasin Creek, and nymphs were collected from a tributary to Econfinia Creek, Econfinia Creek, and Sweetwater Branch. Adults and nymphs were collected in Washington County\* at several locations along Pine Log Creek and Botheration Creek. Dunkle (1992) stated it is endemic to the Florida Panhandle and adjacent Alabama and Georgia. Beaton (2007) stated that the habitat is small clean, sandy streams.

*Gomphus hybridus* Williamson (20 Mar–3 Apr). Adults of this species were collected along the Choctawhatchee River at Cedar Tree Landing in southwestern Washington County\* on 26 Apr 2011 and 7 Mar 2012. Beaton (2007) stated that the habitat for this species is rivers and large streams with sandy bottoms, less commonly with silty bottoms.

Dunkle (1992) stated it was known in Florida only from the Apalachicola River before the Jim Woodruff Dam was closed in 1957 and listed it from two counties (Gadsden and Liberty). FNAI considered this species as extirpated from Florida. Daigle (2011) reported the occurrence of *G. hybridus* from the Choctawhatchee River in Holmes County, cited a

report from the Choctawhatchee River in Walton County, and reported the occurrence of the first specimen from Washington County collected during this survey.

***Gomphus lividus*** Selys (18 Mar–6 May). Adults were collected in Bay County\* along Moccasin Creek and nymphs were collected from Econfinia Creek near Sylvan Springs and Buckhorn Creek at County Line Road. Adults and nymphs were collected in Washington County\* at Cotton Landing and Hightower Landing along Holmes Creek, Pine Log Creek, and Gum Swamp. Fairly common at Panhandle streams.

***Gomphus minutus*** Rambur (14 Feb–25 May). Adults were collected in Bay County at locations in the Hobbs Pasture area and in Washington County\* near Pine Log Creek, Holmes Creek, and the Choctawhatchee River. Common at mesotrophic lentic or lotic waters.

***Hagenius brevistylus*** Selys (16 Apr–8 Nov). Adults were not collected from Bay or Washington counties, but nymphs were collected in Bay County from sites along Econfinia Creek and in Washington County from sites along Pine Log Creek and Holmes Creek. Common inhabitant of lotic waters.

***Progomphus alachuensis*** Byers (10 Apr–30 Aug). This species was not collected during the present survey. FNAI (2011b) provided a single record of an adult from 1952 from the SBIO for the Sandy Creek Radio Tower on SR 22, Bay County. The occurrence in Bay County is considered accidental. Dunkle (1992) stated it is endemic to Florida, and Paulson (2011) stated that the habitat is sand-bottomed lakes, usually with clear water, and often with a bed of emergent vegetation near shore.

***Progomphus bellei*** Knopf & Tennessen (9 May–13 Aug). Adults and nymphs were collected in Bay County at a stormwater retention pond, and FNAI has a record of occurrence from Econfinia Creek at Scott Road. FNAI did not include the record from the Bay County stormwater pond in their database because it was not a typical habitat. Adults and/or nymphs were collected in Washington County at 17 sandhill lakes and ponds and from a white sand-bottomed seepage stream entering a sandhill lake. FNAI has a record from Washington County from Porter Lake. It is found primarily in Florida with single reports from North Carolina and southern Alabama. The habitat is sand-bottomed lakes or open sandy spring-fed trickles.

Three of the collection sites in Washington County were not sand-bottom lakes or sand-bottomed streams typical of the other sites where this species was found as adults and/or nymphs during the survey. Gap Lake is a large basin sur-

rounded by cypress with abundant emergent and floating herbaceous vegetation. An adult and nymphs were collected along a stretch of sand at the Gap Lake boat launch ramp at different times of the year. Litard Log Pond and Little River Pond have organic bottoms with some sand patches along the shoreline where adults and nymphs were collected. Drought has revealed the extent of the organic bottom and small sandy areas in these two ponds.

***Progomphus obscurus*** (Rambur) (2 Apr–7 Aug). Nymphs were collected in Bay County at the SR 20 crossing of Bear Creek and at Sweetwater Branch and in Washington County from White Oak Creek, Cotton Landing along Holmes Creek, Cedar Tree Landing along the Choctawhatchee River, and seepage streams entering Pine Log Creek. Inhabits small to large streams.

***Stylurus ivae*** (Williamson) (1 Sep–19 Nov). An adult was collected along Econfinia Creek at the CR 388 bridge, and a nymph was collected from Sweetwater Branch in Bay County. A nymph was collected in Washington County\* from Pine Log Creek at the SR 20 bridge in April 2011 (pers. comm. R.S. Krotzer, 2011), and I observed an adult female along a seepage stream tributary to Pine Log Creek in Washington County on 19 Sept 2011. Uncommon at sand-bottomed streams.

