Final Report
for the
The West Virginia Dragonfly and Damselfly Atlas

West Virginia Division of Natural Resources
Wildlife Resources Section

Final Report for the
West Virginia Dragonfly and Damselfly Atlas

13 April 2011
revised 1 November 2011

Prepared for: West Virginia Division of Natural Resources, Wildlife Resources Section
324 Forth Avenue, South Charleston, WV 25303

Prepared by: Susan Olcott
West Virginia Division of Natural Resources, Wildlife Resources Section, District 1
1110 Railroad Street, PO Box 99, Farmington, WV 26571

Front cover photographs clockwise from upper left:

Aeshna canadensis (Canada Darner) by Stephen Cresswell
Somatochlora tenebrosa (Clamp-tipped Emerald) by Giff Beaton
Enallagma vesperum (Vesper Bluet) by Giff Beaton
Gomphus viridifrons (Green-faced Clubtail) by Allen Barlow
Argia apicalis (Blue-fronted Dancer) by Stephen Cresswell
Ladona deplanata (Blue Corporal) by Jeffery Pippen
Calopteryx angustipennis (Appalachian Jewelwing) by Giff Beaton

Table of Contents

Introduction 4

Methods 4

Results and Discussion 5
- Species Collected 6
- Geographic Coverage 6
- Habitat Coverage 7
- Distributions 7
- Species Diversity 8
- Recent Taxonomic Changes 8
- Threats 9

Acknowledgements 9

Figure 1. Historical and recent sampling effort (1835-2004) for Odonates in WV 11
Figure 2. Historical, recent, and Atlas sampling effort (1835 – 2010) for Odonates in WV . . 12
Figure 3. Total number of Odonate records in West Virginia by county (1835 – 2010) 13
Figure 4. Bailey eco-regions in West Virginia 14
Figure 5. Odonate species diversity in West Virginia by Bailey eco-region (1835 – 2010) . . 15

Table 1. List of WV odonates, ranks, WV encounter frequency, and relative range 16
Table 2. Number of Odonate species documented in three time periods in West Virginia . . . 21
Table 3. Odonate species diversity and sample sites by county in West Virginia 22
Table 4. Historical Odonate species in West Virginia 24
Table 5. Odonate species diversity by Bailey eco-region in West Virginia 25

Odonata References and Sources 26

Appendix 1. Distribution maps, flight periods, and photographic examples of West Virginia Odonates.
- Figure 6. West Virginia counties . . . . . Appendix 1-1
- Calopterygidae (Broad-wing Damsels) . . . . . Appendix 1-2
- Lestidae (Spread-wing Damsels) . . . . . Appendix 1-7
- Coenagrionidae (Pond Damsels) . . . . . Appendix 1-18
- Petaluridae (Petaltails) . . . . . Appendix 1-48
- aeshnidae (Darners)) . . . . . Appendix 1-49
- Gomphidae (Clubtails) . . . . . Appendix 1-61
- Cordulegastridae (Spiketails) . . . . . Appendix 1-88
- Macromiidae (Cruisers) . . . . . Appendix 1-93
- Corduliidae (Emeralds) . . . . . Appendix 1-97
- Libellulidae (Skimmers) . . . . . Appendix 1-110

Appendix 2. Odonate species diversity in West Virginia by Bailey eco-region . . Appendix 2-1
Appendix 3 Photographic credits . . . . . Appendix 3-1

Introduction

West Virginia is a state of streams and rivers, and its topography is a result of the flowing of thousands of miles of waterways. Not surprisingly, one of the primary concerns of WV residents is the health of these streams (Responsive Management, 1998). The WV Division of Natural Resources contributes to monitoring the state's waterways primarily through fish surveys that are labor and personnel intensive. A more efficient method requiring less personnel and labor was desired to accomplish preliminary aquatic habitat surveys. Within the class of animals called insects (Insecta), dragonflies and damselflies are placed in the order Odonata (colloquially odonates). Dragonflies are in the suborder Anisoptera, which includes seven families in West Virginia, damselflies reside in the suborder Zygoptera, with three families known from West Virginia. Odonates are known to be indicators of water quality for a variety of aquatic habitats. Adult odonates are easily observed, and many can be identified without in-hand examination. A decision was made to develop a wetland assessment protocol that incorporated odonates and other metrics. However, very little baseline data was available in West Virginia about this group of insects as most surveys were conducted at relatively few sites and were conducted three and four decades ago (Ahrens, 1968; Carle, 1982; Cruden, 1962; Harwood, 1973, 1974, 1975, 1979; Kormondy, 1960). Additional surveys were made during the 1990s by Mullins (1994), Rawlins et al. (1996), Orr (1998), and Enz (2000), but the work was not systematic, nor representative of the entire state.

In 2005, the WV Dragonfly and Damselfly Atlas was initiated to help answer questions about odonates in the state and to develop a baseline for wetland assessments. The publication of several popular guides on odonates and development of close focusing binoculars supported increasing public interest on the taxa so that an atlas effort based on citizen volunteers became possible. Although initially planned for three years, the Atlas was expanded to five years as the increasing scope of the project became apparent (Atlas period = 2005-2009, with data from 2010 also included). The objectives of the Atlas were to:

1. Determine the occurrence, distribution, and status of adult Odonata in the state.
2. Determine general habitat parameters of the state's Odonata.
3. Collect voucher specimens of WV Odonata for documentation and research purposes.

Methods

Baseline

Baseline information on odonates in WV was collected starting in 1999 from published literature and from known repositories of WV material (Figure 1). The most significant of these were specimens collected by Paul J. Harwood from 1953-1991 housed at the International Odonata Research Institute/Florida State University in Gainesville, FL. Other institutions or organizations queried were the National Museum of Natural History (Smithsonian), Washington, D.C., the University of Michigan's Museum of Zoology, Colorado State University Gillette Museum, and the Ohio River Valley Water Sanitation Commission. Many individuals who house their own collections provided data on WV specimens. These specimens and literature from numerous published sources were used to produce a preliminary state list of 159 species. In 2002, the Dragonfly Society of the Americas (DSA) held their annual meeting in West Virginia. Their efforts

produced eight state records and over 170 county records. By the start of the Atlas in 2005, the preliminary list had been revised, based on additional surveys and taxonomic changes, to 145 species. A digital database of known and published records was created and geo-referenced.

Volunteer Surveys

In cooperation with the WV Department of Agriculture (WVDA), the West Virginia Division of Natural Resources (WVDNR) developed materials for atlas volunteers, and planned several training classes around the state to prepare interested citizens to collect and process specimens. At least 130 people were trained to participate in the Atlas, either through training classes or one-on-one with an experienced volunteer or project leader. Volunteers were recruited from several sources, including the WV Master Naturalists, the WV Natural History listserv, the WV Entomological Society, the Potomac Chapter of the National Audubon Society, Oglebay Good Zoo, and federal and state agencies. In additional, personal contacts with academia and parties known to be interested in this type of project were contacted. Of 130 people who went through training, a total of 83 participated by submitting specimens to the Atlas. Of these, 37 (44%), were defined as cooperators – those individuals whose participation was part of their job, such as DNR staff. Forty-six participants (56%) were defined as volunteers, those participating on their own time out of interest in the project.

At the time of their training, volunteers were given gear for capture and processing of specimens, collection protocols, and resources for identification. Volunteers were responsible for capturing specimens, collecting data on habitat and weather conditions, processing specimens, identifying specimens to the family level, and sending specimens to the project leader. Gear included an insect net, container for acetone for processing, glassine envelopes, a thermometer, forceps for handling processed specimens, and a small ruler. The book "Stokes Beginners Guide to Dragonflies" by Blair Nikula, et al. (2002) gave volunteers and cooperators the resources needed to identify specimens to the family level and the West Virginia Odonate Survey Manual (2005) provided data sheets and other protocol information.

Volunteers surveyed at sites that were primarily self-chosen, although before each field season they were given geographic, taxonomic, and habitat sampling priorities to focus their efforts.

Other Surveys

DNR staff and volunteers with experience conducted targeted surveys for poorly documented species at historical sites, at new sites with similar habitat, and in geographic areas and habitats that had little sampling effort. In addition, two bioblitz weekends were conducted – one in Tucker County and one in Harrison County – to concentrate sampling in a particular region. Three volunteers were also awarded WVDNR cooperative research grants in 2009 to survey in poorly covered areas – mostly in the southwestern and central part of West Virginia.

Results and Discussion

Overview

The Atlas was successful in expanding knowledge of odonates in West Virginia. A total of 4628 specimens were collected that included representatives from all families known to occur in the state.

Five state records and 655 county records were documented. Distribution for most species was expanded, some quite significantly. All 55 of West Virginia's counties were surveyed (Figure 2), with an average of 12 sites visited in each county. State ranks were revised with 73 species warranting a change in their status based on data collected during the Atlas. Results for species distribution in West Virginia (Appendix 1) are based on 1994 and earlier for historical records and 1995 -2010 for recent records.

Taxonomy is the form accepted by the Dragonfly Society of the Americas as presented by Paulson and Dunkle (2011).

Species Collected

Of the 144 species documented from West Virginia, 119 (83%) were collected during the Atlas period, and 118 were documented during recent effort (1995-2004) (Table 1). Together these efforts verified 132 species (92%) of the state's odonate fauna. Twelve species historically reported from West Virginia were not found. During the Atlas, damselflies (suborder Zygoptera) were better represented than dragonflies (suborder Anisoptera), with 41 (89%) of 46 species collected, compared with 78 (80%) of 98 species collected (Table 2). This difference likely represents both the ease in netting damselflies as compared with dragonflies, and the more challenging habitats that many underrepresented dragonfly taxa inhabit (ex. streams and rivers compared with ponds). The least represented taxa were the clubtails (family Gomphidae) which, except for two species, all occur on flowing water. Only 16 (59%) of 27 species were collected during the Atlas period. Gomphid species that weren't collected historically occurred in poorly sampled geographic areas (SW West Virginia – *Dromogomphus spoliatus*), historically occurred on large and difficult to sample rivers (*Stylurus plagiatus*), or are extremely rare, and possibly extirpated in the state (*Ophiogomphus incurvatus alleghaniensis*).

The most frequently collected odonates during the Atlas were some skimmers (family Libellulidae: *Libellula luctuosa* – 133 specimens, *Plathemis lydia* – 124 specimens, *Sympetrum vicinum* – 121 specimens) and several pond damsels (family Coenagrionidae: *Ischnura posita* – 326 specimens, *Ischnura verticalis* – 295 specimens, *Argia funipennis* – 201 specimens, *Enallagma exsulans* – 198 specimens). All of these species have virtually state-wide distributions, broad habitat requirements, and are easily netted.

Geographic Coverage

Every county in the state was surveyed during the Atlas period, some having greater coverage than others, with an average of 11.4 survey sites per county (Table 3). Tucker County had the largest number of survey sites (43) during the Atlas period, followed by Monongalia (34), and Greenbrier (32). Boone County had only one Atlas survey site (total 168.7 square miles per site), with McDowell (9 sites – total 49.5 square miles per site), Wayne (6 sites – total 46.5 square miles per site), and Wyoming (5 sites – total 46.1 square miles per site) also being under surveyed. Many of the under surveyed counties are in the chronically under surveyed SW area of the state (Figure 3). Access to survey sites in this area is difficult because of lack of access onto private mine lands and development along stream channels. In addition, many of the streams in this area of the state are impacted by sediment, sewage, and other pollutants. Although ponds exist in the area, they are often on private land and difficult to access.

Habitat Coverage
Ponds and other still pooled waters were the most frequently surveyed habitat during the Atlas period, resulting in high numbers of skimmers (Libellulidae) and pond damsels (Coenagrionidae) being collected. High elevation wetlands were adequately surveyed during the Atlas period and immediately prior to it during the DSA meeting. Flowing waters were chronically under surveyed because of flooding and participants' apprehension to wading in streams and rivers during normal and low flows. Some streams and rivers had also been impacted by pollutants and host no or a very low diversity and number of odonate fauna.

Distributions
Of the 144 species known from West Virginia, 131 have been documented in the state since 1995. This recent work has documented range expansions for 126 species, with an average of 9 counties added to each distribution (range 1 – 32 counties; Appendix 1). Although some of these could be actual increases in distribution, the vast majority likely reflect additional survey effort in under sampled areas.

Those species that showed no distribution increase were often high elevation species with specific habitat requirements (ex. sphagnum bogs). This group has been fairly well documented in the mountain counties, and most apparently do not occur at lower elevations. Although the majority of distributional increases were for common species, some were for rarer species that have specific habitat requirements, such as ridge top spring fed streamlets for Tiger Spiketail (*Cordulegaster erronea*) or older, well vegetated ponds for Vesper Bluet (*Enallagma vesperum*). Once habitat requirements were understood, focused surveys were effective tools for documenting these species.

Twelve species known from West Virginia have not been documented since at least 1995, most much earlier (Table 4). Most have extremely small areas of historical occurrence in the state (one or two sites), are at the periphery of their range, or may be vagrant in West Virginia. Unfortunately, the records for many of these species have vague locations associated with them, making finding the historic survey site very difficult. With additional survey effort, some of these species may yet be rediscovered in the state.

Like other taxa in the state, several odonates reach their known range limit in West Virginia, especially northern species reaching their southern range limit (Table 1). Fifteen odonates occur no further south, north, or east than West Virginia (Odonata Central, 2011). The eleven that reach their southern limit here may be encountering climates that are too warm to support required cool wetland habitat that is only found at high elevations (typically above 2500 ft) further south. Although widespread further north (usually well into Canada) and often west, increasing precipitation and warming temperatures that some climatologists predict for the Appalachian region may push the edge of these species ranges further north, and eliminate them from West Virginia. An additional six species have the southern limit to their range adjacent to West Virginia, and could also be pushed north.

Species Diversity
Species diversity by Bailey eco-region (Figure 4) probably reflects a mixture of sampling effort in these areas and actual species diversity (Figure 5). The region exhibiting the highest species diversity was the Northern Ridge and Valley with 107 out of a possible 144 species (Table 5). This

region had a tremendous amount of effort expended documenting odonate fauna and harbors a rich diversity of aquatic habitats from low to high elevation. In addition, its geographic position east of the Allegheny Front of the Appalachian Mountains allowed inclusion of predominantly coastal plain species that were unable to establish themselves over the mountains. Allegheny Mountain and Valley eco-region harbors just slightly fewer species (103). This area includes the species rich Greenbrier River near Alderson, high elevation wetlands, and was extensively sampled during the 2002 DSA meeting. The mountain regions (Western Allegheny Mountains and High Allegheny eco-regions) supported a moderate number of species (97 and 96 species respectively). Although heavily sampled, these regions exhibit extreme conditions of temperature and water regimes providing inhospitable conditions for species adapted to more moderate conditions. The Great Valley and Eastern Hocking Plateau had some of the smallest diversities documented for the state. The tremendous development pressure and subsequent loss of habitat in the Great Valley may explain the fairly low 40 species documented for this area, even though it was very well sampled. The East Hocking Plateau only has a very small portion in West Virginia, and was not expected to produce a large number of species. Interestingly Northern Blue Ridge Mountains, on the very eastern edge of West Virginia with a very small area in the state, has almost double the species as Eastern Hocking Plateau, with 53 species. This may be due to the large number of historical specimens documented in the Harpers Ferry area in the early 1900s. A complete table of species found in each eco-region can be found in Appendix 2.

Recent Taxonomic Changes

Several species of odonates found in West Virginia have had taxonomic revisions in recent years. Most changes are due to a greater understanding of their genetic makeup, supporting a split from or a lump into a closely related species.

In the Spreadwing family (*Lestidae*), the two subspecies comprising the Common Spreadwing (*Lestes disjunctus disjunctus* and *L.d. australis*) were split into full species: the Northern Spreadwing (*Lestes disjunctus*) and the Southern Spreadwing (*Lestes australis*). These two species and a third, Sweetflag Spreadwing (*Lestes forcipatus*), have been confused since they were first described (Donnelly, 2003). The morphological characters that separate them, although subtle, can usually be distinguished in fully adult and undamaged specimens. Donnelly (2003), separated the two subspecies based on emergence, range (to some extent), and morphological characters.

Work done by Turgeon, et al. (2005) supported a split of the circumplolar species *Enallagma cyathigerum* into a Palearctic *Enallagma cyathigerum* and the Holarctic *Enallagma annexum* (Northern Bluet). These two continental populations separated geographically 1.0 – 1.3 million years ago resulting in significant differences in mitochrondrial and nuclear DNA, which supports their status as separate species.

Recent work by Pilgrim and VonDohlen (2007) on Meadowhawks (genus *Sympetrum*, family *Libellulidae*) support the inclusion of Jane's Meadowhawk (*Sympetrum janeae*) as a race or form of Cherry-faced Meadowhawk (*S. intrusum*) by Paulson and Dunkle (2011) based on a lack of difference in morphology or genetics. Although the Ruby Meadowhawk (*S. rubicundulum*) was also included in this confusing group by Pilgrim and VonDohlen (2007), West Virginia specimens of this species have been consistently uniform and fairly straight forward to identify.

Threats

Although most people are familiar with adult odonates, most of these species lives are spent as larvae underwater in the rivers, streams, ponds, bogs, and marshes of West Virginia preying on other invertebrates. They are intimately tied to aquatic habitats, and are affected by their quality.

Odonates are under pressure world-wide, and throughout the United States because of deforestation, declining water quality, changes in water flows, changes in substrates, loss and degradation of habitat, and exotic species introduction (Moore, 1997). Twenty-seven odonates that occur in the United States are listed on the IUCN Red List of threatened species. The single West Virginia listed species, Appalachian Snaketail (*Ophiogomphus incurvatus alleghaniensis*), may have been extirpated from the state possibly because of agricultural pesticide overspray and runoff. Approximately 15% of odonates are at risk of extinction in North America (Dunkle, 2000). In West Virginia, species most at risk are those whose larvae inhabit flowing waters and low elevation wetlands (often found along major rivers). Clubtails (family *Gomphidae*), who almost as a group inhabit streams and rivers, are particularly susceptible to pollutants including municipal, household, agricultural runoff, sedimentation, and mineral extraction effluents. Most need clear, clean streams with high oxygen levels. Other groups whose larvae inhabit streams and rivers include the broad-wing damsels (family *Calypterigidae*), dancers (genus *Argia*, family *Coenagrionidae*), spiketails (family *Cordulegastridae*), cruisers (family *Macromiidae*), and shadowdragons (genus *Neurocordulia*, family *Corduliidae*). Although some rivers in eastern and north-central West Virginia (Cheat, Tygart, and Middle Fork among others) have made substantial recovery from unregulated logging, acid mine drainage, and unregulated municipal pollution from the 1900s, other West Virginia rivers and streams remain highly impacted. Others remain under threat from streamside development, mountain top removal mining, and the booming Marcellus Shale drilling industry.

Because flat land for development is at such a premium in West Virginia, areas along our major rivers is often quickly developed, and the sloughs, back channels, and boggy pools that line the Ohio, Kanawha, Cacapon and other rivers are disappearing. Species that use these habitats include the Swamp Darner (*Epiaeschna heros*), Great Blue Skimmer (*Libellula vibrans*), Blue-faced Meadowhawk (*Sympetrum ambiguum*), spreadwings (family *Lestidae*), and Duckweed Firetail (*Telebasis byersi*). At least one species formerly recorded in West Virginia hasn't been seen in decades; the habitat at the single know site has been severely degraded by cattle (Cyrano Darner – *Nasiaeschna pentacantha*).

Acknowledgements

The West Virginia Odonata Atlas was possible with assistance from an EPA State Wetland Program Development Grant (CD 973080-01-0) and the USFWS State Wildlife Grant program. Abundant thanks goes to the volunteers and cooperators who made this project possible. Without their commitment, time, and energy West Virginia's odonate fauna would be much less well known and understood, and the Atlas would not have happened. Jennifer Wykle, formerly WV DNR, and Lois Swoboda, formerly WV Department of Agriculture, developed the Atlas from an idea, to a proposal, to a reality. Nick Donnelly volunteered his time and expertise to verify determinations of state records, county records, and more challenging specimens in the Lestidae and Gomphidae. Thank you also to WV DNR Wildlife Resources staff Mike Dougherty and Jeremy Rowan for essential database help, analysis guidance, and the generation of WV distribution and other maps.

Figure 1. Historical and recent sampling effort (1835-2004) for Odonates in West Virginia.