***Stylurus laurae*** (Williamson) (27 May–8 Aug). An adult was collected in Bay County along a trail in the hardwood forest along Econfinia Creek. Scarce dragonfly of Panhandle streams.

***Stylurus plagiatus*** (Selys) (21 Apr–1 Dec). Adults were observed in Bay County along Econfinia Creek, and nymphs were collected in Washington County\* from Cedar Tree Landing on the Choctawhatchee River and Spurling Landing on Holmes Creek. Commonly inhabits streams and lakes.

***Stylurus potentulus*** (Needham) (mid-May to early Aug). Adults were not collected from either county, but a nymph was collected in Washington County\* in April 2011 from Pine Log Creek at the SR 20 bridge. R.S. Krotzer confirmed the identification and subsequently collected additional nymphs from the same site (pers. comm. R.S. Krotzer, 2011). Scarce dragonfly of western Panhandle streams.

#### CORDULEGASTRIDAE

Three species of the genus *Cordulegaster* were collected as adults and/or nymphs.

***Cordulegaster maculata*** Selys (22 Feb–19 Apr). Nymphs were collected in Bay County from Econfinia Creek at the



Scotts Road crossing of the creek. An adult was collected in Washington County at the head of a seepage stream, and nymphs were collected from Pine Log Creek and two seepage stream tributaries to Pine Log Creek. Uncommon on forest streams.

***Cordulegaster obliqua*** (Say) (25 May–23 Jul). A nymph of this species was collected in Washington County\* from a small sand-bottomed seepage streamlet in a bluff ravine to the floodplain of the Choctawhatchee River. It was collected from brown to black muck along the side of the narrow, very shallow channel. Rare species of small forest streams.

***Cordulegaster sayi*** Selys (27 Feb–22 Apr). Adults were collected along a seepage stream along Daniel's Lake Road in Washington County\*, and nymphs were collected in Washington County from nine ravine seepage streams, and nymphs were collected in Bay County from a steephead ravine seepage stream. Nymphs were collected in areas of fine brown, soupy, organic material at all locations and were examined by R.S. Krotzer. Rare species of seepage trickles with a restricted range extending from north Florida to central Georgia.

#### MACROMIIDAE

Five species in two genera were collected as adults and/or nymphs or were reported by others. *Didymops* is represented by two species and *Macromia* by three species.

***Didymops floridensis*** Davis (20 Jan–3 May). Adults were collected and commonly encountered in Washington County during the middle part of the flight season along forest roads in the Greenhead Slope area, and nymphs were collected from a sandhill pond. Dunkle (1992) stated it is endemic and common at Florida sand-bottomed lakes, but there is a single record from Alabama (Abbott, 2011).

***Didymops transversa*** (Say) (25 Jan–11 May). An adult of this species was collected in Bay County\* from a meadow near a pond, and in Washington County nymphs of this species were collected from Pine Log Creek and several sites along Holmes Creek. Common and normally a stream species.

***Macromia alleghaniensis*** Williamson (Jun–Sep). This species was not collected during this survey. Dunkle (1992) reported it from a single Panhandle location, in Santa Rosa County, based on three specimens taken by M.J. Westfall, Jr. in 1973. FNAI (2011d) provided a record of an adult in Bay County from the SBIO database, taken at the Sandy Creek radio tower, HWY 22, on 2 Jun 2003. Paulson (2011) stated the habitat is slow-flowing streams and rivers. This species is apparently rare in the survey area.

***Macromia illinoiensis georgina*** (Selys) (7 Mar–9 Nov). Adults were collected in Bay County along a forest road near Mill Branch and along Econfina Creek, and nymphs were collected in Econfina Creek. Nymphs were collected in Washington County from a few locations along Pine Log Creek. Donnelly and Tennessen (1994) examined *Macromia illinoiensis* and *M. georgina* and concluded that the two taxa should be regarded as subspecies. Paulson and Dunkle (2011) agreed with the conclusion. *M. illinoiensis georgina* is the subspecies in Florida. Common on streams.

***Macromia taeniolata*** Rambur (14 Apr–23 Nov). Adults were collected in Bay County along the road to Hobbs Pasture, and adults and nymphs were collected in Washington County from Pine Log Creek, locations along Holmes Creek, and the Choctawhatchee River. Common at streams and sometimes lakes.

#### CORDULIIDAE

Nine species in four genera were collected or reported in the literature. *Epithec*a is represented by four species, *Helocordulia* by one, *Neurocordulia* by three, and *Somatochlora* by one.

***Epithec*a costalis** Selys (20 Jan–18 Apr). Adults were collected in Washington County along forest roads, Potter Springs Road, and Cedar Tree Landing Road. Fairly common at sand-bottomed lakes.

***Epithec*a cynosura** (Say) (8 Jan–7 May). Adults were collected in Bay County from near an artificial pond and from Hobbs Pasture and in Washington County from a road along Henry Lee Pond, from an open area at Gum Creek Swamp, Daniel's Lake, and Yates Mill Swamp. Common at lentic waters.

***Epithec*a princeps** (Hagen) (15 Mar–3 Dec). Adults were observed in Washington County\* at Holmes Creek and the Choctawhatchee River, and nymphs were collected from backwaters at two sites along the Choctawhatchee River. Adults were collected in Bay County\* at Hobbs Pasture. Common at both lentic and lotic waters.

***Epithec*a sepia** Gloyd (3 Mar–23 Nov). This species was not collected during the survey. Richardson (2003) reported it from Bay and Washington counties. Common at lentic habitats except for the western Panhandle.

***Helocordulia selysii*** (Hagen) (11 Mar–11 Apr). One adult was collected in Bay County at a pond near a small forested stream and one was collected in Washington County\* along a tributary to Pine Log Creek; nymphs were collected from Pine Log Creek and from two seepage streams to Pine Log Creek. Paulson (2011) stated the habitat is woodland streams.

*Neurocordulia alabamensis* Hodges (6 May–2 Aug). This species was not collected during this survey, but Richardson (2003) reported it from Bay County. Common, but rarely seen, on small forest streams.

*Neurocordulia molesta* (Walsh) (15 Jun–8 Aug). This species was not collected during this survey. FNAI (2011c) provided records of occurrence from Bay and Washington counties that were extracted from the SBIO database. *Neurocordulia molesta* was observed/collected in Bay County 26 Jul 2001 at “South Fork of Bear Creek, Ed Lee Road” and was collected/observed in Washington County at Holmes Creek 5 Sep 2006, Choctawhatchee River 5 Sep 2006, and another location on the Choctawhatchee River on 6 Sep 2006. These records extend the flight season in Florida to 6 September. It occurs on large Panhandle rivers.

*Neurocordulia virginienensis* Davis (18 Mar–11 Jun). This species was not collected during this survey. Richardson (2003) reported it from Bay and Washington counties. Common on rivers.

*Somatochlora provocans* Calvert (30 Jun–10 Aug). An adult was collected in Washington County\* on 17 Jun 2010 along a forest road at a crossing of a seepage stream. Beaton (2007) stated that the habitat of this species is forest seeps and trickles.

#### LIBELLULIDAE

Thirty-two species in 14 genera were collected and found in literature records. *Brachymesia*, *Erythemis*, *Ladona*, *Orthemis*, *Pachydiplax*, *Perithemis*, and *Plathemis* are each represented by one species, *Celithemis* by six, *Erythrodiplax* by two, *Libellula* by nine, *Pantala* by two, *Sympetrum* by three, and *Tramea* by two.

*Brachymesia gravida* (Calvert) (all year). Adults were collected or observed in Bay County at Hobbs Pasture, a pond south of SR 20, the Lynn Haven Sports Complex pond, and Deer Point Reservoir. Common at eutrophic lentic waters.

*Celithemis amanda* (Hagen) (15 May–20 Nov). This species was abundant near and at many ponds and lakes in Bay and Washington counties. Fairly common at infertile ponds.

*Celithemis berthia* Williamson (3 Apr–20 Dec). Adults were collected in Washington County from a number of sandhill lakes early in the survey period. As lakes and ponds became reduced in size or dry due to drought, it became very scarce. G.L. Harp (pers. comm. July 2010) collected an adult from a sandhill lake in Bay County. Common at infertile lakes.

*Celithemis elisa* (Hagen) (12 Apr–5 Oct). Adults were collected and observed in Bay County\* at a number of natural

ponds and stormwater ponds and in Washington County at two sandhill lakes. Common at lentic waters.

*Celithemis eponina* (Drury) (all year). Adults were observed and collected at a number of lakes and ponds in Bay and Washington\* counties. Common at lentic waters throughout the state.

*Celithemis fasciata* Kirby (8 Apr–28 Oct). Adults were observed and collected at a number of lakes and ponds in Bay and Washington counties. Common at infertile lentic habitats.

*Celithemis ornata* (Rambur) (all year). Adults were observed or collected at a number of lakes and ponds in Bay and Washington counties. Common at lentic habitats.

*Erythemis simplicicollis* (Say) (all year). Adults were observed at most sites visited in both Bay and Washington counties. One of the most abundant dragonflies in Florida; found at nearly every lentic habitat.

*Erythrodiplax berenice* (Drury) (all year). Adults were collected and observed in Bay County at a number of locations at salt marshes around St. Andrew Bay. Common at salt marshes.