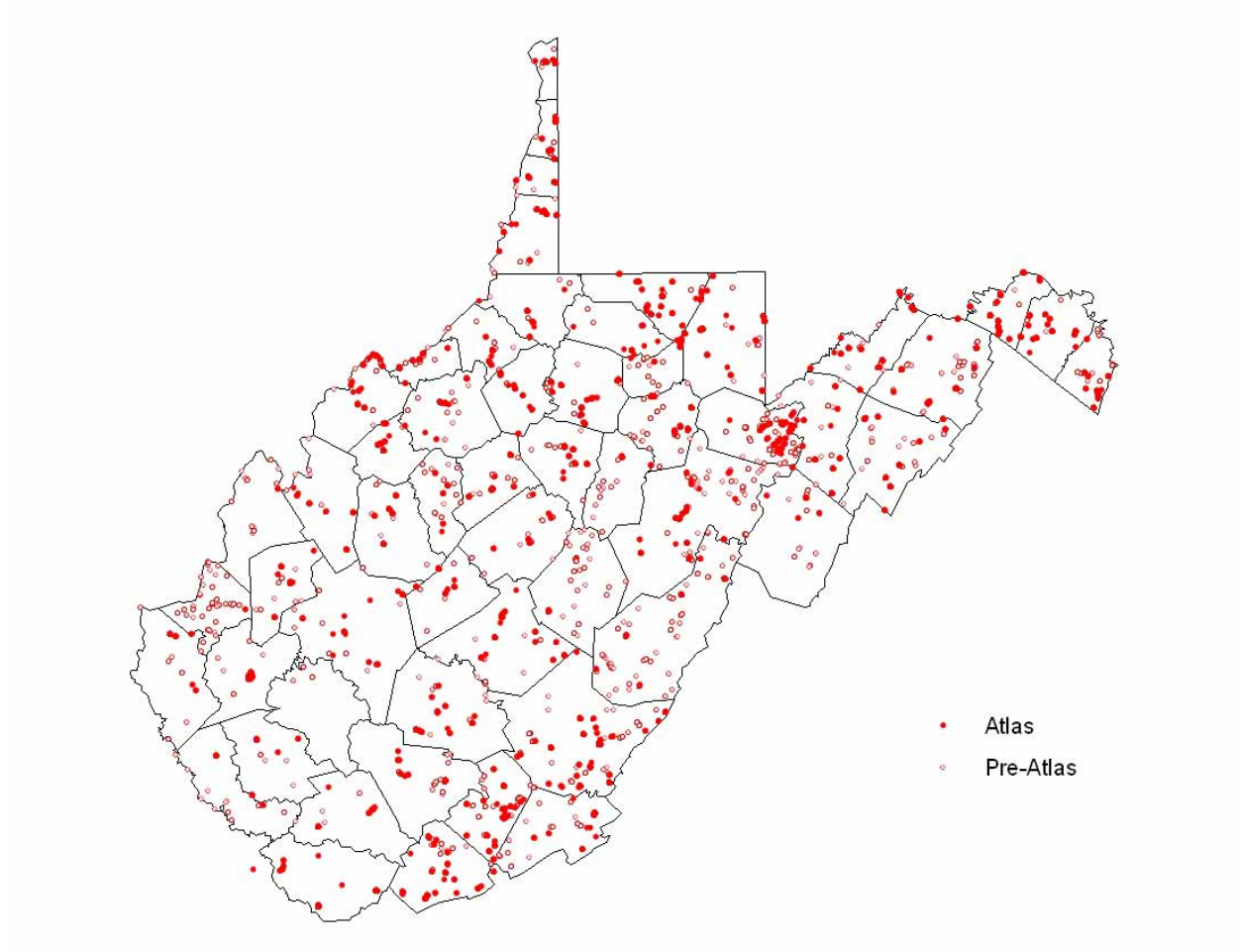


Figure 2. Historical, recent, and Atlas sampling effort (1835 – 2010) for Odonates in West Virginia.

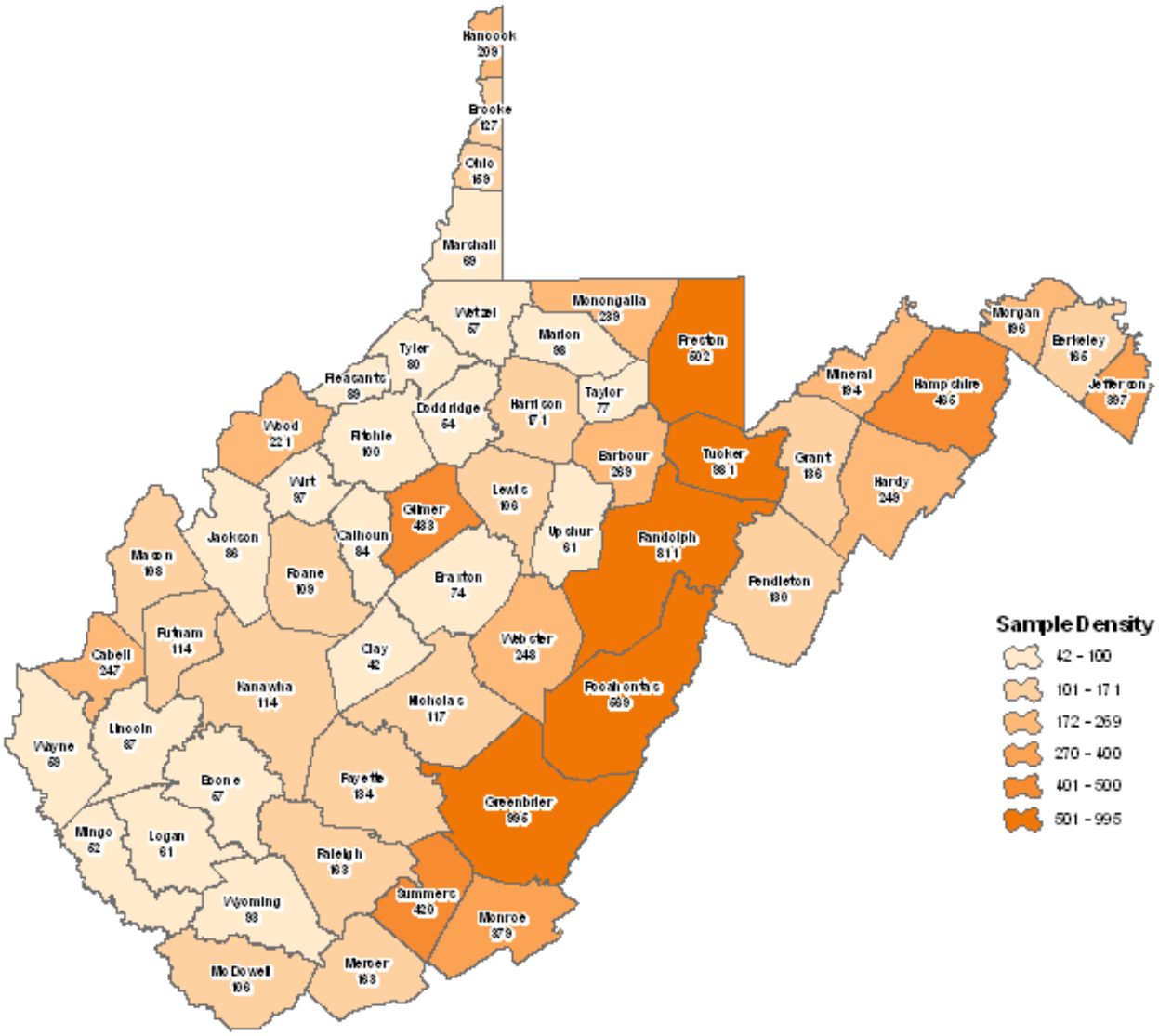


Figure 3. Total number of Odonate records in West Virginia by county (1835 – 2010).

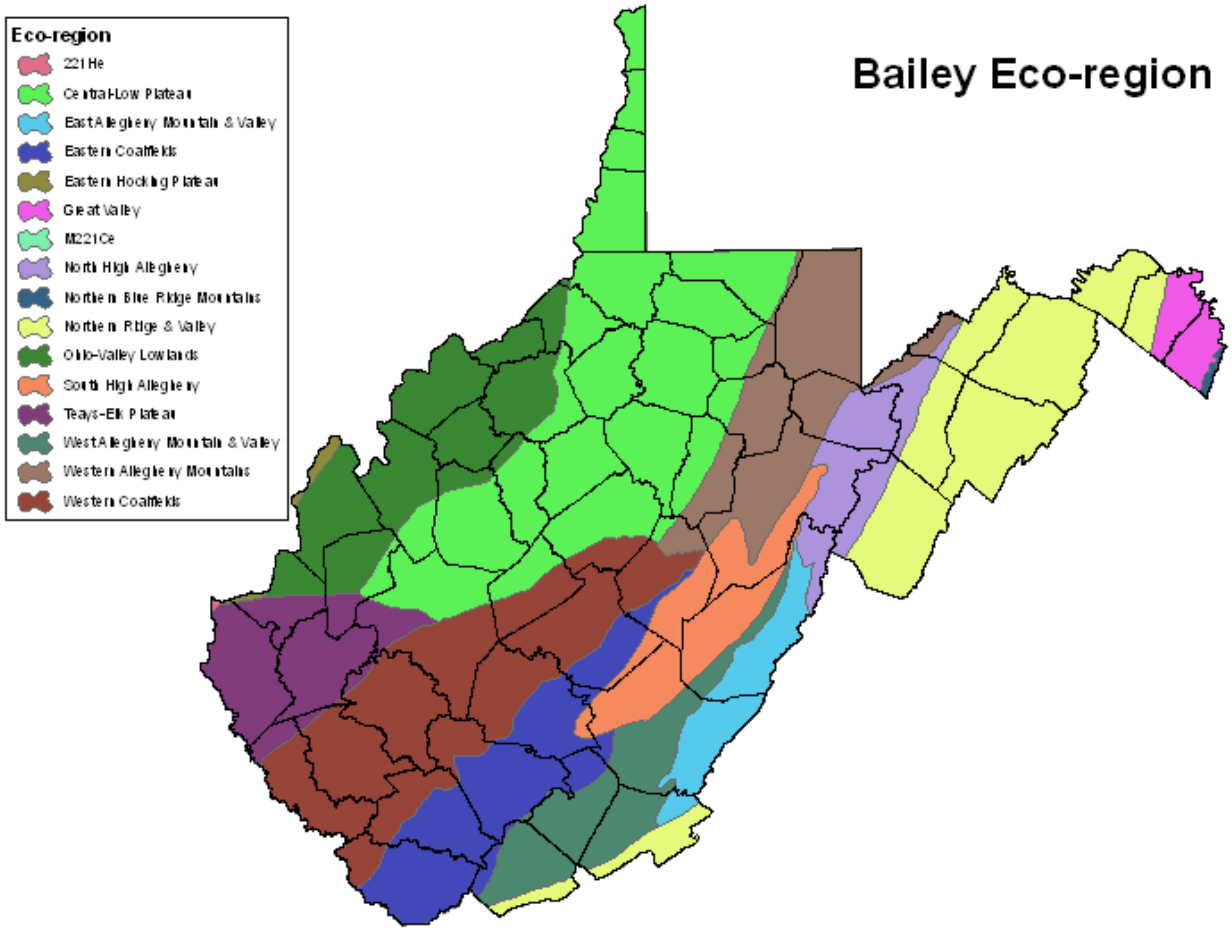


Figure 4. Bailey eco-regions in West Virginia.

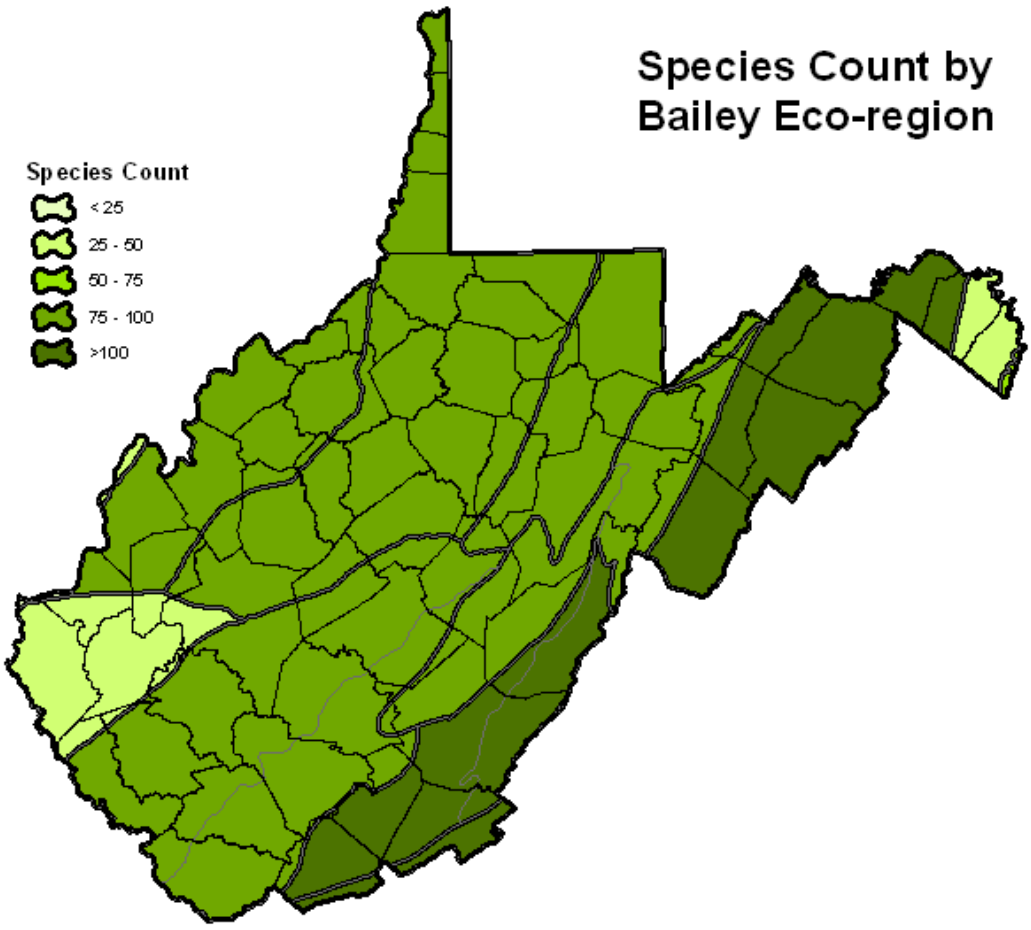


Figure 5. Odonate species diversity in West Virginia by Bailey eco-region (1835 – 2010). Eastern and Western Coalfields have been combined into Coalfields; and North and South High Allegheny have been combined into High Allegheny; and Eastern and Western Allegheny Mountain and Valley have been combined into Allegheny Mountain and Valley.

Table 1. List of WV odonates, ranks, WV encounter frequency, and relative range

	Global Rank	WV State Rank	# Recent Counties[1]	Total Counties[2]	% Total Records[3]	Occ. Status[4]	Range Status[7]
Suborder Zygoptera - Damselflies							
Family Calopterygidae - Broad-wing Damsels							
Calopteryx amata - Superb Jewelwing	G4	S3	2	5	0.63	AR	C
Calopteryx angustipennis - Appalachian Jewelwing	G4	S3	3	7	0.30	AR	C
Calopteryx maculata - Ebony Jewelwing	G5	S5	20	53	3.77	AR	C
Hetaerina americana - American Rubyspot	G5	S4	14	33	1.78	AR	C
Hetaerina titia - Smoky Rubyspot	G5	S1	1	3	0.03	A	C
Family Lestidae - Spreadwing Damsels							
Archilestes grandis - Great Spreadwing	G5	S3	7	10	0.25	AR	C
Lestes australis - Southern Spreadwing	G5	S3	2	5	0.13	AR	C
Lestes congener - Spotted Spreadwing	G5	S4	3	11	0.26	AR	C
Lestes disjunctus - Northern Spreadwing	G5	S3	2	6	0.42	AR	C
Lestes dryas - Emerald Spreadwing	G5	SH	0	2	0.02	H	n
Lestes eurinus - Amber-winged Spreadwing	G4	S4	14	20	0.41	AR	C
Lestes forcipatus - Sweetflag Spreadwing	G5	S3	6	10	0.14	A	C
Lestes inaequalis - Elegant Spreadwing	G5	S3	6	6	0.56	AR	C
Lestes rectangularis - Slender Spreadwing	G5	S5	24	36	2.09	AR	C
Lestes unguiculatus - Lyre-tipped Spreadwing	G5	SNA	0	1	<0.01	H	n
Lestes vigilax - Swamp Spreadwing	G5	S4	20	21	0.58	AR	C
Family Coenagrionidae - Pond Damsels							
Amphiagrion saucium - Eastern Red Damsel	G5	S4	8	15	1.13	AR	C
Argia apicalis - Blue-fronted Dancer	G5	S5	21	41	2.14	AR	C
Argia fumipennis violacea - Variable Dancer	G5	S5	13	54	3.45	AR	C
Argia moesta - Powered Dancer	G5	S5	10	42	3.76	AR	C
Argia sedula - Blue-ringed Dancer	G5	S4	6	18	0.80	AR	C
Argia tibialis - Blue-tipped Dancer	G5	S4	12	28	0.79	AR	C
Argia translata - Dusky Dancer	G5	S5	11	46	2.06	AR	C
Chromagrion conditum - Aurora Damsel	G5	S4	22	30	1.57	AR	C
Enallagma annexum - Northern Bluet	G5	S3	7	7	0.16	AR	C
Enallagma antennatum - Rainbow Bluet	G5	S1S2	1	4	0.10	A	C
Enallagma aspersum - Azure Bluet	G5	S4	17	35	1.05	AR	C
Enallagma basidens - Double-striped Bluet	G5	S5	19	40	1.13	AR	C
Enallagma boreale - Boreal Bluet	G5	SNA	0	1	<0.01	H	N
Enallagma civile - Familiar Bluet	G5	S5	17	44	1.62	AR	C
Enallagma divagans - Turquiose Bluet	G5	S4	17	24	0.76	AR	C
Enallagma exsulans - Stream Bluet	G5	S5	11	53	3.69	AR	C
Enallagma geminatum - Skimming Bluet	G5	S4	22	31	0.70	AR	C

	Global Rank	WV State Rank	# Recent Counties[1]	Total Counties[2]	% Total Records[3]	Occ. Status[4]	Range Status[7]
Enallagma hageni- Hagen's Bluet	G5	S4	8	16	2.23	AR	C
Enallagma signatum - Orange Bluet	G5	S5	24	45	1.03	AR	C
Enallagma traviatum - Slender Bluet	G5	S4	23	31	1.12	AR	C
Enallagma vernale- Vernal Bluet	G4	S1	2	3	0.03	AR	N
Enallagma vesperum - Vesper Bluet	G5	S3	8	9	0.15	AR	C
Ischnura hastata - Citrine Forktail	H5	S4	12	26	0.59	AR	C
Ischnura kellicotti - Lilypad Forktail	G5	S1	1	1	<0.01	A	C
Ischnura posita - Fragile Forktail	G5	S5	32	55	4.12	AR	C
Ischnura prognata - Furtive Forktail	G4	SNA	0	1	<0.01	H	V,s
Ischnura verticalis - Eastern Forktail	G5	S5	10	55	4.92	AR	C
Nehalennia gracilis - Sphagnum Sprite	G5	S1	1	2	0.03	R	n
Nehalennia irene - Sedge Sprite	G5	S3	6	10	0.86	AR	C
Telebasis byersi - Duckweed Firetail	G5	S1	1	1	0.06	AR	C
Suborder Anisoptera - Dragonflies							
Family Petaluridae - Petaltails							
Tachopteryx thoreyi - Gray Petaltail	G4	S3	12	12	0.11	AR	C
Family Aeshnidae - Darners							
Aeshna canadensis - Canada Darneer	G5	S3	5	6	0.14	AR	C
Aeshna tuberculifera - Black-tipped Darner	G4	S3	6	12	0.20	AR	C
Aeshna umbrosa umbrosa - Shadow Darner	G5	S4	9	27	0.81	AR	C
Aeshna verticalis - Green Striped Darner	G5	S2S3	2	6	0.16	A	n
Anax junius - Common Green Darner	G5	S5	22	43	1.08	AR	C
Anax longipes - Comet Darner	G5	S3	9	11	0.10	A	C
Basiaeschna janata - Springtime Darner	G5	S5	6	28	0.63	AR	C
Boyeria grafiana - Ocellated Darner	G5	S4	5	22	0.54	AR	C
Boyeria vinosa - Fawn Darner	G5	S5	16	38	1.25	AR	C
Epiaeschna heros - Swamp Darner	G5	S3	7	9	0.08	AR	C
Nasiaeschna pentacantha - Cyrano Darner	G5	SNA	0	1	<0.01	H	C
Rhionaeschna mutata - Spatterdock Darner	G4	S1	2	2	0.26	AR	C
Family Gomphidae - Clubtails							
Arigomphus villosipes - Unicorn Clubtail	G5	S5	15	26	1.05	AR	C
Dromogomphus spinosus - Black-shouldered Spinyleg	G5	S4	17	34	1.01	AR	C
Dromogomphus spoliatus - Flag-tailed Spinyleg	G4G5	SH	0	7	0.22	H	W
Gomphus abbreviatus - Spine-crowned Clubtail[5]	G3G4	SH	0	2	0.04	H	C
Gomphus adelphus - Moustached Clubtail	G4	S2	3	4	0.31	R	C
Gomphus descriptus - Harpoon Clubtail	G4	S2S3	2	11	0.49	AR	C
Gomphus exilis - Lancet Clubtail	G5	S5	28	39	1.41	AR	C
Gomphus fraternus - Midland Clubtail	G5	S2	2	6	0.08	A	C
Gomphus lineatifrons - Splendid Clubtail	G4	S2	3	7	0.15	R	C
Gomphus lividus - Ashy Clubtail	G5	S5	11	29	1.22	AR	C

	Global Rank	WV State Rank	# Recent Counties[1]	Total Counties[2]	% Total Records[3]	Occ. Status[4]	Range Status[7]
Gomphus quadricolor - Rapids Clubtail[5]	G3G4	S3	2	12	0.21	AR	C
Gomphus rogersi - Sable Clubtail	G4	S1	2	3	0.05	R	C
Gomphus vastus - Cobra Clubtail	G5	S2	4	7	0.22	AR	C
Gomphus viridifrons - Green-faced Clubtail[5]	G3G4	S3	4	4	0.32	AR	C
Hagenius brevistylus - Dragonhunter	G5	S3	9	17	0.40	AR	C
Lanthus parvulus - Northern Pygmy Clubtail	G4	S3	1	7	0.25	R	N
Lanthus vernalis - Southern Pygmy Clubtail	G4	S1	1	1	<0.01	R	C
Ophiogomphus carolus - Riffle Snaketail	G5	S2	1	2	0.02	R	C
O. incurvatus alleghaniensis - Appalachian Snaketail[5]	G3T2T3	SH	0	1	0.16	H	C
O. mainensis fastigiatus - Maine Snaketail	G4TU	S3	2	3	0.18	R	C
O. rupinsulensis - Rusty Snaketail	G5	S2	3	5	0.14	AR	C
Progomphus obscurus - Common Sanddragon	G5	S2S3	3	14	0.19	R	C
Stylogomphus albistylus - Eastern Least Clubtail	G5	S3	7	21	0.95	AR	C
Stylurus notatus - Elusive Clubtail	G3	S1S2	1	1	<0.01	AR	C
Stylurus plagiatus - Russet-tipped Clubtail	G5	SH	0	2	0.02	H	C
Stylurus scudderi - Zebra Clubtail	G4	SH	0	1	<0.01	H	C
Stylurus spiniceps - Arrow Clubtail	G5	S2	2	6	0.06	A	C
Family Cordulegastridae - Spiketails							
Cordulegaster bilineata - Brown Spiketail	G5	S3S4	5	6	0.49	AR	S
Cordulegaster diastatops - Delta-spotted Spiketail	G5	S3S4	1	5	0.47	AR	N
Cordulegaster erronea - Tiger Spiketail	G4	S2	5	6	0.08	AR	C
Cordulegaster maculata - Twin-spotted Spiketail	G5	S4	3	21	0.68	AR	C
Cordulegaster obliqua - Arrowhead Spiketail	G4	S2	1	14	0.16	R	C
Family Macromiidae - Cruisers							
Didymops transversa - Stream Cruiser	G5	S4	12	17	0.18	AR	C
Macromia alleghaniensis - Allegheny River Cruiser	G4	S2S3	2	10	0.14	A	s
Macromia i. illinoiensis - Swift River Cruiser	G5	S3	9	22	0.49	AR	C
Macromia taeniolata - Royal River Cruiser	G5	S3	4	10	0.18	A	C
Family Corduliidae - Emeralds							
Cordulia shurtleffi - American Emerald	G5	S4	4	12	0.62	AR	n
Epitheca canis - Beaverpond Baskettail	G5	S3	3	4	0.16	AR	N
Epitheca costalis - Slender Baskettail	G5	SNA	1	1	<0.01	R	V
Epitheca cynosura - Common Baskettail	G5	S5	24	45	2.13	AR	C
Epitheca princeps - Prince Baskettail	G5	S5	16	38	0.92	AR	C
Helocordulia uhleri - Uhler's Sundragon	G5	S2S3	7	9	0.18	AR	C
Neurocordulia molesta - Smoky Shadowdragon	G4	S2	4	6	0.25	R	W
Neurocordulia obsoleta - Umber Shadowdragon	G4	S1	0	2	0.02	H	C
Neurocordulia yamaskanensis - Stygian Shadowdragon	G5	S3	3	7	0.08	AR	C
Somatochlora elongata - Ski-tipped Emerald	G5	S3	2	7	0.18	AR	C
Somatochlora forcipata - Forcipate Emerald	G5	S3	1	1	0.06	R	N

	Global Rank	WV State Rank	# Recent Counties[1]	Total Counties[2]	% Total Records[3]	Occ. Status[4]	Range Status[7]
Somatochlora linearis - Mocha Emerald	G5	S3	5	8	0.13	A	C
Somatochlora tenebrosa - Clamp-tipped Emerlad	G5	S4	8	17	0.37	AR	C
Family Libellulidae - Skimmers							
Celithemis elisa - Calico Pennant	G5	S5	21	43	1.58	AR	C
Celithemis eponina - Halloween Pennant	G5	S4	24	25	0.48	AR	C
Celithemis fasciata - Banded Pennant	G5	S3	11	11	0.20	AR	C
Celithemis verna - Double-ringed Pennant	G5	SNA	1	1	<0.01	A	V,s
Erythemis simplicicollis - Eastern Pondhawk	G5	S5	25	49	2.63	AR	C
Erythrodiplax minuscula - Little Blue Dragonlet	G5	SNA	1	2	0.02	R	V,s
Ladona deplanata - Blue Corporal	G5	S3	14	14	0.41	AR	C
Ladona julia - Chalk-fronted Corporal	G5	S4	7	7	0.51	AR	C
Leucorrhinia glacialis - Crimson-ringed Whiteface	G5	S1	1	1	0.07	R	N
Leucorrhinia hudsonica - Hudsonian Whiteface	G5	S3	4	5	0.48	AR	N
Leucorrhinia intacta - Dot-tailed Whiteface	G5	S4	13	18	0.69	AR	n
Libellula auripennis - Golden-winged Skimmer	G5	SNA	2	2	0.03	R	V,E
Libellula axilena - Bar-winged Skimmer	G5	S2	2	2	0.03	AR	s
Libellula cyanea - Spangled Skimmer	G5	S5	23	44	1.27	AR	C
Libellula flavida - Yellow-sided Skimmer	G5	S3	1	3	0.08	AR	s
Libellula incesta - Slaty Skimmer	G5	S3S4	25	25	0.71	AR	C
Libellula luctuosa - Widow Skimmer	G5	S5	23	51	2.37	AR	C
Libellula pulchella - Twelve-spotted Skimmer	G5	S5	17	44	1.63	AR	C
Libellula quadrimaculata - Four-spotted Skimmer	G5	SNA	0	1	<0.01	H	N
Libellula semifasciata - Painted Skimmer	G5	S4	9	16	0.42	AR	C
Libellula vibrans - Great Blue Skimmer	G5	S1	4	4	0.06	AR	C
Pachydiplax longipennis - Blue Dasher	G5	S5	23	49	2.69	AR	C
Pantala flavescens - Wandering Glilder	G5	S4	8	13	0.13	AR	C
Pantala hymenaea - Spot-winged Glider	G5	S4	10	12	0.16	AR	C
Perithemis tenera - Eastern Amberwing	G5	S5	19	51	1.59	AR	C
Plathemis lydia - Common Whitetail	G5	S5	16	51	2.62	AR	C
Sympetrum ambiguum - Blue-faced Meadowhawk	G5	S1	3	3	0.04	AR	C
Sympetrum corruptum - Varigated Meadowhawk	G5	SNA	0	2	0.03	H	V
Sympetrum internum - Cherry-faced Meadowhawk[6]	G5	S2	0	2	0.03	R	E
Sympetrum obtrusum - White-faced Meadowhawk	G5	S3	4	9	0.64	AR	C
Sympetrum rubicundulum - Ruby Meadowhawk	G5	S5	19	35	1.40	AR	C
Sympetrum semicinctum - Band-winged Meadowhawk	G5	S3S4	8	11	0.23	AR	C
Sympetrum vicinum - Autumn Meadowhawk	G5	S5	9	40	2.10	AR	C
Tramea carolina - Carolina Saddlebags	G5	S3	5	5	0.07	AR	C
Tramea lacerata - Black Saddlebags	G5	S5	20	32	0.68	AR	C
Tramea onusta - Red Saddlebags	G5	S1	2	2	0.02	A	C

1. Number of recent counties = number of WV counties a species has been documented 1995-2010. The maximum number of counties is 55.
2. The number of total WV counties that a species has been documented 1835-2010. Maximum number of counties is 55.
3. Percent total records = the number of all records of a species (adult and larval) divided by the total number of WV records (11757) expressed as a percentage.
4. Occurrence status: A=documented during the Atlas period (2005-2009); R=documented during recent efforts (1995-2004); H=historical, not documenterd in WV since 1994 or earlier
5. Globally rare species
6. Sympetrum internum and S. janeae were recently lumped into one species based on a lack of genetic or morphological distinctiveless. See Results for further details.
7. Range status = indication of whether a species is at its range periphery in West Virginia: C=central, not peripheral; N,n=a northern species at or near its southern limit in WV; S,s=a southern species at or near its northern limit in WV; E=primarily an eastern species; W= a western species at its eastern limit in WV; V=a vagrant or accidental species in WV

Table 2. Number of Odonate species documented in West Virginia during three time periods. Maximum number of species: Zygoptera (damselflies) = 46, Anisoptera (dragonflies) = 98, Total = 144.

Record Source	Number of Documented Species		
	Zygoptera	Anisoptera	Total
Atlas	41	78	119
(2005-2010)	89%	80%	83%
Recent	38	83	118
(1995-2004)	83%	85%	82%
additional species beyond Atlas	0	12	12
Total Atlas + Recent	42	90	132
Historical	44	84	128
(1835-1994)	96%	86%	89%
additional species beyond Atlas + Recent	4	8	12

Table 3. Odonate species diversity and sample sites by county in West Virginia**.**

Counties	Number Species[1]	Sample Sites Atlas[2]	Sample Sites Total[3]	Sq miles per Site[4]
Barbour	50	11	27	12.7
Berkley	49	14	17	19.1
Boone	27	1	3	168.7
Braxton	45	7	17	30.6
Brooke	32	5	8	11.5
Cabell	44	8	44	6.5
Calhoun	33	5	17	16.4
Clay	35	7	13	19.4
Doddridge	20	8	14	23.0
Fayette	48	12	19	35.0
Gilmer	53	7	17	20.1
Grant	48	12	23	20.8
Greenbrier	89	32	67	15.3
Hampshire	83	10	35	18.3
Hancock	39	8	11	8.1
Hardy	57	14	31	18.6
Harrison	54	11	20	20.9
Jackson	33	10	16	29.5
Jefferson	64	13	23	9.2
Kanawha	34	19	29	31.5
Lewis	31	14	23	17.0
Lincoln	29	12	17	25.7
Logan	28	9	14	32.6
Marion	34	10	14	38.4
Marshall	31	10	19	16.5
Mason	32	3	17	18.5
McDowell	38	9	9	49.6
Mercer	48	22	33	12.8
Mineral	46	15	23	14.3
Mingo	24	5	13	32.6
Monongalia	56	34	40	9.2
Monroe	63	9	26	18.2
Morgan	43	16	20	11.6
Nicholas	58	15	26	25.3
Ohio	32	8	10	10.9
Pendleton	50	6	23	30.3
Pleasants	32	7	16	8.4

Counties	Number Species[1]	Sample Sites Atlas[2]	Sample Sites Total[3]	Sq miles per Site[4]
Pocahontas	77	12	55	17.1
Preston	74	26	40	16.4
Putnam	30	10	18	19.5
Raleigh	51	10	21	29.0
Randolph	81	22	56	18.7
Ritchie	44	9	22	20.7
Roane	38	6	14	34.7
Summers	54	18	38	9.7
Taylor	34	6	14	12.6
Tucker	80	43	87	4.8
Tyler	30	5	14	18.6
Upshur	34	4	15	23.7
Wayne	23	5	11	46.5
Webster	44	1	28	20.0
Wetzel	25	6	10	36.0
Wirt	36	8	10	23.4
Wood	36	13	20	18.9
Wyoming	52	5	11	46.1

1. Total number of species documented for each WV county (maximum possible = 144)
2. Number of sampling sites in each WV county during the Atlas period (2005-2009)
3. Total number of sampling sites in each WV county (Historical+Recent+Atlas)
4. Square miles in each county divided by total sample sites

Table 4. Historical Odonate species documented from West Virginia**.**

Species	Last seen in WV	Number of Sites	Habitat	Possibility of Rediscovery	Specimens Available?	Comments
Lestes dryas - Emerald Spreadwing	1974	2	ponds, marshes, slow streams, stream back channels	unknown	no	2 adult specimens - historical sites vague or no longer exist in Hampshire and Ritchie Counties
Lestes unguiculatus - Lyre-tipped Spreadwing	1971	1	small ponds, sloughs, oxbows	unknown	no	1 specimen (unknown age) - vague location in Hardy County
Enallagma boreale - Boreal Bluet	1972	1	pools, marshes	unknown	no	1 reared larval specimen - vague location in Tucker County
Ischnura prognata - Furtive Forktail	1835	1	seeps, swampy edges, boggy ponds	unlikely	no	habitat at site no longer exists - if ID correct was likely a vagrant
Naiaeschna pentacantha - Cyrano Darner	1961	1	swampy streams, ponds	unlikely	yes - ID confirmed	one adult specimen - pond at Mason County site filled in
Dromogompus spoliatus - Flag-tailed Spinyleg	1976	21	rivers with muddy bottomed pools	likely	unknown	all records are from larval specimens - mostly vague locations in Braxton, Cabell, Hampshire, Mineral, Ritchie, Wayne, and Wyoming Counties
Gomphus abbreviatus - Spine-crowned Clubtail	1973	3	clean streams, rivers with muck deposits	likely	yes - ID confirmed	5 adult specimens
Ophiogomphus incurvatus alleghaniensis - Allegheny Snaketail	1980	1	open streams at low elevations with sandy/gravel riffles	unlikely	yes - ID confirmed	19 specimens collected in 3 day period - Visits in 2007 and 2008 to site produced no sightings - evidence of herbicide use around stream - hardly any aquatic invertebrates present - population likely extirpated
Stylurus plagiatus - Russet-tipped Clubtail	1930	2	large rivers	likely	one ID confirmed, one unknown	current records from neighboring Maryland (Potomac River)
Stylurus scudderi - Zebra Clubtail	1990	3	clear forest streams, small rivers with riffles and sandy/mucky bottom	unknown	yes - ID confirmed for adults, but not larva	2 adult records (Greenbrier, Pocahontas counties), 1 larval record (Raleigh Co.) with vague location
Libellula quadrimaculata - Four-spotted Skimmer	1930	1	boggy lakes and ponds	unlikely	no	1 record from extreme western WV in Jackson County - vague location - probable vagrant
Sympetrum corruptum - Varigated Meadowhawk	1975	2	open ponds and slow streams	unlikely	yes - ID not confirmed	3 adult specimens - vague locations in Hardy and Grant counties- probable vagrant
Sympetrum janeae - Jane's Meadowhawk	1982	1	ponds, lakes, slow streams	unknown	unknown	1 adult specimen - paratype - taxonomic issues - now considered a form of *Sympetrum internum* - species lumped

Table 5. Odonate species diversity by Bailey eco-region in West Virginia (1835 – 2010).

Bailey Eco-region	Number of Species
Allegheny Mountain and Valley[1]	103
Central Low Plateau	90
Coalfields[2]	89
Eastern Hocking Plateau	26
Great Valley	40
High Allegheny[3]	96
Northern Blue Ridge Mountains	53
Northern Ridge and Valley	107
Ohio Vally Lowlands	78
Teays-Elk Plateau	48
Western Allegheny Mountains	97

1. Allegheny Mountain and Valley includes Eastern Allegheny Mountain and Valley and Western Allegheny Mountain and Valley eco-regions.

2. Coalfields includes Eastern Coalfields and Western Coalfields eco-regions.

3. High Allegheny includes Northern High Allegheny and Southern High Allegheny eco-regions.

Odonata References and Sources

Publications and Reports

Ahrens, C. 1968. A list of Odonata taken in Cranesville Swamp in 1966. Arboretum Newsletter, West Virginia University 17(4):6.

Ahrens, Carsten, G.H. Beatty, and A.F. Beatty. 1968. A survey of the Odonata of western Pennsylvania. Proceedings of the Pennsylvania Academy of Science 42:103-109.

Carle, Frank L. 1982. Ophiogomphus incurvatus: a new name for O. carolinus Hagen. Entomological Society of America 75:335-339.

Carle, F.L. 1992. *Sympertrum janeae* Spec. Nov. From Eastern North America. With A Key To Neartic Sympetrum (Anisoptera: Libellulidae), Odonatologica 22:1-16.

Chordas, Steve. 1999. West Virginia Division of Natural Resources, Scientific Collecting Permit Report.

Cruden, R.W. 1962. A Preliminary Survey of West Virginia Dragonflies (Odonata). Entomological News 73:156-160.

Donnelly, T.W. 2003. Lestes disjunctus, forcipatus, and australis: a confusing complex of North American damselflies. Argia 15(3)10-13.

Donnelly, T.W. 2004a. Distribution of North American Odonata, Part I: Aeshnidae, Petaluridae, Gomphidae, Cordulegastridae. Bull. American Odonatology 7:61-90.

Donnelly, T.W. 2004b. Distribution of North American Odonata, Part II: Macromiidae, Cordulidae, and Libellulidae. Bull. American Odonatolgy 8:1-32.

Harwood, Paul D. 1971. Synopsis of James G. Needham's (Cornell University) unpublished manuscript "The Dragonflies of West Virginia". Proceedings of the West Virginia Academy of Sciences 43:72-73.

Harwood, Paul D. 1973. Notes on Damselflies from West Virginia. Proceedings of the WV Academy of Science 45:167-169.

Harwood, Paul D. 1974. Dragonflies of Pendleton Co. The Redstart 41: 81-84.

Harwood, Paul D. 1975. Dragonflies of Ritchie County. The Redstart 42:18-21.

Harwood, Paul D. 1979**.** The dragonflies of Pocahontas County, WV. The Redstart 46:35-38.

Kormondy, Edward J. 1960. New North American records of Anisopterous odonata. Entomological News 71:121-130.

Mauffrey, Bill and Steve Roble. 2000. New state records of Odonata for West Virginia in the collection of the late Paul D. Harwood. Argia 12(3):29-30.

Mullins, L.A.; May, 1994. Marshall University, unpub. thesis

Olson, Carl. 1972. A taxonomic survey of the larval Odonata fauna of Cabell Co. Marshall University, Unpublished thesis.

Orr, Richard. 2005. Dragonflies and damselflies, significant non-target insects likely to be affected by West Nile virus management in the National Capitol Parks. Report submitted to the National Park Service (PIMIS #76797), 40pg.

Orr, Richard. 1998. The dragonflies and damselflies (Insecta: Odonata) of Cranesville Swamp, Garrett County, Maryland and Preston County, West Virginia. Maryland Naturalist 42(3-4):52-59.

Odonata Central. 2011. Distribution maps of North American Odonata. online at: www.odonatacentral.org.

ORSANCO Macroinvertebrate Database. 1991-2000. Ohio River Valley Sanitation Commission. Online at www.orsanco.org/macroinvetebrate.

Paulson, Dennis and Sidney Dunkle. 2011. A checklist of North American Odonata: including English name, etymology, type locality, and distribution. Originally published as Occasional Paper No. 56, Slater Museum of Natural History, University of Puget Sound, June 1999; completely revised March 2009; updated February 2011. Online; available at: http://www.odonatacentral.org/docs/NA_Odonata_Checklist_2011.pdf.

Pilgrim, E. M., S.A. Roush, and D.E. Krane. 2002. Combining DNA sequences and morphology in systematics: testing the validity of the dragonfly species *Cordulegaster bilineata*. Heredity 89: 184-190.

Pilgrim, Erik M. and Carol D. VonDohlan. 2007. Molecular and morphological study of species-level questions within the dragonfly genus *Sympetrum* (*Odonata: Libellulidae*). Ann. Entomological Society of America100:688-702.

Rawlins, John E., Chen W. Young, and Robert L. Davidson. 1996. Arthropod survey in Four Different Habitat Types in WV, submitted to WVDNR

Responsive Management. 1998. West Virginia residents' attitudes toward the land acquisition program and fish and wildlife management. Harrisonburg, VA: West Virginia Division of Natural Resources.

Turgeon, Julie, Robby Stoks, Ryan A. Thum, Jonathan M. Brown, and Mark A. McPeek. 2005. Simultaneous Quaternary radiations of three damselfly clades in the Holarctic. American Naturalist 165:78-107.

Institutional Collections
Colorado State University C. P. Gillette Museum of Arthropod Diversity – Boris Kondratieff

Florida State University/ International Odonata Research Institute – Bill Mauffrey

National Museum of Natural History (Smithsonian) – Jerry Louton

University of Michigan Museum of Zoology (Insect Division) – Mark O'Brien

University of Texas Insect Collection at Brackenridge Field Laboratory – John C. Abbot

WV Department of Agriculture Odonata Collection – Laura Miller

Personal Collections
John C. Abbot, Allen Barlow, Omar R. Bocanegra, Robert W. Cruden, Duncan Cuyler, Jerrell J. Daigle, T. Nick Donnelly, Sid W. Dunkle, John Enz, Oliver Flint, Rosser W. Garrison, Robert Glotzhober, George L. Harp, Steve Hummel, James Johnson, M.J. Kotzer, Steve Krotzer, Ellis L. Laudermilk, Brian MacDonald, Dennis Paulson, Erik Pilgrim, Andrew Rehn, Steve Roble, Thomas Schultz, Kenneth J. Tennessen, Deana L. Terry, Harold B. White

Identification and Natural History Resources
Beaton, Giff. 2007. Dragonflies and damselflies of Georgia and the Southeast. University of Georgia Press, Athens, GA, 355 pg.

Carle, Frank L. 1983. A new *Zoraena* (Odonata: Cordulegastridae) from eastern North America, with a key to the adult Cordulegastridae of America. Ann. Entomological Soc. America 76: 61-68.

Corbett, Philip S., 1999. Dragonflies: behavior and ecology of Odonata. Cornell University Press, Ithaca, NY, 829 pg.

Dunkle, Sidney W. 2000. Dragonflies through binoculars: a field guide to dragonflies on North America. Oxford Univ. Press, NY. 266pg.

Glotzhober, Robert and Dave McShaffrey, eds. 2002. Guide to dragonflies and damselflies of Ohio. Bulletin of the Ohio Biological Survey 14(2) 342 pg.

Lam, Ed. 2006. Damselflies of the northeastern United States. Biodiversity Books, Forest Hills, NY, 96 pg.

Mead, Kurt. 2006. Dragonflies of the north woods. Kollath-Stensaas Publishers, Duluth, MN, 203 pg.