*Erythrodiplax minuscula* (Rambur) (all year). Adults were observed at most sites visited in both Bay and Washington counties. Common at lentic waters throughout Florida.

*Ladona deplanata* (Rambur) (4 Jan–6 May). Adults and/or nymphs were collected in Bay County\* from Deep Springs steephead ponded area, ponds south of SR 20, and ponds along Enfinger Road, and in Washington County along forest roads, near sandhill ponds, and near Tumble Creek. Common at infertile lentic habitats.

*Libellula auripennis* Burmeister (25 Mar–19 Oct). Adults were collected and observed at a number of locations at and near ponds and lakes in Bay and Washington counties. Common at grassy lakes.

*Libellula axilena* Westwood (25 Mar–19 Oct). Adults were collected and observed at a number of locations at or near lakes and ponds in Bay and Washington\* counties. Fairly common at swampy habitats.

*Libellula flavida* Rambur (4 Apr–26 Sep). Adults were collected and observed in Bay County at Hobbs Pasture and near Moccasin Creek and in Washington County\* at Tumble Creek Preserve, Laidlaw Preserve, near a seepage slope, and near a seepage stream. Krotzer et al. (2008) stated it breeds in permanent, often spring-fed seepage pools and ditches usually associated with forest.

***Libellula incesta*** Hagen (21 Mar–7 Nov). Adults were collected and observed at a number of locations in both Bay and Washington counties. Common at lentic habitats throughout the mainland.

***Libellula jesseana*** Williamson (21 Apr–12 Sep). Adults were collected or observed in Washington County at 10 locations and in Bay County at five locations. Habitats in Washington County were sand-bottomed lakes and ponds that supported the endemic vascular plant, smoothbark St. John's-wort (*Hypericum lissophloeus*). The locations in Bay County included organic-sand bottomed ponds with titi borders and/or *Hypericum lissophloeus*. The earliest observation was on 13 Apr 2011 (a male was seen guarding an egg-laying female at a sandhill pond in Washington County); the latest observation was on 16 Oct 2009 (an adult male was seen at a sandhill pond in Washington County). Endemic to the sand-bottomed lakes of both the Florida Panhandle and Peninsula.

***Libellula needhami*** Westfall (16 Feb–1 Nov). Adults were collected in Bay County at Hobbs Pasture. Prefers brackish or eutrophic lentic waters, and is most common coastally.

***Libellula pulchella*** Drury (accidental). An adult of this species was collected in Bay County\*. Keppner (2009) provided information regarding the occurrence of this species in Florida and reported adults at a stormwater pond in Bay County on 30 Nov 2007. Dunkle (1992) stated that it appeared to be a rare migrant or vagrant in Florida. It appears to be an intermittently accidental species in Florida.

***Libellula semifasciata*** Burmeister (20 Feb–19 Sep). Adults were collected and observed in Bay County\* at ponds north of West Bay and at Hobbs Pasture and in Washington County\* at a few ponds and near a seepage bog. Uncommon at marshy forest ponds.

***Libellula vibrans*** Fabricius (24 Mar–11 Oct). Adults were observed and collected from Bay and Washington counties at a number of locations both at and away from water. Common at swampy habitats.

***Orthemis ferruginea*** (Fabricius) (all year). Adults were collected in Bay County\* at the Lynn Haven Sports Complex pond, near a pond on Garrison Road, and two newly constructed stormwater ponds. Common at lentic habitats.

***Pachydiplax longipennis*** (Burmeister) (all year). Adults were observed and collected at a number of locations in Bay and Washington counties. It is nearly as abundant in Florida as *Erythemis simplicicollis* at practically all lentic habitats.

***Pantala flavescens*** (Fabricius) (all year). Adults were observed and collected in Bay and Washington counties at a

number of locations. Common, strongly flying, and migratory dragonfly.

***Pantala hymenaea*** (Say) (all year). An adult was collected in Bay County at a small freshwater pond and at a Bay County park north of SR 20. Might occur anywhere but is less common than *P. flavescens* and more difficult to collect.

***Perithemis tenera*** (Say) (all year). Adults were collected or observed in Bay County\* at the Lynn Haven Sports Complex pond, a pond on Garrison Road, and a stormwater pond and in Washington County at a number of lakes and ponds. Common throughout Florida at lentic habitats.

***Plathemis lydia*** (Drury) (9 Feb–16 Nov). Adults were observed and collected in Bay County\* at the Lynn Haven Sports Complex pond, near a pond on Garrison Road, and a stormwater pond and in Washington County\*, near Pine Log Creek, and a sandhill pond. Common at lentic habitats.