Moore, Norman W. 1997. Dragonflies – status survey and conservation action plan. IUCN/SSC Odonata Specialist group. IUCN, Gland, Switzerland and Cambridge, UK, 28 pg.

Needham, James G., Minter Westfall and Michael May. 2000. Dragonflies of North America. Scientific Publishers, Gainesville, FL, 939 pg.

Nikula, Blair, Jackie Sones, Donald Stokes and Lillian Stokes. 2002. Beginners guide to dragonflies. Little, Brown and Co., NY, 159 pg.

Nikula, Blair, Jennifer L. Ryan, and Matthew R. Burne. 2007. A field guide to dragonflies and damselflies of Massachusetts. MA Division of Fisheries and Wildlife, Westborough, MA, 197 pg.

Rosche, Larry, Judy Semroc and Linda Gilbert. 2008. A guide to the dragonflies and damselflies of northeast Ohio, 2nd edition. Cleveland Museum of Natural History, Cleveland, OH, 300 pg.

Westfall, Minter and Michael May. 1996. Damselflies of North America. Scientific Publishers, Gainesville, FL, 649 pg.

Appendix 1. Distribution maps, flight periods, and photographic examples of West Virginia Odonata.

Distribution maps are divided into historical (1994 and earlier = ○) and recent (1995 – 2010 = ●) and include all valid known WV records of a species. A shaded county ▫ indicates that the species has been documented there. See Figure 6 (below) for West Virginia county names.

Flight period data includes all known adult records of the species from West Virginia with valid dates and provide an estimate of a species' greatest adult activity period during the year. Valid dates are for adults with complete dates including month and day. On some of the flight period graphs there may be a significant spike in late June. This is due to the collecting from the Dragonfly Society of the Americas meeting that took place in West Virginia in June 2002.

See Appendix 3 for photo credits.

Species are presented one per page, and listed taxonomically by suborder and family, then alphabetically by genus and species within each family.

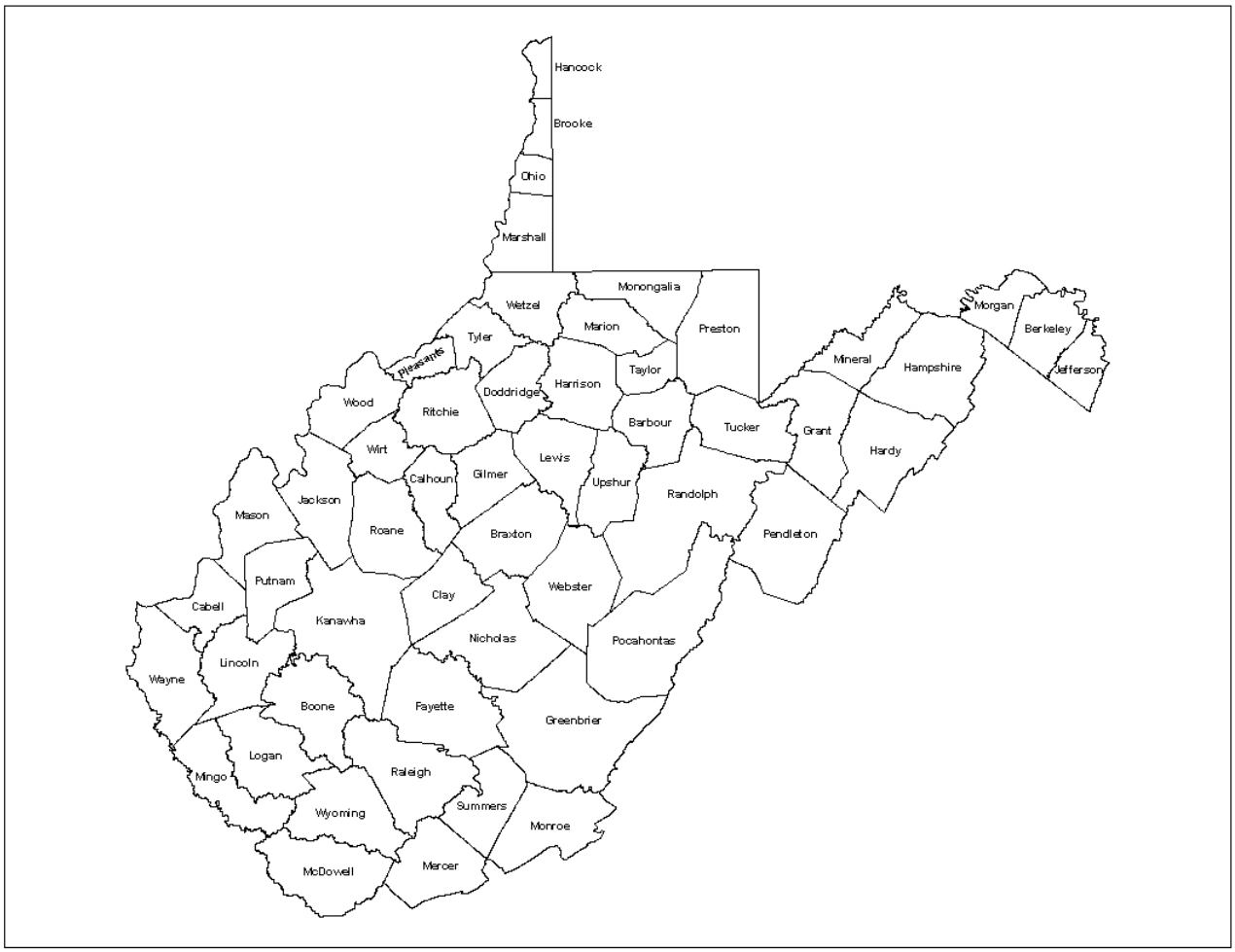


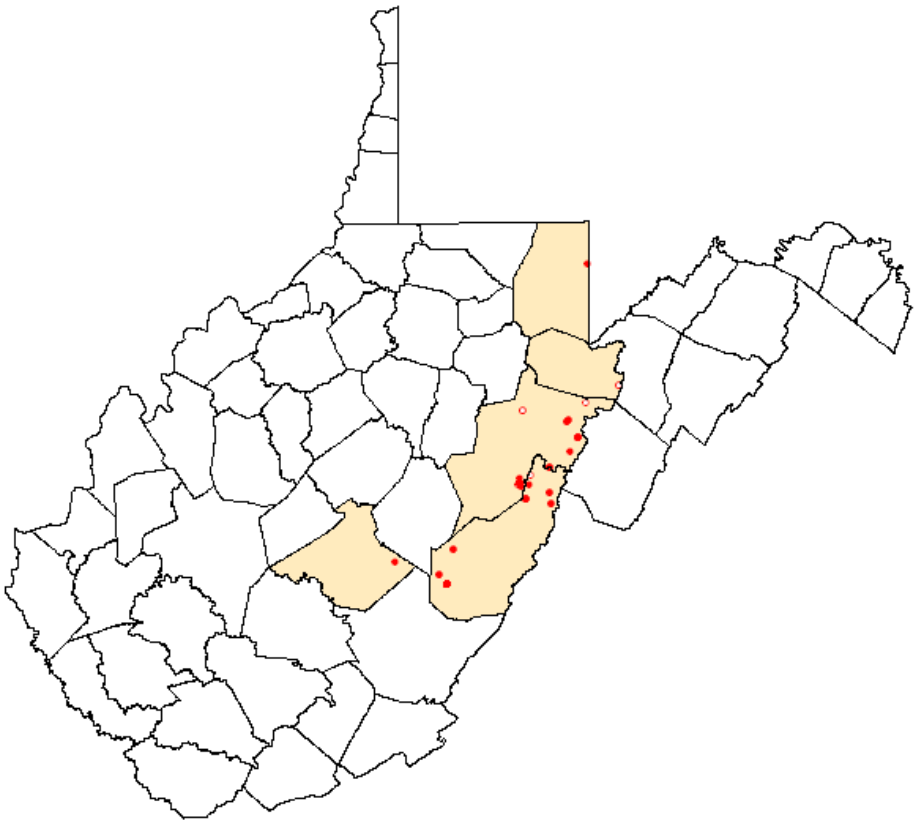
Figure 6. West Virginia counties.

Suborder Zygoptera
Family Calopterygidae

Calopteryx amata
Superb Jewelwing

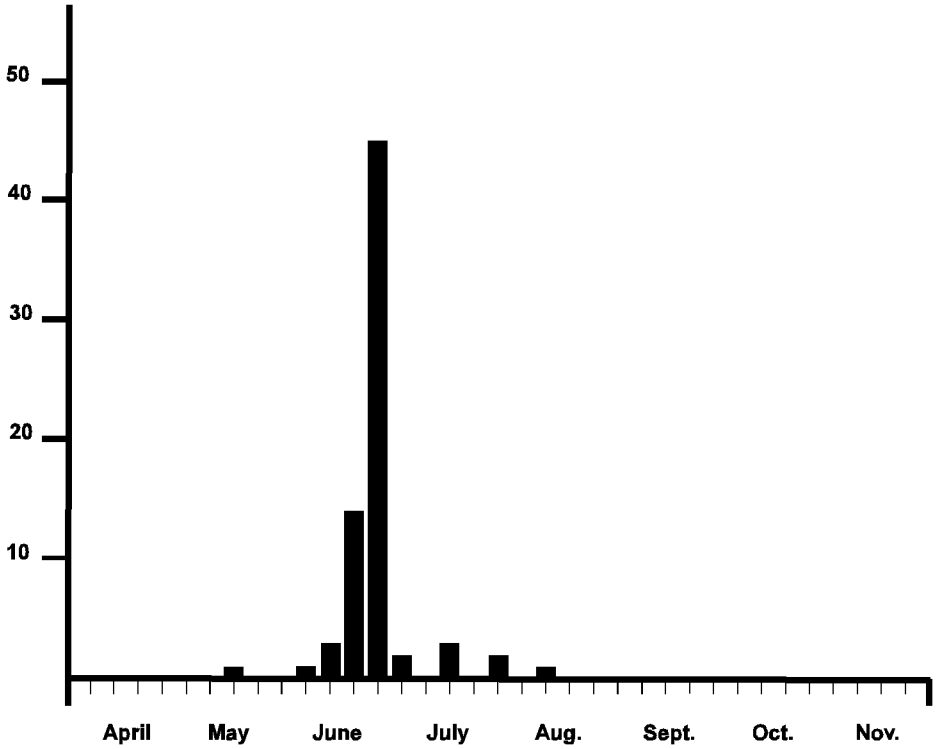
Calopteryx amata male

Calopteryx amata female



Calopteryx amata distribution based on 74 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Calopteryx amata is a high elevation (above 2500 ft) species in West Virginia. It is found in riffle areas of clear, clean, forested mountain streams.



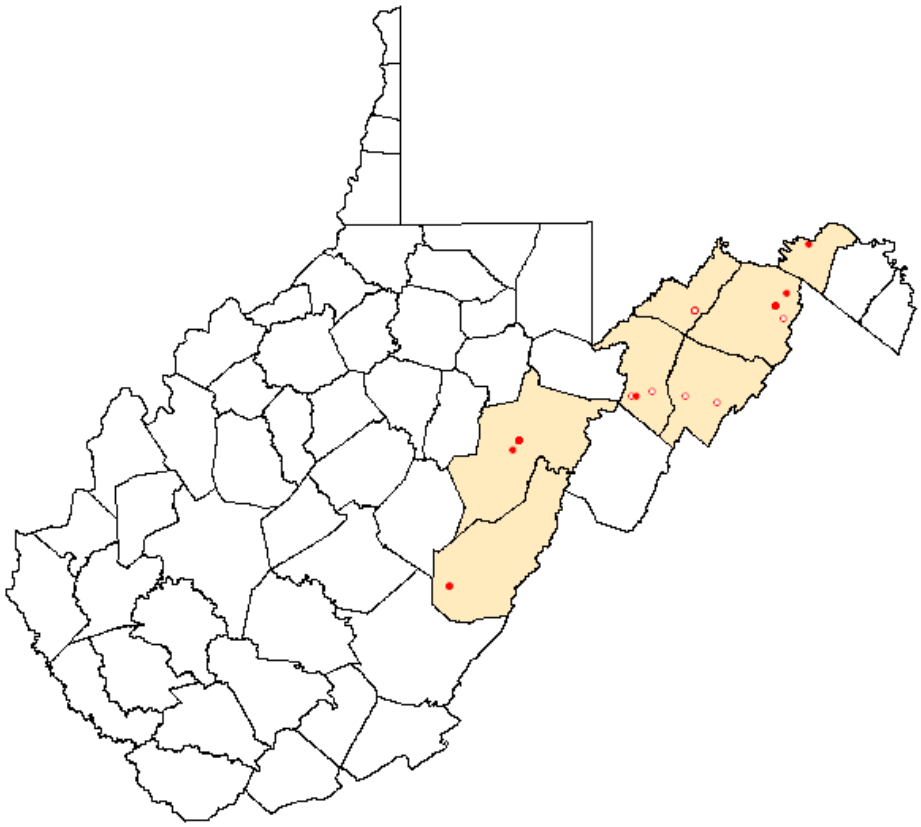
Calopteryx amata adults have been documented from 12 May — 10 August with 72 valid records.

Suborder Zygoptera
Family Calopterygidae

Calopteryx angustipennis
Appalachian Jewelwing

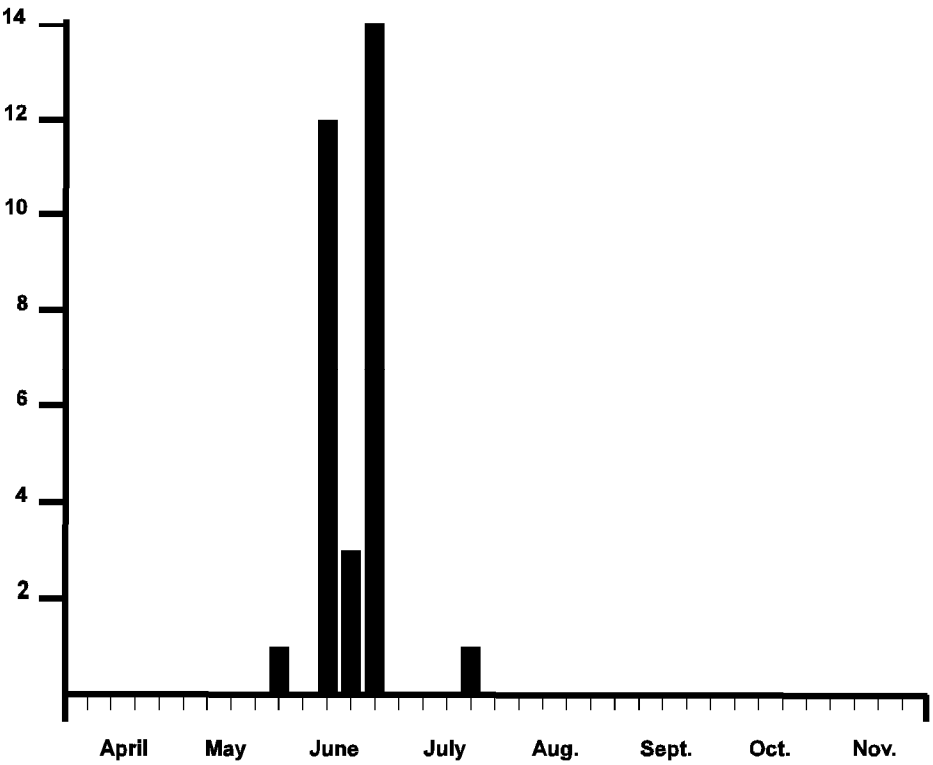
Calopteryx angustipennis male

Calopteryx angustipennis female



Calopteryx angustipennis distribution based on 35 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Calopteryx angustipennis inhabits both high elevation streams (above 2500 ft) in the mountains, and streams in the Eastern Panhandle. Sampling earlier in Eastern Panhandle counties may produce additional sites.



Calopteryx angustipennis adults have been documented from 16 May — 22 July with 32 valid records.

Suborder Zygoptera
Family Calopterygidae

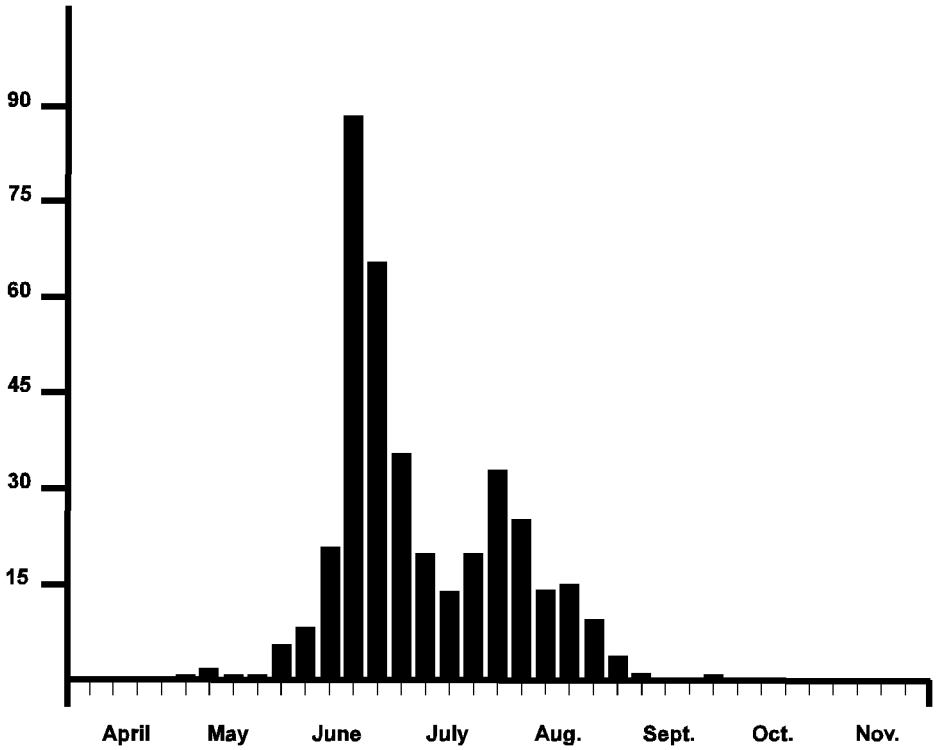
Calopteryx maculata
Ebony Jewelwing

Calopteryx maculata male

Calopteryx maculata female

Calopteryx maculata distribution based on 443 records. Open dots are 1994 and earlier record; solid dots are 1995-2010 records.

Ubiquitous throughout West Virginia, *Calopteryx maculata* is likely found in every county. It breeds in flowing water with overhanging vegetation.



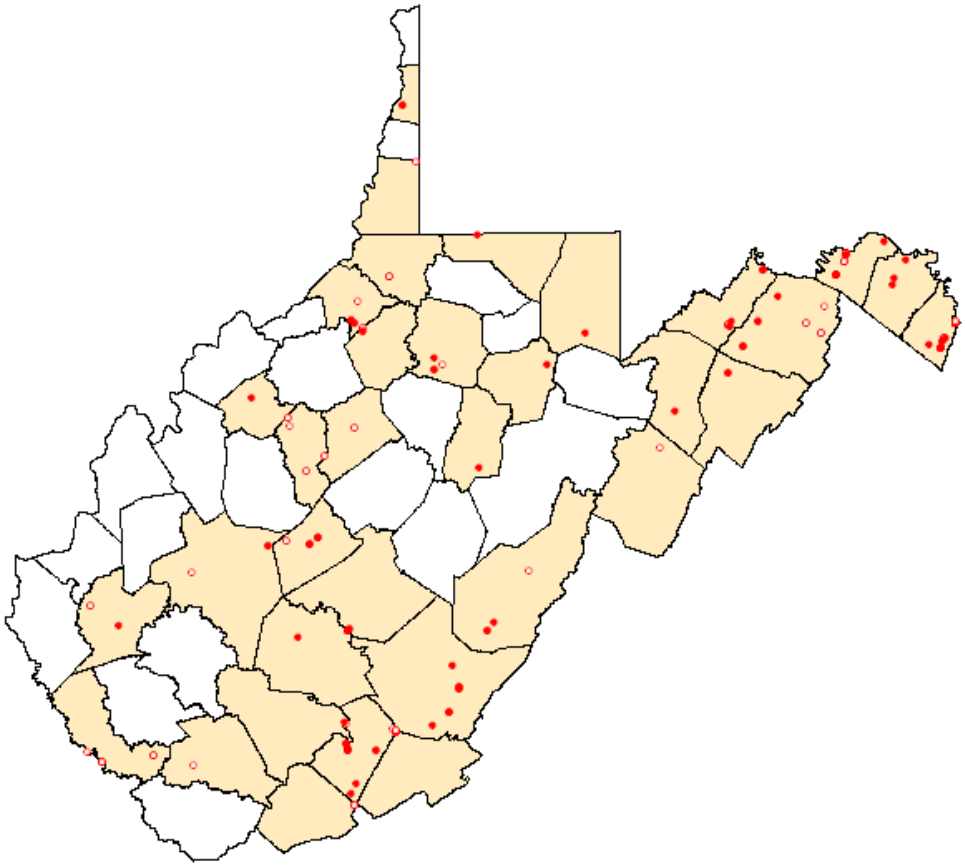
Calopteryx maculata adults have been documented from 1 May — 30 September with 387 valid records.

Suborder Zygoptera
Family Calopterygidae

Hetaerina americana
American Rubyspot

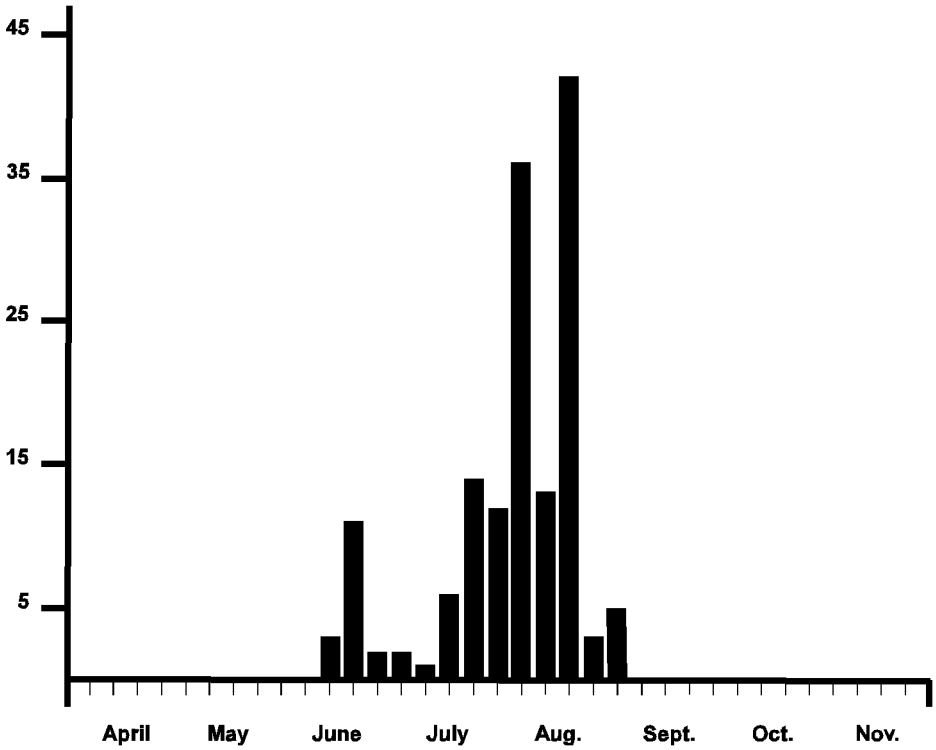
Hetaerina americana male

Hetaerina americana female



Hetaerina americana distribution based on 209 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Absent from high elevation rocky mountain streams (above 2500 ft), *Hetaerina americana* is found throughout the rest of West Virginia. It is especially common on streams with pool and riffle areas edged with patches of water willow (*Justicia americana*).



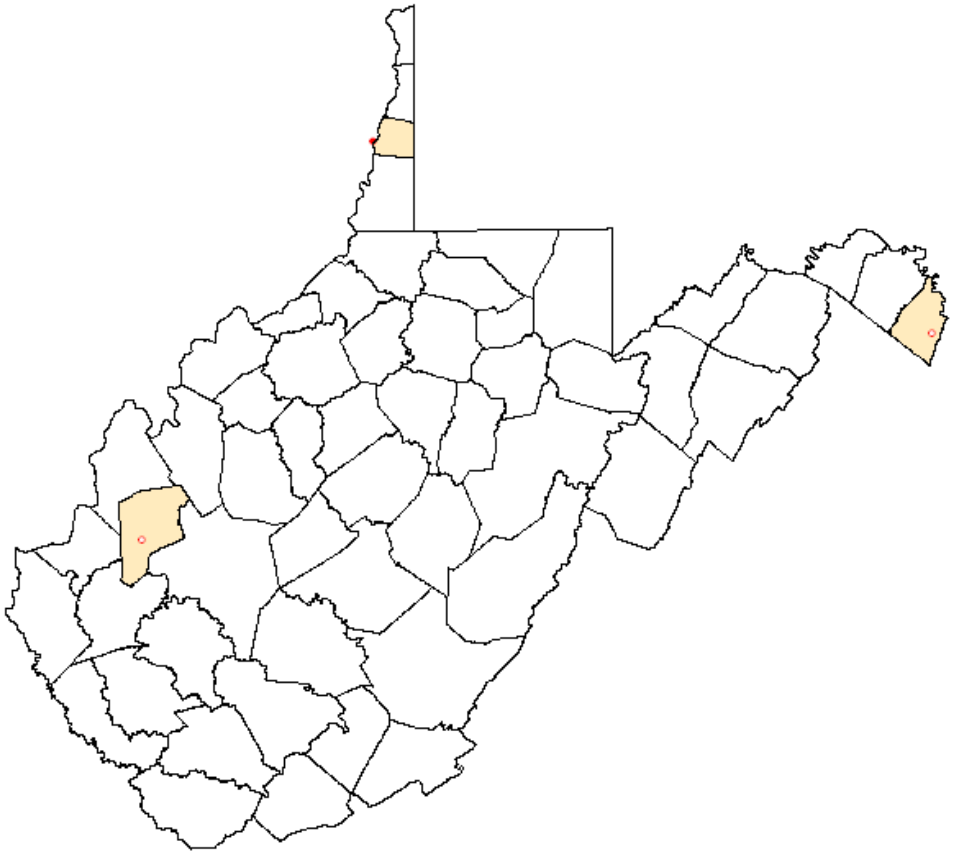
Hetaerina americana adults have been documented from 12 June — 19 September with 206 valid records.

Suborder Zygoptera
Family Calopterygidae

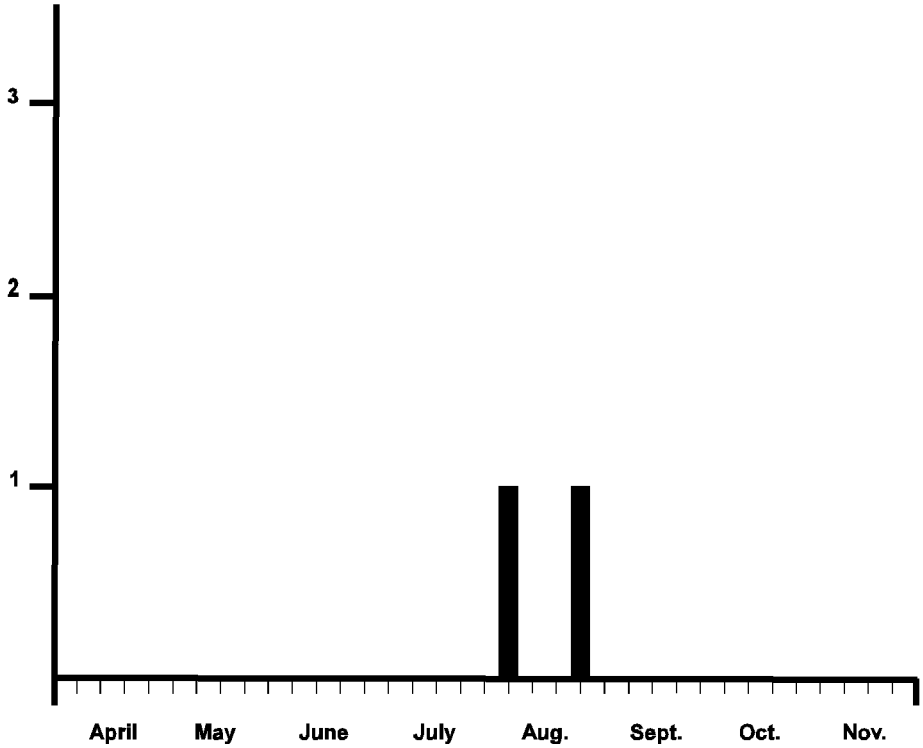
Hetaerina titia
Smoky Rubyspot

Hetaerina titia male

Hetaerina titia female


Hetaerina titia distribution based on 3 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Hetaerina titia was rediscovered in West Virginia on Wheeling Island on the Ohio River after a 34 year hiatus. It is known to have a fairly late and short (4 week) flight period, and prefers larger streams and rivers with moderate current and overhanging vegetation. It likely occurs in other areas of West Virginia including the Kanawha, Little Kanawha, Potomac, and Shenandoah rivers, and additional sites on the Ohio River.



Hetaerina titia adults have been documented from 3 August — 26 August with 2 valid records.

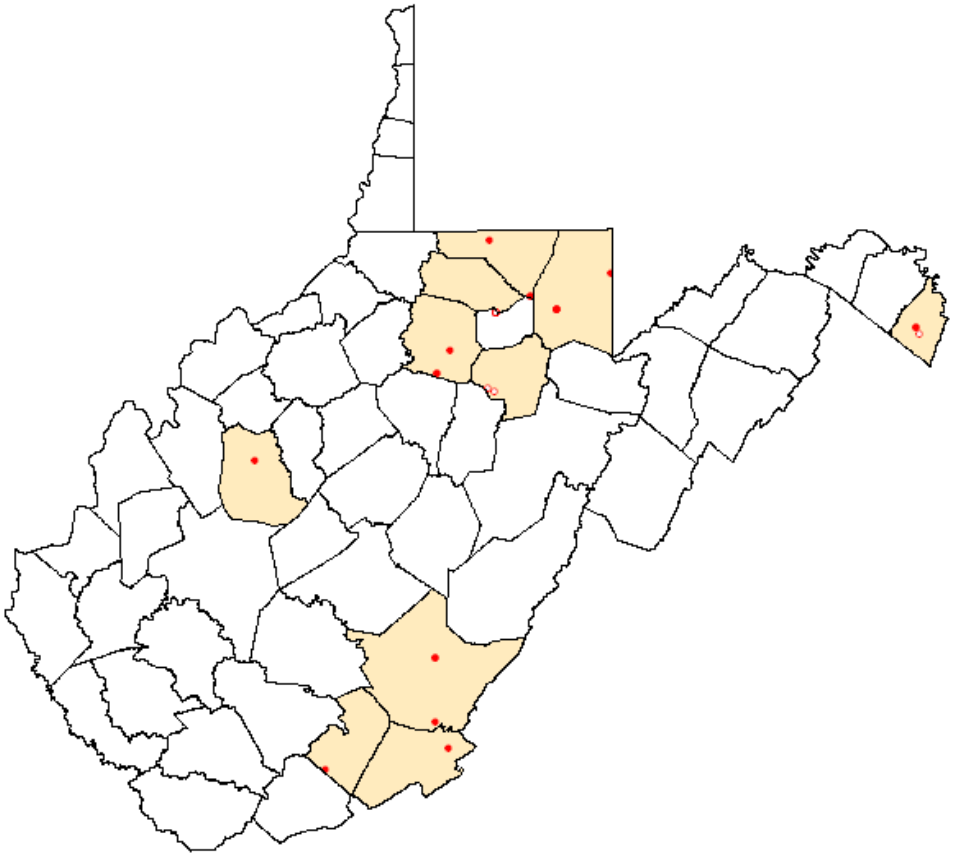
Suborder Zygoptera
Family Lestidae

Archilestes grandis
Great Spreadwing

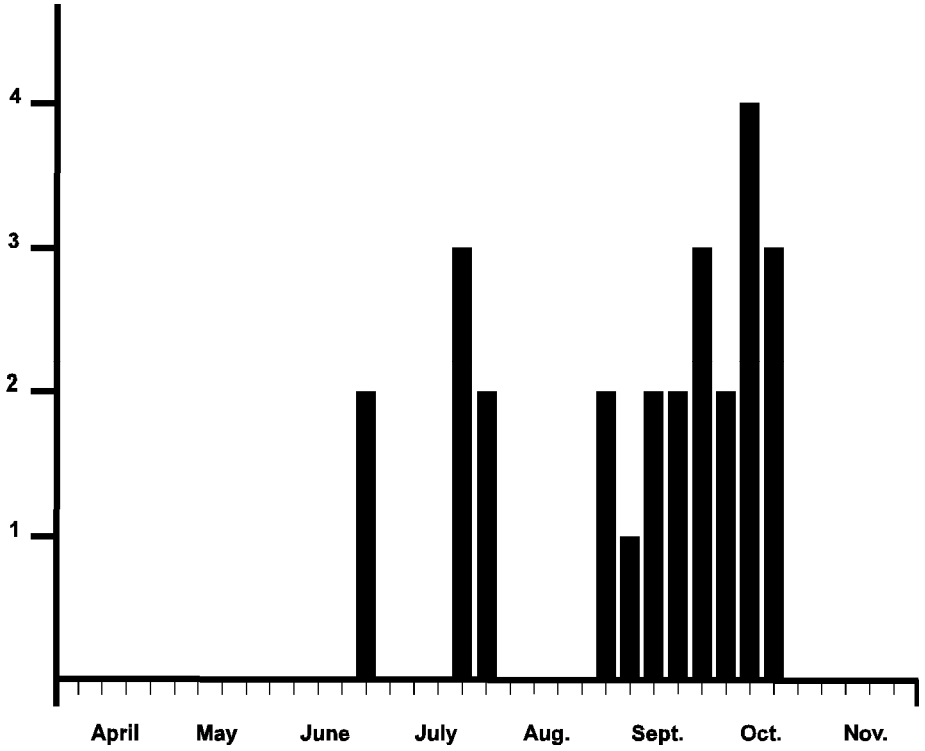
Archiletes grandis male

Archilestes grandis female

Archilestes grandis is most common in late summer along forested and brushy edges with small streams. They likely have a wider distribution in the state than records indicate.



Archilestes grandis distribution based on 29 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.



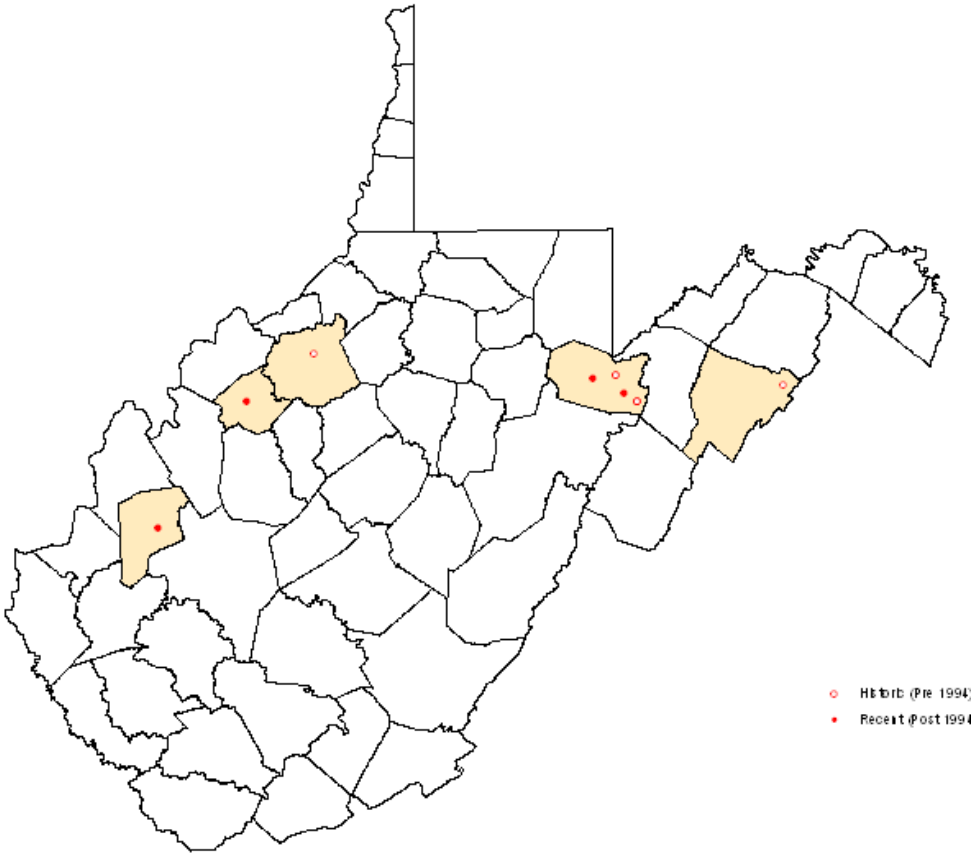
Archilestes grandis adults have been documented from 21 June — 20 October with 26 valid records.

Suborder Zygoptera
Family Lestidae

Lestes australis
Southern Spreadwing

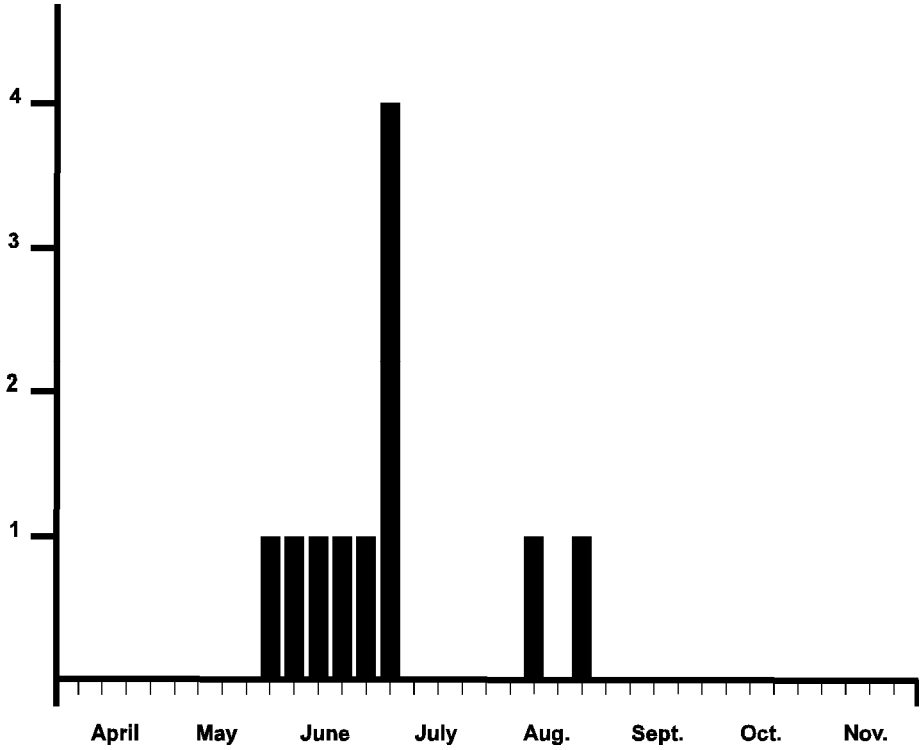
Lestes australis male

Lestes australis female



Lestes australis distribution based on 11 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Lestes australis was split from the Common Spreadwing (*Lestes disjunctus*) in 2003. More records for it certainly exist in West Virginia, but specimens with the former name were unavailable for examination. Like most spreadwings, it prefers pond and marsh edges with abundant vegetation. Because of the difficulty in separating it from *L. disjunctus* and *L. forcipatus*, historical records of these three species may not be entirely accurate.



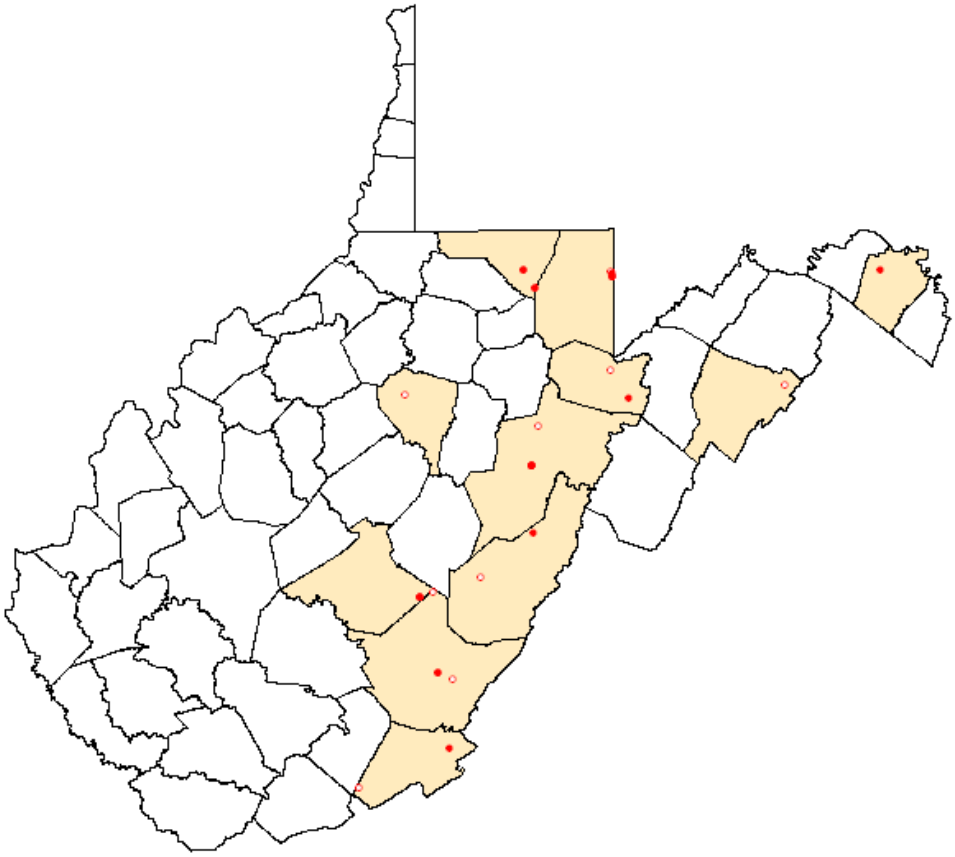
Lestes australis adults have been documented from 25 May — 21 August with 11 valid records.