***Sympetrum ambiguum*** (Rambur) (all year). A photograph of an adult of this species was taken by Mr. George Willson (verified by J. Daigle) in Washington County\* during this survey, but specimens were not collected from either county. Scarce in Florida, mostly at temporary ponds.

***Sympetrum vicinum*** (Hagen) (27 May–22 Aug). This species was not collected or observed in either county, but Richardson (2003) and Abbott (2011) reported it from Washington County. Rare in Florida; inhabits marshes and ponds (Beaton, 2007).

***Tramea carolina*** (Linnaeus) (all year). Adults were observed and collected at a number of locations in both counties during this survey. Common at lentic habitats throughout Florida.

***Tramea lacerata*** Hagen (probably all year). Adults were observed and collected in Bay County from a number of ponds; observed at several ponds Washington County\* but not collected. Fairly common at lentic waters.

## Discussion

**Migrant or Vagrant Species.** Dunkle (1992) stated that *Libellula pulchella* and *Sympetrum corruptum* are migrants or vagrants that rarely if ever breed in Florida. Richardson (2003) did not list a record of *L. pulchella* nymphs from any county in Florida but did report *S. corruptum* nymphs from seven Florida counties. The collection of an early instar nymph in Bay County, tentatively identified as *S. corruptum*, would bring the number of counties based on nymphs to eight. However, I have not included it on the list of species from the survey area at this time. The records of *L. pulchella*,

*Triacanthagyna trifida*, and *Progomphus alachuensis* in the survey area are based on single reports; I consider them to be accidental or vagrant occurrences.

**Species Diversity.** The number of species documented herein for the entire survey area is 114 (36 Zygoptera and 78 Anisoptera). If the species considered migrant or vagrant, (*Progomphus alachuensis*, *Sympetrum corruptum*, *Triacanthagyna trifida*, and *Libellula pulchella*) are excluded, the total number of species in the entire survey area decreases to 110 (36 Zygoptera and 74 Anisoptera).

Dunkle (1992) listed 35 species (7 Zygoptera and 28 Anisoptera), Abbott (2011) listed 42 species (9 Zygoptera and 33 Anisoptera), and Richardson (2003, 2010) listed 67 species (23 Zygoptera and 44 Anisoptera) from Bay County. Keppner and Keppner (2007) listed 77 species (29 Zygoptera and 48 Anisoptera) from Bay County that added 7 additional species of Zygoptera and 12 additional species of Anisoptera to the list for the County (Appendix I). However, an examination of my material revealed that I have misplaced the specimen of *Argia apicalis* reported by Keppner and Keppner (2007) from Bay County and hereby remove it from the list for Bay County. As a result of the removal of *A. apicalis* and *Sympetrum corruptum*, Bay County has a total of 94 species (31 Zygoptera and 63 Anisoptera).

Dunkle (1992) listed 29 species (7 Zygoptera, and 22 Anisoptera), Abbott (2011) listed 30 species (7 Zygoptera and 23 Anisoptera), and Richardson (2003, 2010) listed 50 species (15 Zygoptera and 35 Anisoptera) from Washington County. This survey added an additional 11 species of Zygoptera and 25 species of Anisoptera to the list for Washington County (Appendix I). The total number of species now listed for Washington County is 92 (28 Zygoptera and 64 Anisoptera).

The number of species documented as occurring in the SAB totals 99 species (31 Zygoptera and 68 Anisoptera). This number includes all the species reported from Bay County (excluding vagrants), plus the species collected in the Washington County (*Gomphus australis*, *Didymops floridensis*, and *Epitheca costalis*), Gulf County (*Argomphus pallidus*), and Jackson County (*Enallagma dubium*) portions of the SAB. The information regarding the occurrence of Odonata in the SAB can be added to the existing lists of species of vascular plants, amphibians, reptiles, birds, and other taxa reported from the SAB to achieve a more complete understanding of the species diversity of the counties and the SAB.

**Imperiled and/or Rare Species.** Bick (2003) summarized the existing information on at-risk species of odonates in the conterminous United States and assigned a conservation status based on National Heritage designations in use

at the time in some states by substituting G for the S in the states' ranking system. He designated *Nehalennia pallidula*, *Progomphus bellei*, and *Cordulegaster sayi* as rare (G3), and *Libellula jesseana* and *Stylurus potulentus* as imperiled (G2). The FNAI serves as the Heritage Program for Florida and independently, as well as in conjunction with State and Federal agencies, evaluates the species of plants and animals in Florida and assigns a level of imperilment within the State based on FNAI (2011) criteria. The rankings are:

- SX** Believed to be extirpated throughout Florida.
- S1** Critically imperiled in Florida because of extreme rarity (5 or fewer occurrences or less than 1000 individuals) or because of extreme vulnerability to extinction due to some natural or man-made factor.
- S2** Imperiled in Florida because of rarity (6 to 20 occurrences or less than 3000 individuals) or because of vulnerability to extinction due to some natural or man-made factor.
- S3** Either very rare and local in Florida (21–100 occurrences or less than 10,000 individuals) or found locally in a restricted range or vulnerable to extinction from other factors.
- S4** Apparently secure in Florida (may be rare in parts of range).