Suborder Zygoptera
Family Lestidae

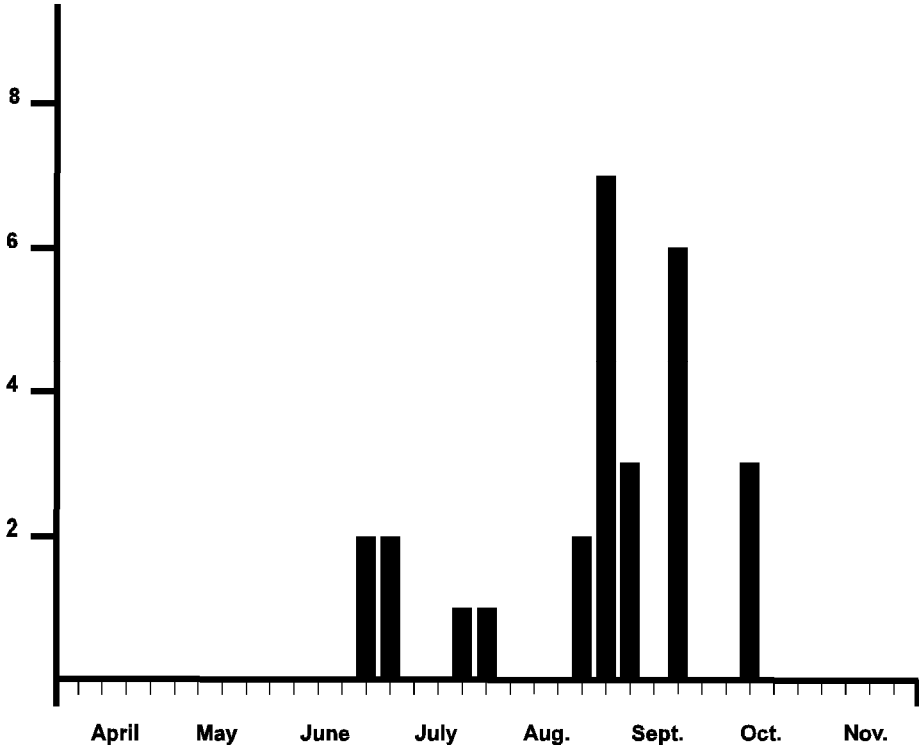
Lestes congener
Spotted Spreadwing

Lestes congener male


Lestes congener female oviposit-


Lestes congener distribution based on 31 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Lestes congener is mostly a species of higher elevation ponds and wetlands in West Virginia, and is found mostly in the mountain counties. It is likely more widespread than records indicate, but its dark coloration, thickly vegetated habitat, and late flight period may have limited its detection by collectors.



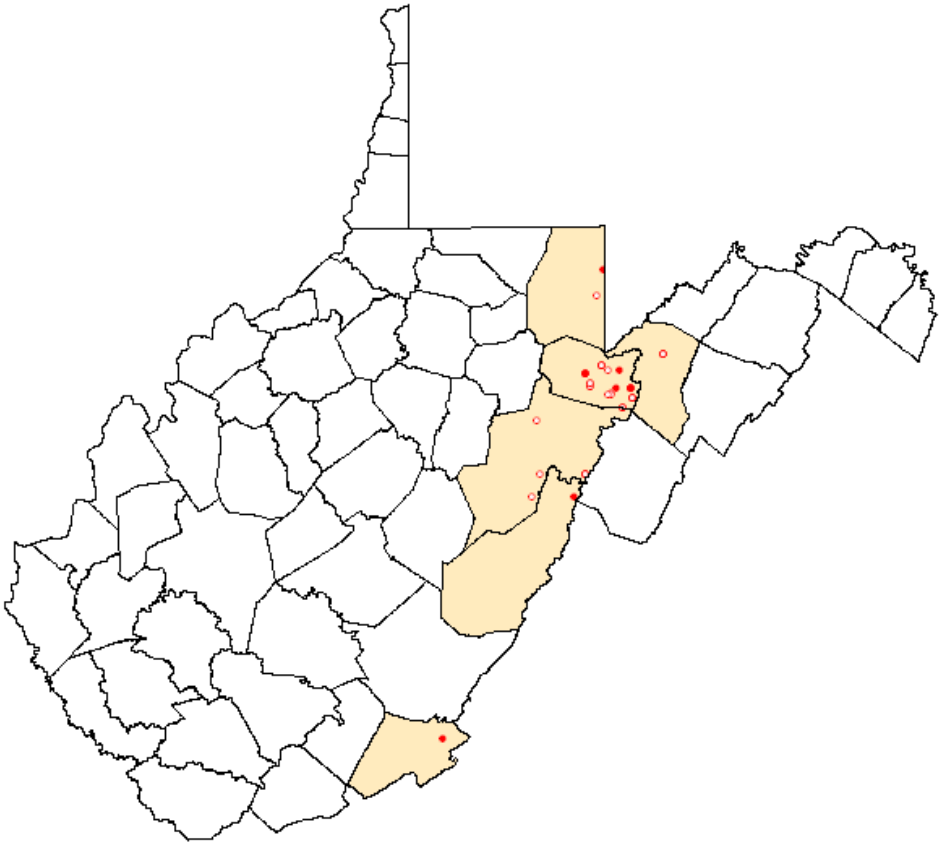
Lestes congener adults have been documented from 17 June — 4 October with 27 valid records.

Suborder Zygoptera
Family Lestidae

Lestes disjunctus
Northern Spreadwing

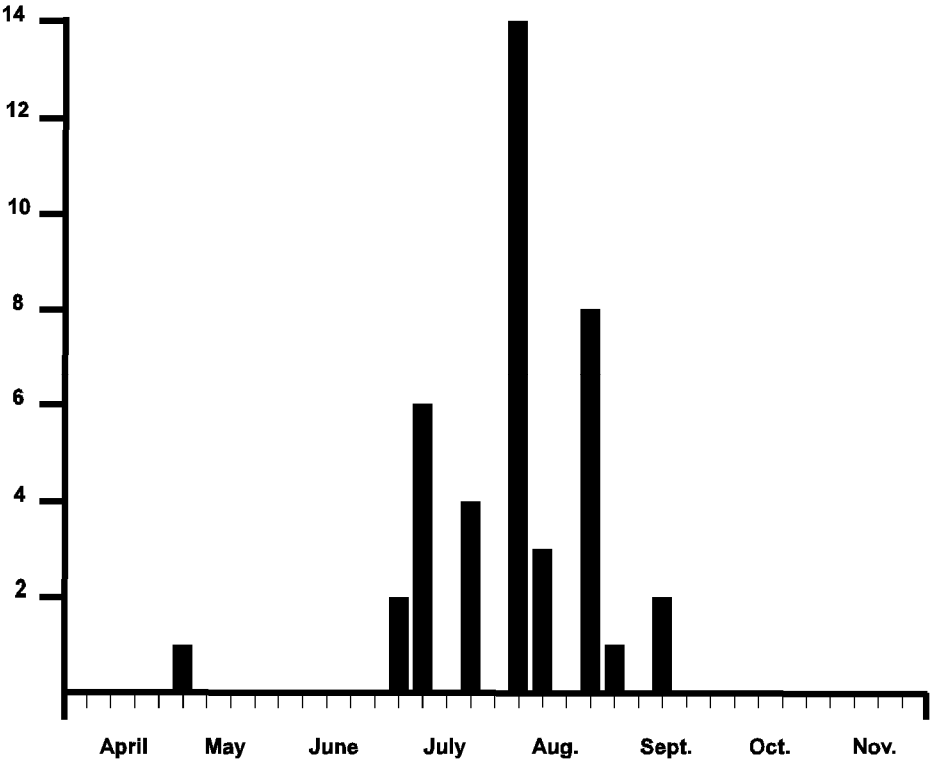
Lestes disjunctus male

Lestes disjunctus female



Lestes disjunctus distribution based on 44 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Lestes disjunctus was split from the Common Spreadwing (*Lestes d. disjunctus*) in 2003. More records for it certainly exist in West Virginia, but specimens with the former name were unavailable for examination. Like most spreadwings this species prefers well vegetated pond and marsh edges, and is found only in the mountain counties. Because of the difficulty in separating it from *L. australis* and *L. forcipatus*, historical records of these three species may not be entirely accurate.



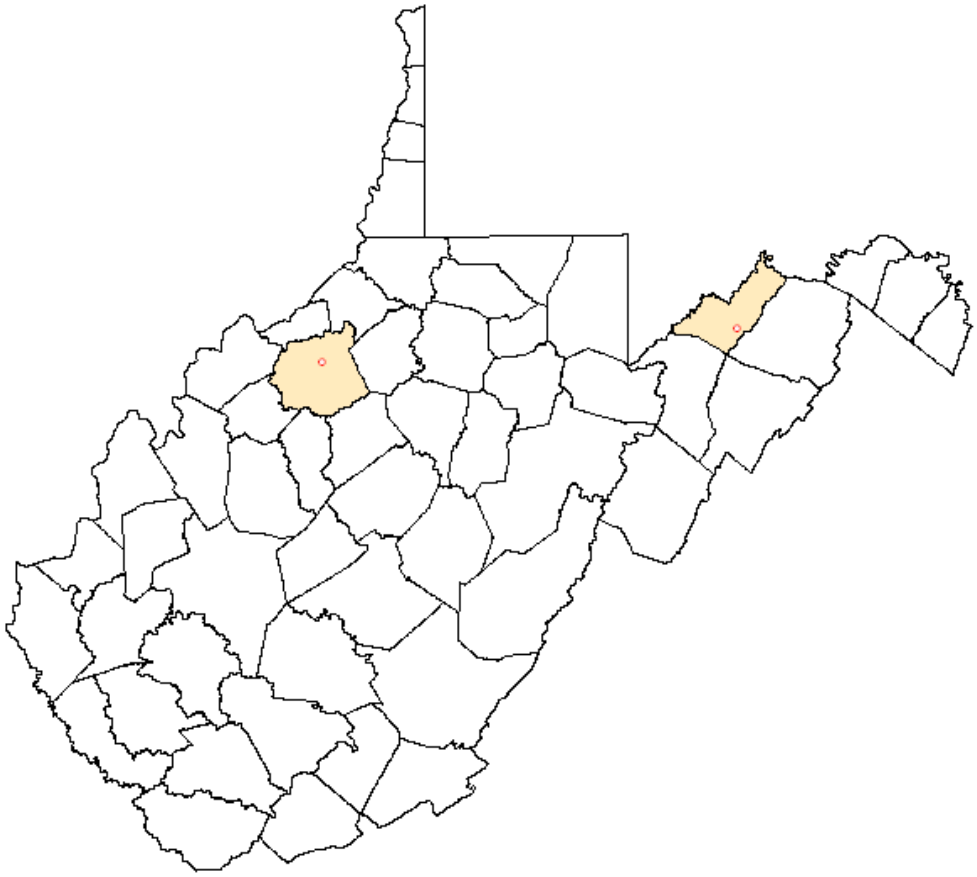
Lestes disjunctus adults have been documented from 27 April — 21 September with 43 valid records.

Suborder Zygoptera
Family Lestidae

Lestes dryas
Emerald Spreadwing

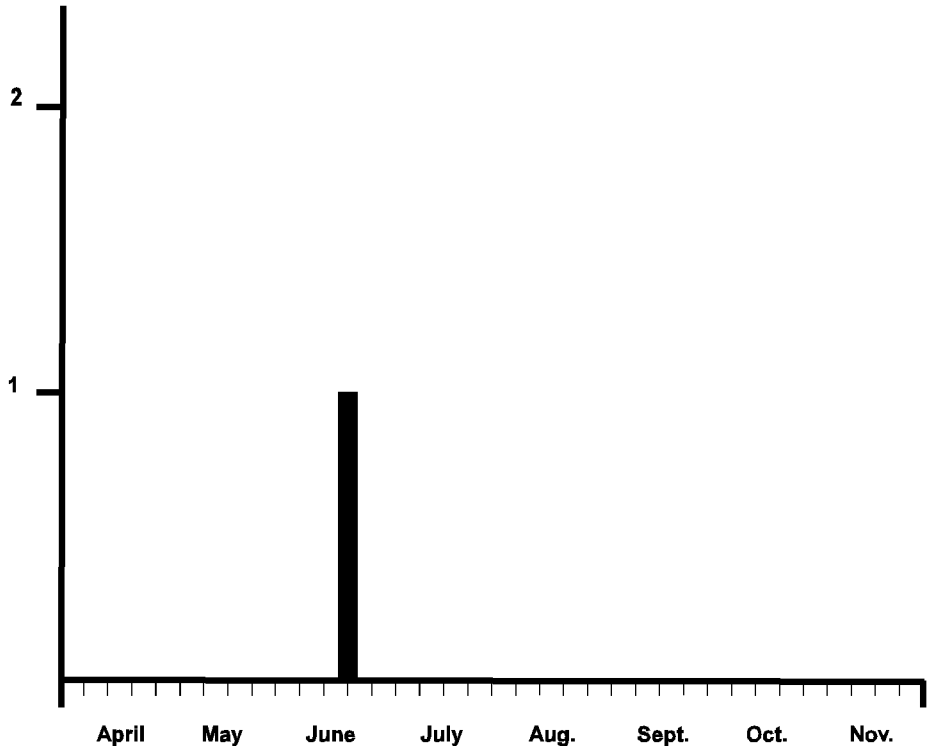
Lestes dryas male

Lestes dryas female



Lestes dryas distribution based on 2 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Lestes dryas was last documented in West Virginia in 1974. Primarily a northern and western species, it approaches its southern limit in the east in West Virginia. It is known to have a fairly early flight period (starting in early May), and is found around pond and marsh edges, including ephemeral ponds.



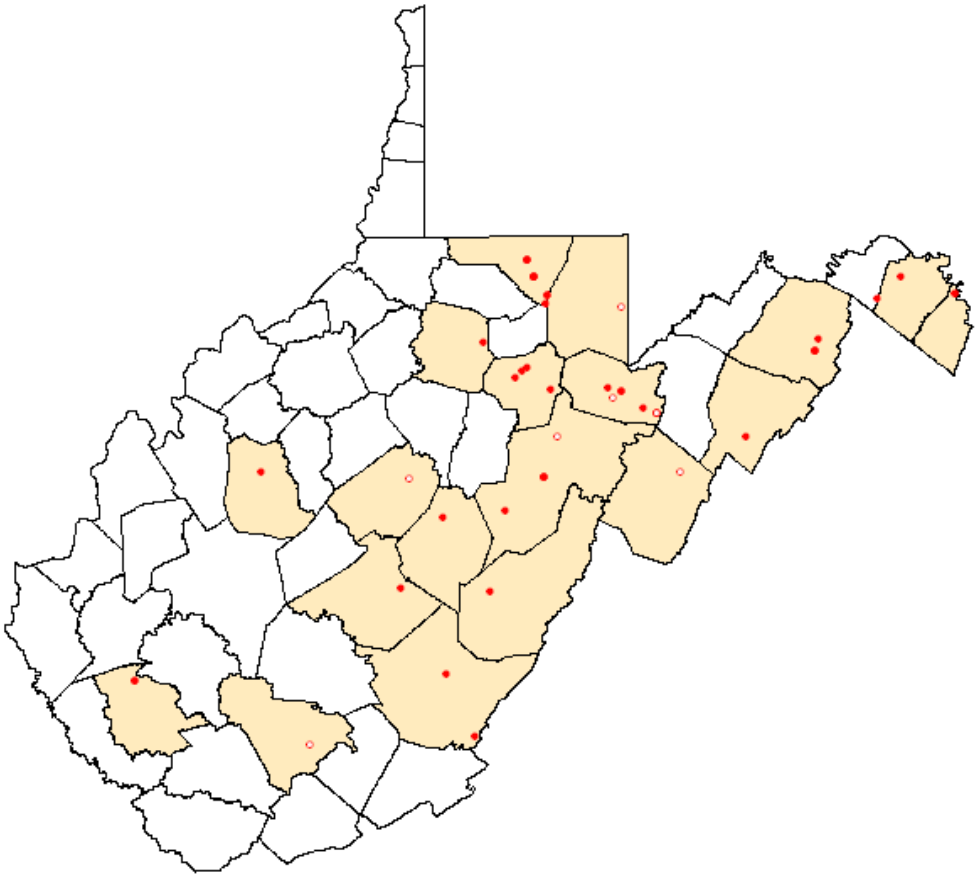
One *Lestes dryas* adult has been documented from 15 June.

Suborder Zygoptera
Family Lestidae

Lestes eurinus
Amber-winged Spreadwing

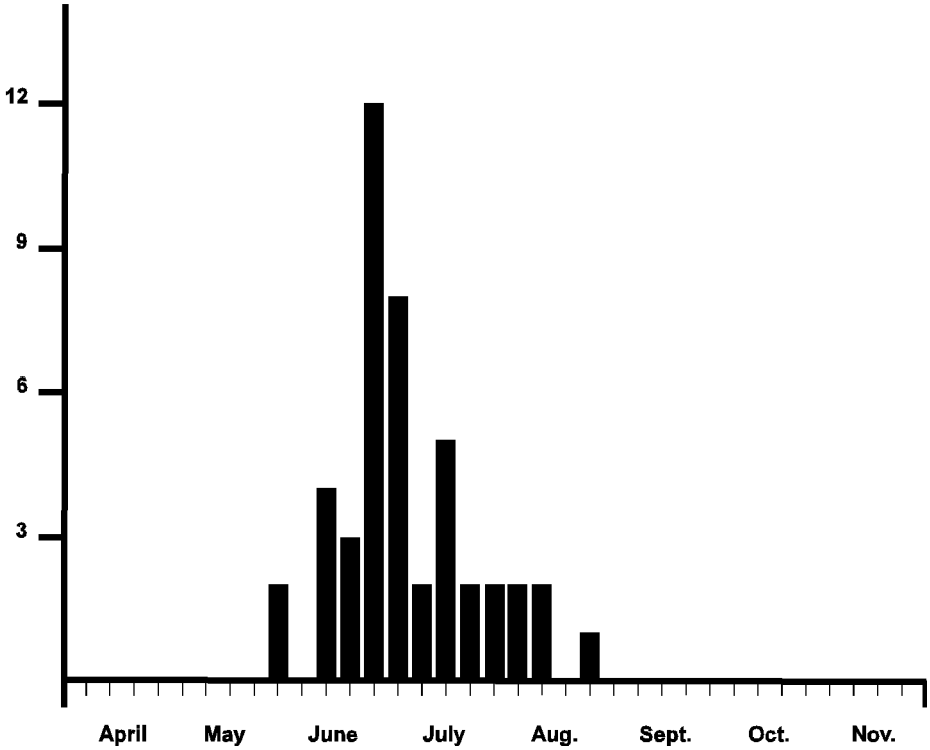
Lestes eurinus male

Lestes eurinus female



Lestes eurinus distribution based on 48 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Recent survey work has expanded the West Virginia distribution of *Lestes eurinus* significantly. Formerly documented from only six counties, it is now known from an additional fourteen counties. It is most commonly found along well vegetated edges of ponds, ditches. and marshes.



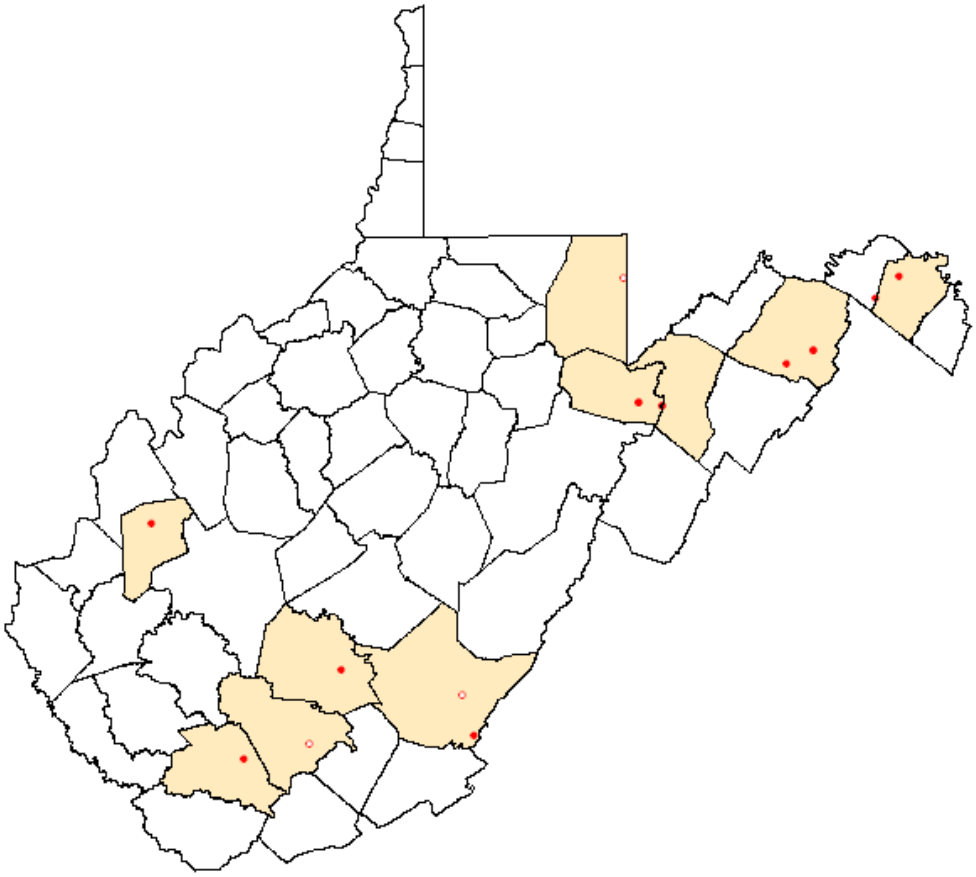
Lestes eurinus adults have been documented from 31 May — 26 August with 45 valid records.

Suborder Zygoptera
Family Lestidae

Lestes forcipatus
Sweetflag Spreadwing

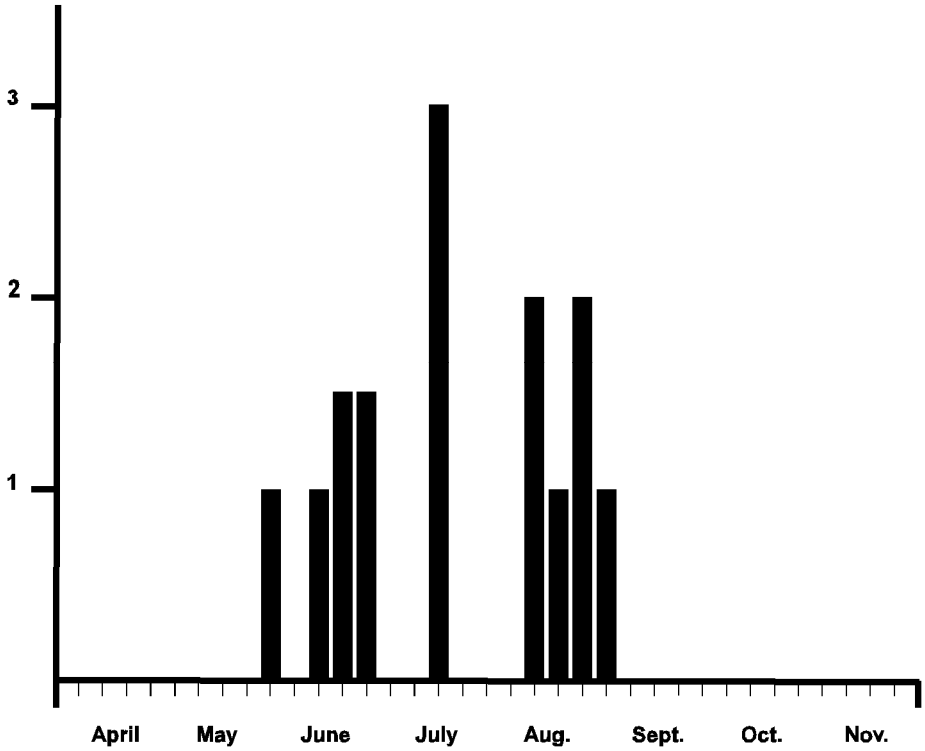
Lestes forcipatus male

Lestes forcipatus female



Lestes forcipatus distribution based on 16 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Recent survey work has significantly increased the West Virginia distribution of *Lestes forcipatus.* Historically known from only four counties, it has been documented from six additional counties and is likely found in several more. Because of the difficulty in separating it from *L. australis* and *L. disjunctus*, historical records of these three species may not be entirely accurate.



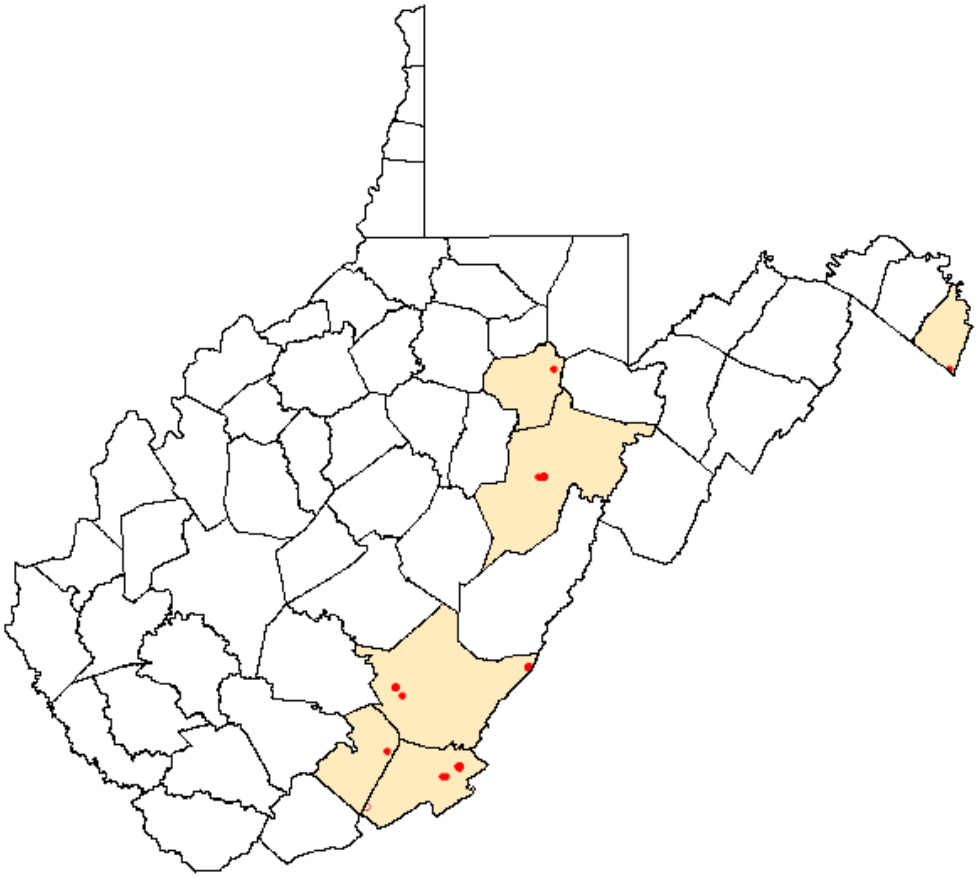
Lestes forcipatus adults have been documented from 25 May — 1 September with 15 valid records.

Suborder Zygoptera
Family Lestidae

Lestes inaequalis
Elegant Spreadwing

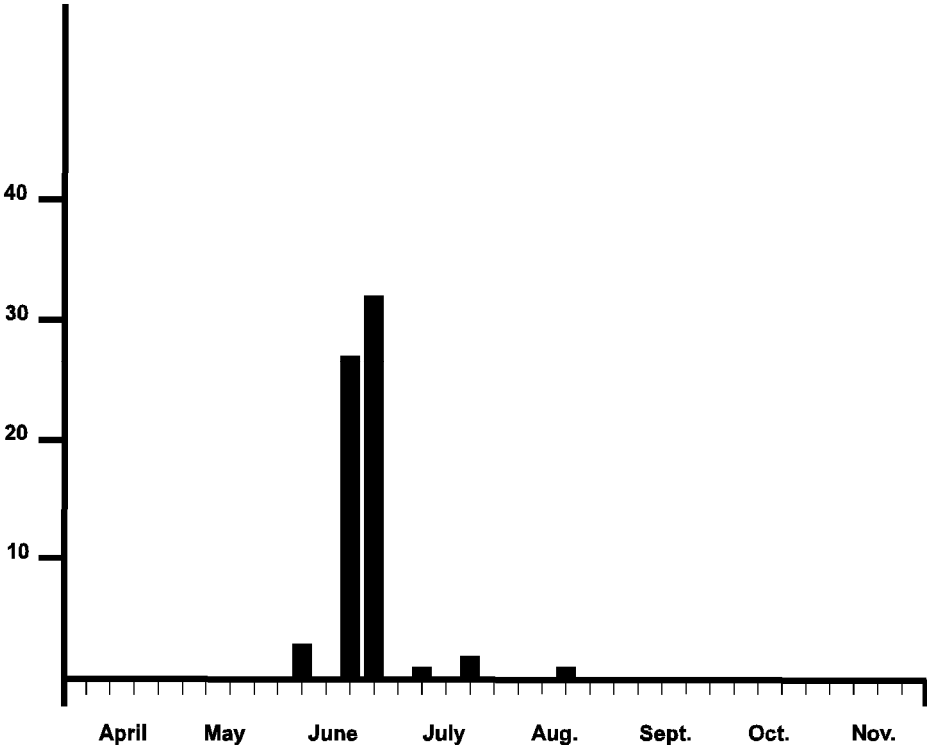
Lestes inaequalis male

Lestes inaequalis female



Lestes inaequalis distribution based on 67 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Although a widespread eastern species, *Lestes inaequalis* has only scattered records in primarily higher elevation areas of West Virginia. Perhaps because it prefers forested ponds, forested slow streams, and deeper marshy areas bordered with thick vegetation, collectors either haven't looked for it, or have found it difficult to physically sample where it occurs.



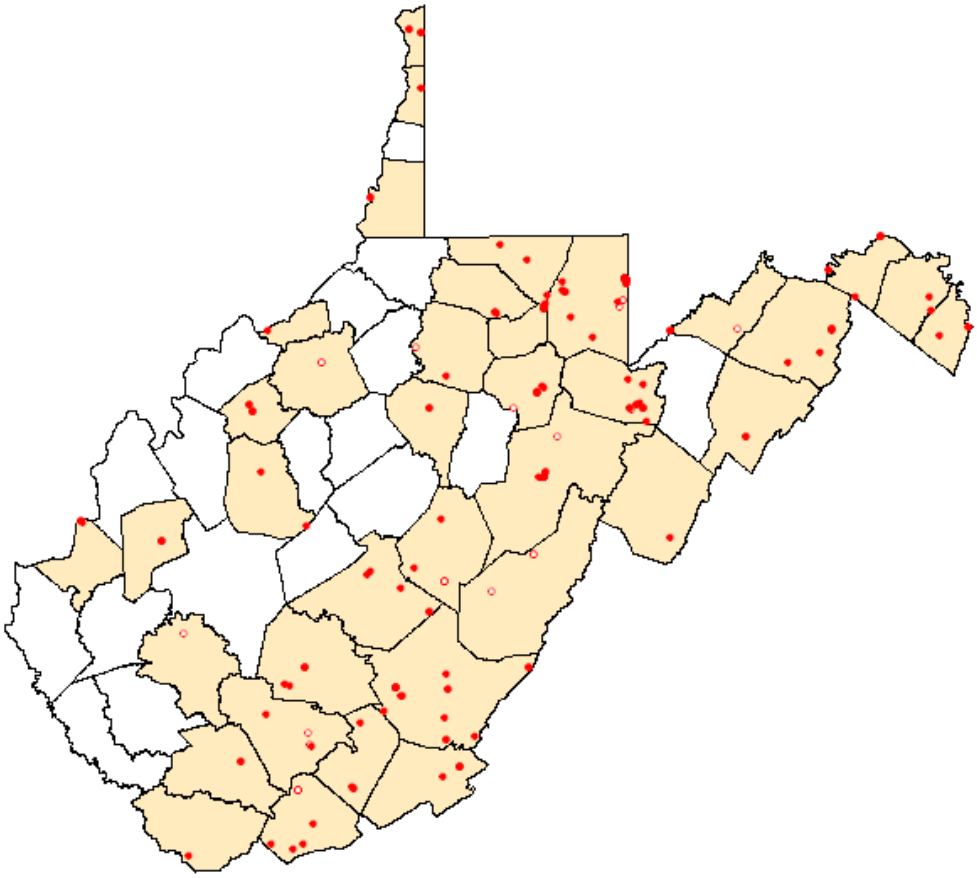
Lestes inaequalis adults have been documented from 1 June — 23 August with 66 valid records.

Suborder Zygoptera
Family Lestidae

Lestes rectangularis
Slender Spreadwing

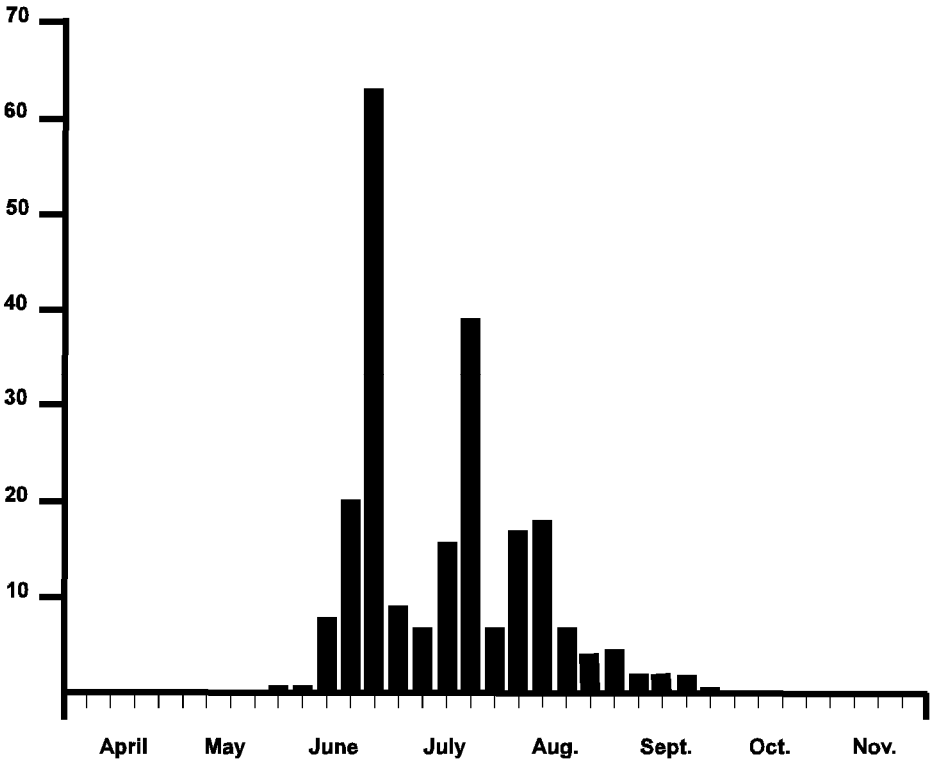
Lestes rectangularis male

Lestes rectangularis female



Lestes rectangularis distribution based on 245 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

The most frequently encountered spreadwing in West Virginia, *Lestes rectangularis* is ubiquitous at ponds and other well vegetated still water, and is likely found statewide. Its dark dorsal coloration and unobtrusive behavior may have allowed it to escape the notice of collectors in areas where it hasn't been documented.



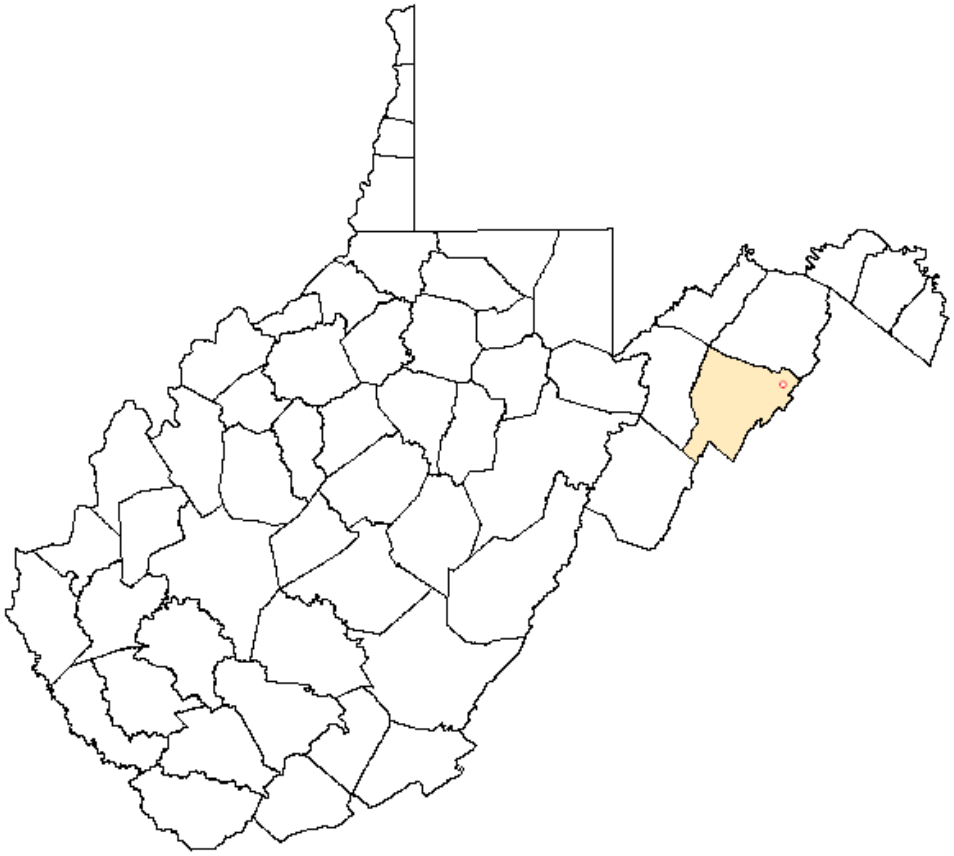
Lestes rectangularis adults have been documented from 31 May — 29 September with 232 valid records.

Suborder Zygoptera
Family Lestidae

Lestes unguiculatus
Lyre-tipped Spreadwing

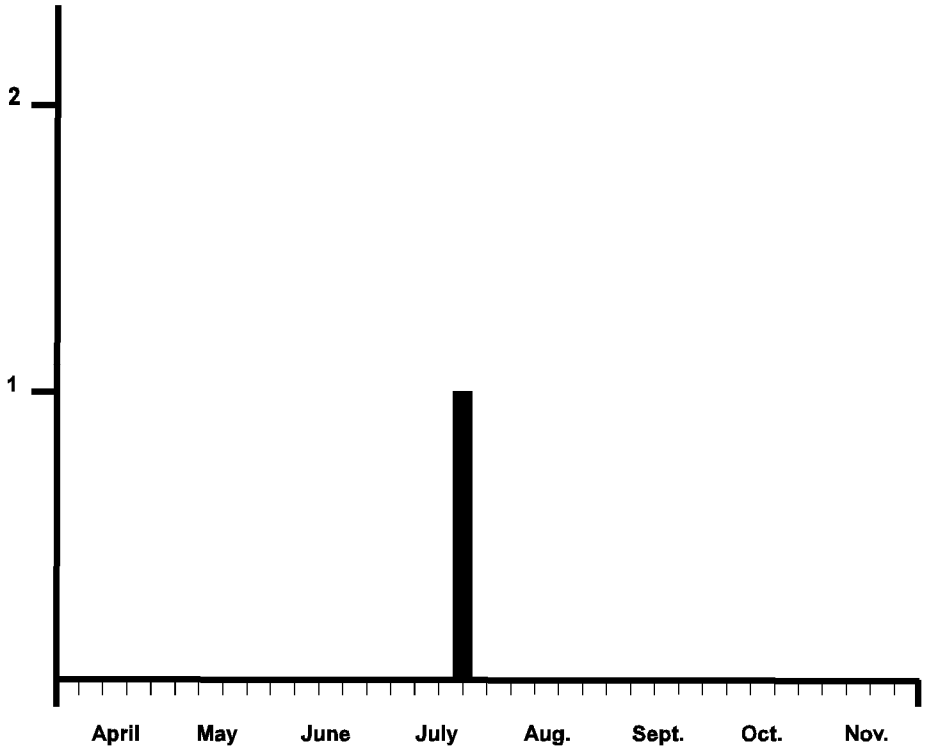
Lestes unguiculatus male

Lestes unguiculatus female



Lestes unguiculatus distribution based on 1 record. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Primarily a northern and western species, *Lestes unguiculatus* approaches the southern limit of its range in West Virginia. It is known from one record from 1971 that has only a vague location. Survey of low elevation marshy ponds, oxbows, and sloughs may produce additional records.



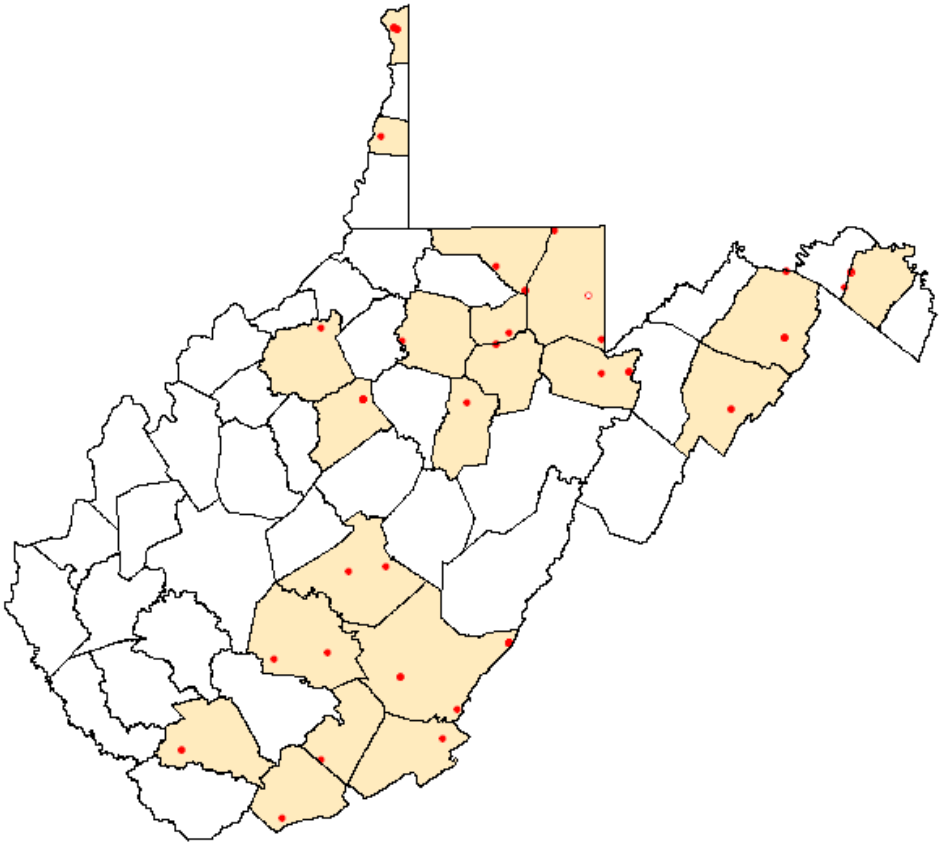
One valid adult record for *Lestes unguiculatus* from 22 July.