FNAI maintains a database of locations for the 40 species of odonates they track in Florida ([www.fnai.org](http://www.fnai.org)). Twenty species (50%) of FNAI tracked odonate species have been reported from the survey area (Table 1). The tracking lists should be consulted regularly because species designations change as additional information is obtained. The locations for the tracked species reported herein may increase the number of elements of occurrence in the database and may aid in the continued assessment of the degree of imperilment of these species in Florida.

**SX Species.** Dunkle (1992) considered *Gomphus hybridus* to have been extirpated from Florida, and FNAI lists it as SX. Daigle (2011) re-established the presence of *G. hybridus* in Florida on the Choctawhatchee River in Holmes and Walton counties, and its occurrence in Washington County was established during this survey. FNAI and the Florida Fish and Wildlife Conservation Commission (FFWCC) were notified of the rediscovery of *G. hybridus* in Florida.

**S1 Species.** FNAI-listed S1 species, *Macromia alleghaniensis* and *Neurocordulia molesta*, were not collected or observed during the present survey. However, *Libellula jesseana* (S1) was collected at 15 locations (5 in Bay and 10 in Washington County). Abbott (2011) has records of this species from 10 Florida counties including Bay and Washington counties. Additional records may be present in private collections or other databases.

Table 1. FNAI Tracked Species and Species of Greatest Conservation Needs.

Species	FNAI	SGCN
<i>Cordulegaster obliqua</i>	S3	
<i>Cordulegaster sayi</i>	S2	×
<i>Didymops floridensis</i>	S4	
<i>Dromogomphus armatus</i>	S3	×
<i>Gomphaeschna antelope</i>	S4	
<i>Gomphus cavillaris</i>	S4	
<i>Gomphus geminatus</i>	S3	×
<i>Gomphus hybridus</i>	SX	
<i>Helocordulia selysii</i>	S4	
<i>Hetaerina americana</i>	S2	×
<i>Libellula jesseana</i>	S1	×
<i>Macromia alleghaniensis</i>	S1	×
<i>Nehalennia pallidula</i>	S3	×
<i>Neurocordulia molesta</i>	S1	×
<i>Progomphus alachuensis</i>	S3	×
<i>Progomphus belli</i>	S3	×
<i>Somatochlora provocans</i>	S3	×
<i>Stylurus laurae</i>	S3	×
<i>Stylurus potulentus</i>	S2	×
<i>Tachopteryx thoreyi</i>	S4	

**S2 Species.** The FNAI-listed S2 species reported from the survey area are *Hetaerina americana*, *Cordulegaster sayi* and *Stylurus potulentus*.

*Hetaerina americana* was not collected during the survey, but Dunkle (1992) stated that it is found in Calhoun and Jackson counties, Abbott (2011) has records from locations in Calhoun, Jackson, Okaloosa, and Alachua counties in Florida, and Tennesen (2004) reported it from Okaloosa County. Richardson (2010) provided nonspecific locations of collections of nymphs for Escambia, Santa Rosa, Okaloosa, Holmes, Bay, Calhoun, and Jackson counties.

*Cordulegaster sayi* is discussed above, and FNAI (FNAI, 2011e) has three locations for this species in Liberty County, one each in Alachua, Santa Rosa, Lake, Bay, and Washington counties for eight locations in six Florida counties. Richardson (2003) added Okaloosa County to bring the number of counties of record to 7 and locations to 9. The additional 10 locations for Washington County found during this survey appear to be new records for the survey area. Additional seepage streams and ravines that may support populations of *C. sayi* remain to be examined in Bay and Washington counties.

*Stylurus potulentus* nymphs were collected from Pine Log Creek in Washington County. This appears to be a new location for this species in Florida. Dunkle (1992) stated that it was found in Calhoun, Okaloosa, and Santa Rosa counties, and Abbott (2011) and Richardson (2003) have the same counties of record.

**S3 Species.** FNAI (2011) lists the following species as S3; *Nehalennia pallidula*, *Dromogomphus armatus*, *Gomphus geminatus*, *Progomphus alachuensis*, *Progomphus belli*, *Stylurus laurae*, *Cordulegaster obliqua*, and *Somatochlora provocans*. Each species is discussed above.

**S4 Species.** Some of the species listed as S4 by FNAI (2011) such as *Gomphus cavillaris* and *Didymops floridensis*, were collected or observed often during their flight season while species such as *Tachopteryx thoreyi*, *Gomphaeschna antelope*, and *Helocordulia selysii* were not collected or observed as often in the survey area.

The United States Fish and Wildlife Service (USFWS) and the Florida Fish and Wildlife Conservation Commission (FFWCC) do not list any species of Odonata in Florida as imperiled. However, the FFWCC prepared Florida's Wildlife Legacy Initiative (2005) and recently began revising this document (FFWCC, 2011). Species of Greatest Conservation Need (SGCN) were determined from a list of six criteria, one of which is taxa on the FNAI list as S1–S3. The preliminary revised list included 33 species of Odonata as SGCN, but the status and trend of each species listed is unknown. Thirteen of the 33 (39%) odonate SGCN are known from the survey area (SGCN in Table 1).

The Center for Biological Diversity (2010) petitioned the USFWS to list 404 species of southeastern plants and animals under the Endangered Species Act. Included on the list were *Stylurus potulentus*, *Cordulegaster sayi*, and *Libellula jesseana* which occur in the survey area. The USFWS (2011) reached a Settlement Agreement with the Center for Biological Diversity and WildEarth Guardians that required preparation of status reviews for 374 aquatic-dependent species. The list of species for 90-day reviews includes *Stylurus potulentus*, *Cordulegaster sayi*, and *L. jesseana*.

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Appendix I. Odonata from the survey area and source of species reports. (B = Bay County, W = Washington County, \* = vagrant or migrant species).

Species	Present Survey	Dunkle (1992)	OdonataCentral (2011)	Richardson (2003)	Richardson (2010)
<b>Zygoptera</b>					
CALOPTERYGIDAE					
<i>Calopteryx dimidiata</i>	B,W		B,W		B,W
<i>Calopteryx maculata</i>	B,W	W	B		B,W
<i>Hetaerina americana</i>					B
<i>Hetaerina titia</i>	B	W	W		B,W
LESTIDAE					
<i>Lestes australis</i>	B,W	B	B		B,W
<i>Lestes vidua</i>	B,W				
<i>Lestes vigilax</i>	B,W	W	W		B,W
COENAGRIONIDAE					
<i>Argia apicalis</i>		W	W		W
<i>Argia bipunctulata</i>	B,W	B	B		B
<i>Argia fumipennis</i>	B,W	B,W	B,W		B,W
<i>Argia moesta</i>	B,W				B,W
<i>Argia sedula</i>	B,W				B,W
<i>Argia tibialis</i>	B,W	B,W	B,W		B,W
<i>Enallagma cardenium</i>	B				B
<i>Enallagma civile</i>	B,W				B
<i>Enallagma concisum</i>	B	B	B		B
<i>Enallagma daeckii</i>	B				
<i>Enallagma davisii</i>	W				
<i>Enallagma divagans</i>	B,W	B			
<i>Enallagma doubledayi</i>	B,W				W
<i>Enallagma dubium</i>					B,W
<i>Enallagma geminatum</i>	B,W				
<i>Enallagma pallidum</i>	B				W
<i>Enallagma pollutum</i>	B				B
<i>Enallagma signatum</i>	B				B,W

## Appendix I continued . . .

Species	Present Survey	Dunkle) (1992)	OdonataCentral (2011)	Richardson (2003)	Richardson (2010)
<i>Enallagma sulcatum</i>	W				
<i>Enallagma vesperum</i>	B				
<i>Enallagma weewa</i>		W	W		
<i>Ischnura hastata</i>	B, W				B
<i>Ischnura kellicotti</i>	B, W				B
<i>Ischnura posita</i>	B				B, W
<i>Ischnura prognata</i>	B				B
<i>Ischnura ramburii</i>	B, W	B	B		B
<i>Nehalennia integrigollis</i>	B, W				B
<i>Nehalennia pallidula</i>	B		B		
<i>Telebasis byersi</i>	W				
<b>Anisoptera</b>					
PETALURIDAE					
<i>Tachopteryx thoreyi</i>	B, W				
AESHNIDAE					
<i>Anax junius</i>	B, W	B	B	B	
<i>Anax longipes</i>	B, W				
<i>Basiaeschna janata</i>	W	W	W	W	
<i>Boyeria vinosa</i>	W	W	W	B, W	
<i>Coryphaeschna ingens</i>	B, W	B	B	B	
<i>Epiaeschna heros</i>	B, W				
<i>Gomphaeschna antilope</i>	B, W				
<i>Gomphaeschna furcillata</i>	W				
<i>Nasiaeschna pentacantha</i>	B			B	
<i>Triacanthagyna trifida</i> *	B				
GOMPHIDAE					
<i>Aphylla williamsoni</i>	B, W		B	W	
<i>Arigomphus pallidus</i>				W	
<i>Dromogomphus armatus</i>	B, W			B	
<i>Dromogomphus spinosus</i>		W	W	B, W	
<i>Gomphus australis</i>				W	
<i>Gomphus cavillaris</i>	B, W				
<i>Gomphus dilatatus</i>	B, W	B, W	B, W	B, W	
<i>Gomphus exilis</i>		W	W	W	
<i>Gomphus geminatus</i>	B, W			B	
<i>Gomphus hybridus</i>	W				
<i>Gomphus lividus</i>	B, W				
<i>Gomphus minutus</i>	B, W			B	
<i>Hagenius brevistylus</i>	B, W			B, W	
<i>Progomphus alachuensis</i> *	B				
<i>Progomphus bellei</i>	B, W			B	
<i>Progomphus obscurus</i>	W	B	B	B, W	
<i>Stylurus ivae</i>	B, W		B	B	
<i>Stylurus laurae</i>	B		B		
<i>Stylurus plagiatus</i>	B, W			B	
<i>Stylurus potulentus</i>	W				
CORDULEGASTRIDAE					
<i>Cordulegaster obliqua</i>	W				
<i>Cordulegaster sayi</i>	B, W		B		
<i>Cordulegaster maculata</i>	B, W			B, W	



## Appendix I continued . . .

Species	Present Survey	Dunkle) (1992)	OdonataCentral (2011)	Richardson (2003)	Richardson (2010)
MACROMIIDAE					
<i>Didymops floridensis</i>	W			W	
<i>Didymops transversa</i>	B, W			W	
<i>Macromia alleghaniensis</i> *	B				
<i>Macromia illinoiensis georgina</i>	B, W	B	B	B, W	
<i>Macromia taeniolata</i>	B, W	B, W	B, W	B, W	
CORDULIIDAE					
<i>Epithea costalis</i>	W	W	W	W	
<i>Epithea cynosura</i>	B, W	B, W	B, W	B, W	
<i>Epithea princeps</i>	B, W				
<i>Epithea sepia</i>				B, W	
<i>Helocordulia seelyi</i>	B, W			B	
<i>Neurocordulia alabamensis</i>				B	
<i>Neurocordulia molesta</i>				B	
<i>Neurocordulia virginienensis</i>				B, W	
<i>Somatochlora provocans</i>	W				
LIBELLULIDAE					
<i>Brachymesia gravida</i>	B	B	B	B	
<i>Celithemis amanda</i>	B, W	B, W	B, W	B, W	
<i>Celithemis berthia</i>	B, W	B, W	B, W	B, W	
<i>Celithemis elisa</i>	B, W	W	W	W	
<i>Celithemis eponina</i>	B, W	B	B	B	
<i>Celithemis fasciata</i>	B, W	B, W	B, W	B, W	
<i>Celithemis ornata</i>	B, W	B, W	B, W	B, W	
<i>Erythemis simplicicollis</i>	B, W	B, W	B, W	B	
<i>Erythrodiplax berenice</i>	B	B	B	B	
<i>Erythrodiplax minuscula</i>	B, W	B, W	B, W	B, W	
<i>Ladona deplanata</i>	B, W	W	W	W	
<i>Libellula auripennis</i>	B, W	B, W	B, W	B, W	
<i>Libellula axilena</i>	B, W	B	B	B	
<i>Libellula flavida</i>	B, W	B	B	B	
<i>Libellula incesta</i>	B, W	B	B	B, W	
<i>Libellula jesseana</i>	B, W	B, W	B, W	B, W	
<i>Libellula needhami</i>	B		B		
<i>Libellula pulchella</i>	B				
<i>Libellula semifasciata</i>	B, W				
<i>Libellula vibrans</i>	B, W	B, W	B, W	B, W	
<i>Orthemis ferruginea</i>	B				
<i>Pachydiplax longipennis</i>	B, W	B, W	B, W	B, W	
<i>Pantala flavescens</i>	B, W	B	B	B, W	
<i>Pantala hymenaea</i>	B	B	B	B	
<i>Perithemis tenera</i>	B, W	W	W	W	
<i>Plathemis lydia</i>	B, W				
<i>Sympetrum ambiguum</i>	W	B	B	B	
<i>Sympetrum corruptum</i>	B				
<i>Sympetrum vicinum</i>			W	W	
<i>Tramea carolina</i>	B, W	B, W	B, W	B, W	
<i>Tramea lacerata</i>	B, W	B	B	B	



# The Dragonfly Society Of The Americas

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