Suborder Zygoptera
Family Lestidae

Lestes vigilax
Swamp Spreadwing

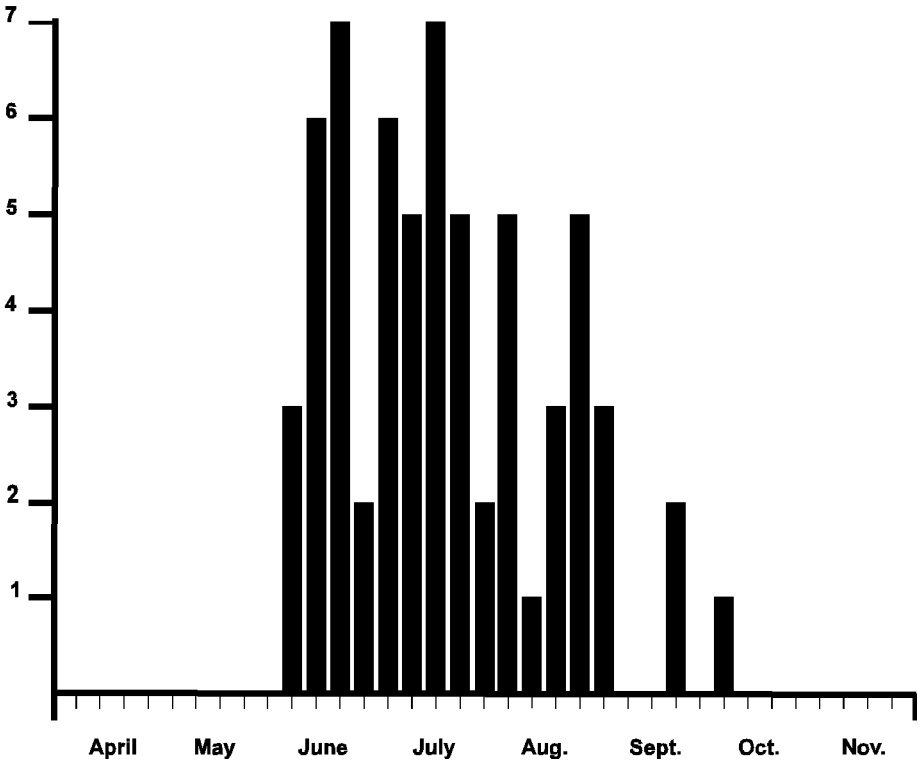
Lestes vigilax male

Lestes vigilax female



Lestes vigilax distribution based on 68 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Historically known from only one county in West Virginia, the distribution for *Lestes vigilax* has significantly increased to include twenty additional counties. It prefers well vegetated edges of shaded ponds, boggy ditches, and swamps.



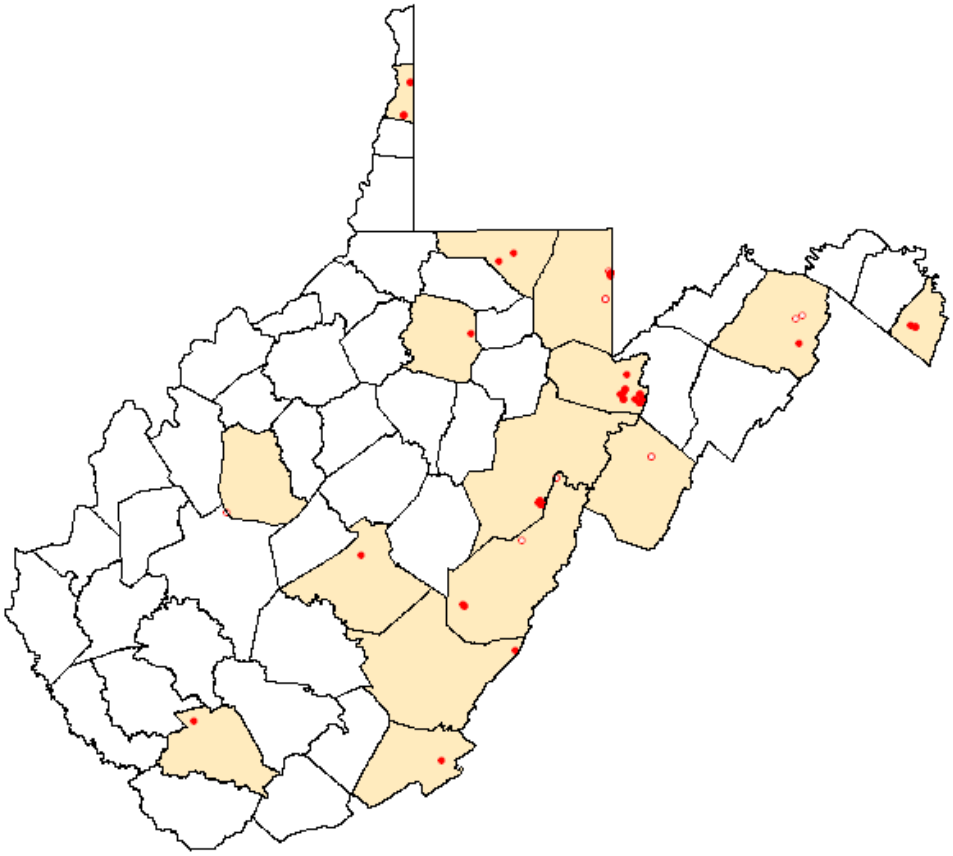
Lestes vigilax adults have been documented from 5 June — 6 October with 63 valid records.

Suborder Zygoptera
Family Coenagrionidae

Amphiagrion saucium
Eastern Red Damsel

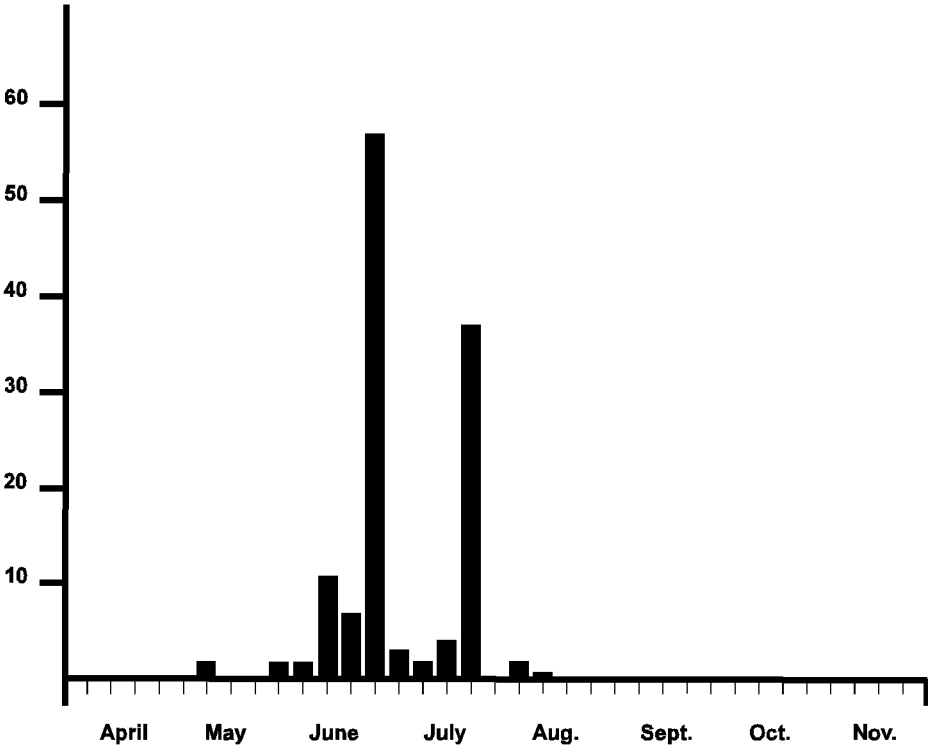
Amphiagrion saucium male

Amphiagrion saucium female



Amphiagrion saucium distribution based on 132 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Recent surveys have documented *Amphigrion saucium* from six additional counties from its previous five, significantly expanding its West Virginia distribution. This little damselfly can be found along well vegetated edges of ponds, pools, marshes, seeps, and ditches. Often difficult to detect, it may have a more extensive distribution than records indicate.



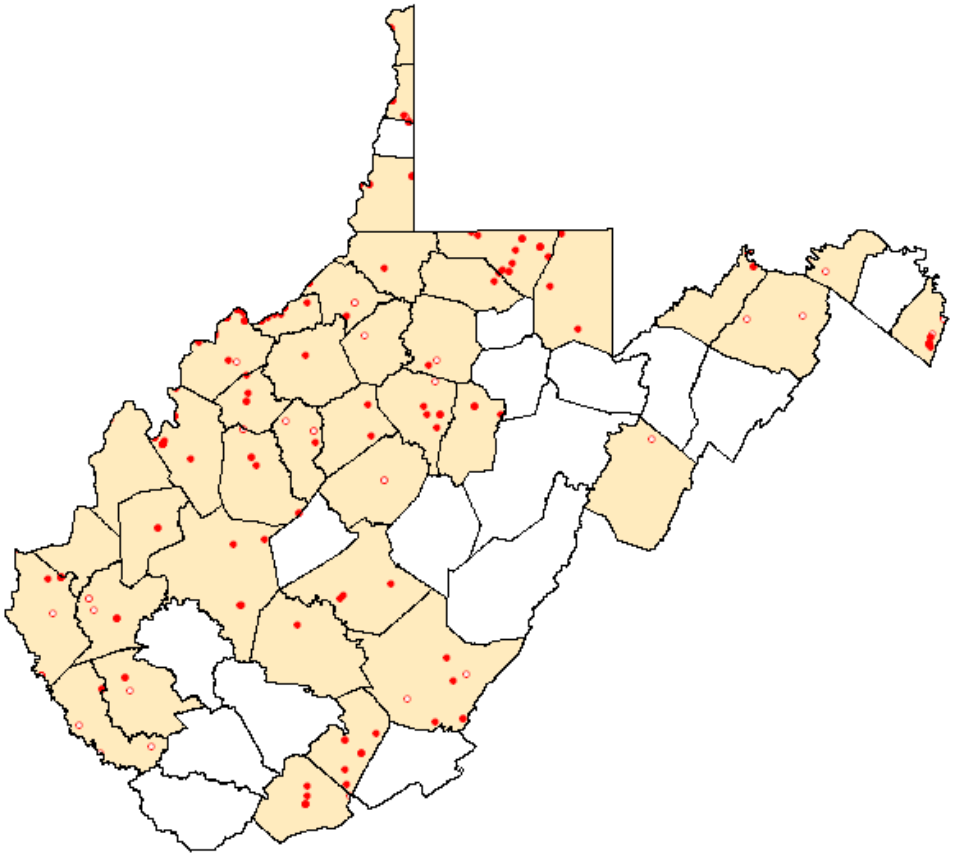
Amphiagrion saucium adults have been documented from 12 May — 13 August with 130 valid records.

Suborder Zygoptera
Family Coenagrionidae

Argia apicalis
Blue-fronted Dancer

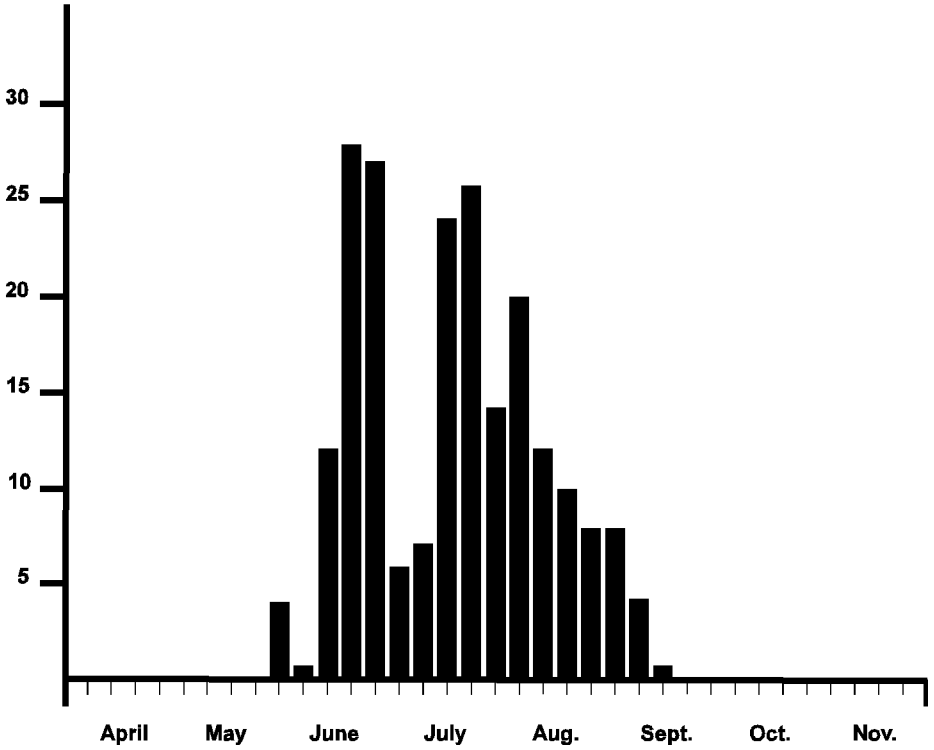
Argia apicalis male

Argia apicalis female blue phase—can also be tan



Argia apicalis distribution based on 250 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Common along most streams and rivers in the western part of West Virginia, *Argia apicalis* is generally absent from high elevations and less common in the Eastern Panhandle.



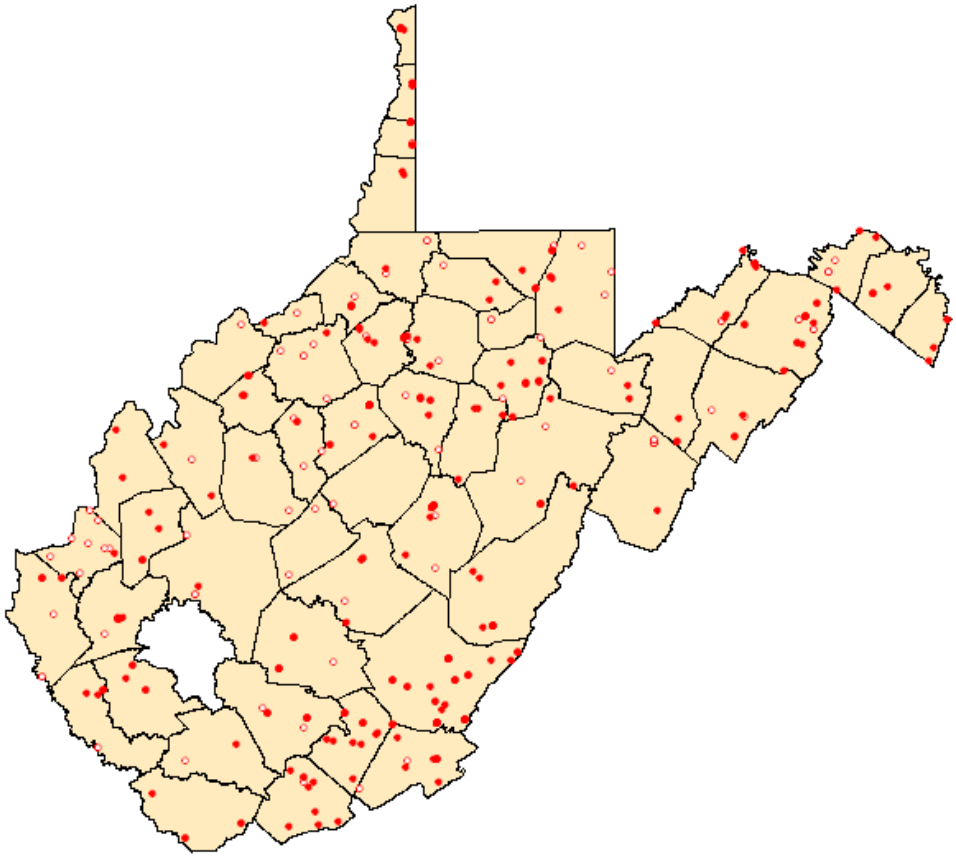
Argia apicalis adults have been documented from 24 May — 12 September with 212 valid records.

Suborder Zygoptera
Family Coenagrionidae

Argia fumipennis violacea
Variable Dancer

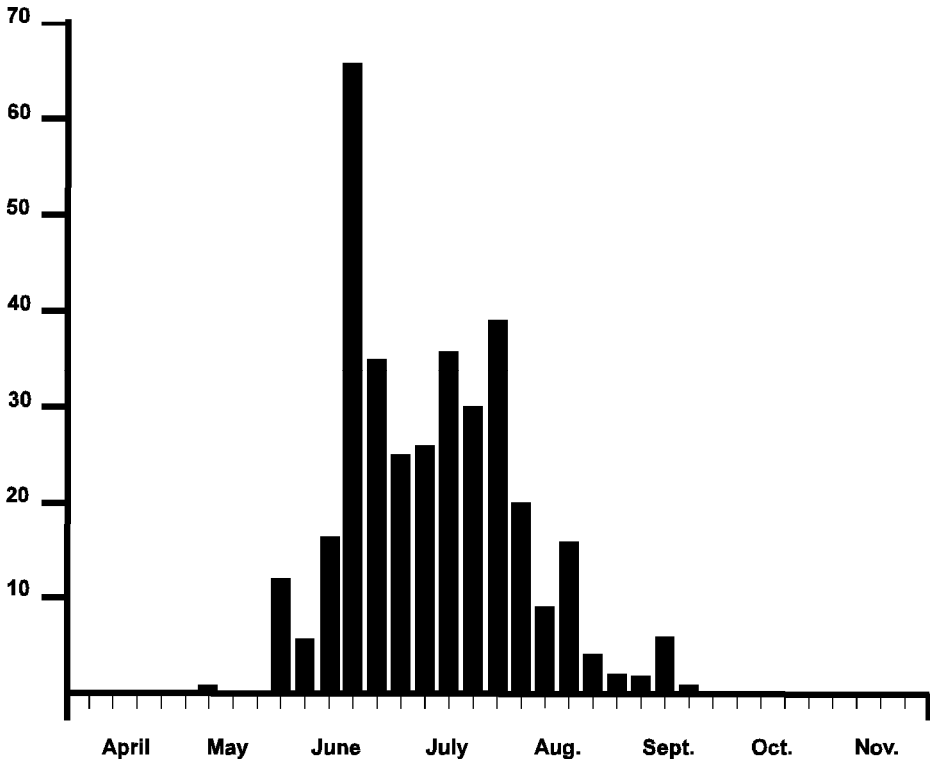
Argia fumipennis violacea male

Argia fumipennis violacea female



Argia fumipennis violcaea distribution based on 403 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

One of the most frequently encountered odonates in West Virginia, *Argia fumipennis violacea* can be found over a variety of aquatic habitats including streams, rivers, ponds, ditches, and swamps.



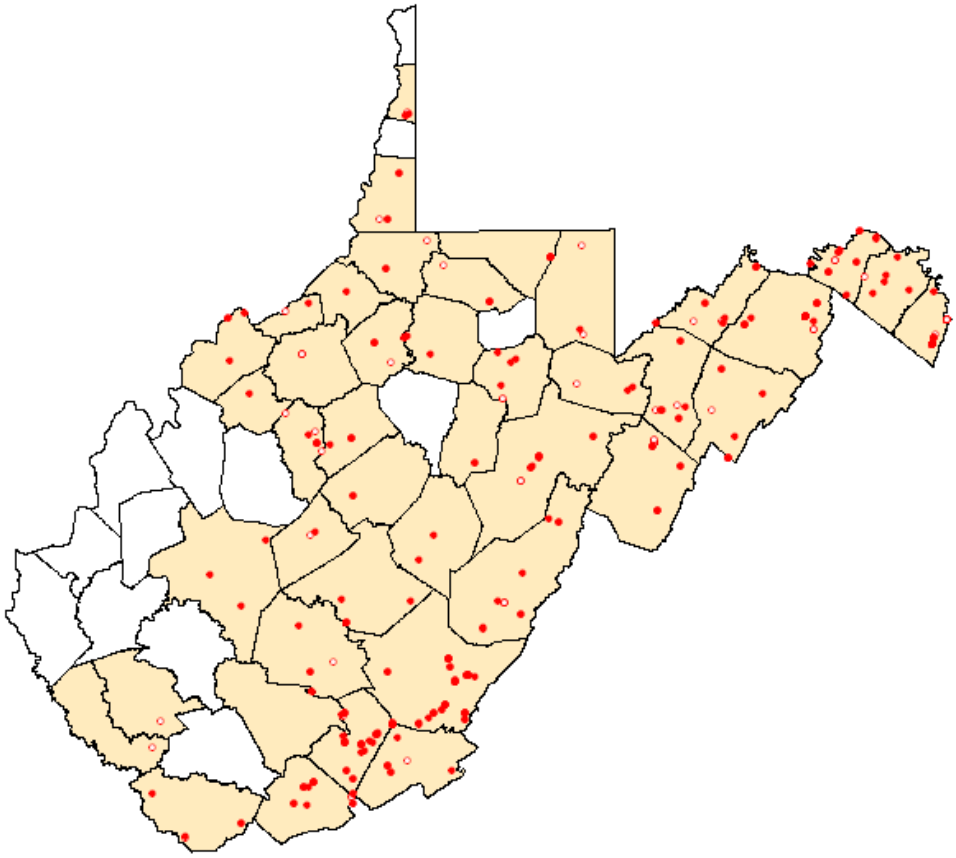
Argia fumipennis violacea adults have been documented from 11 May — 3 October with 378 valid records.

Suborder Zygoptera
Family Coenagrionidae

Argia moesta
Powdered Dancer

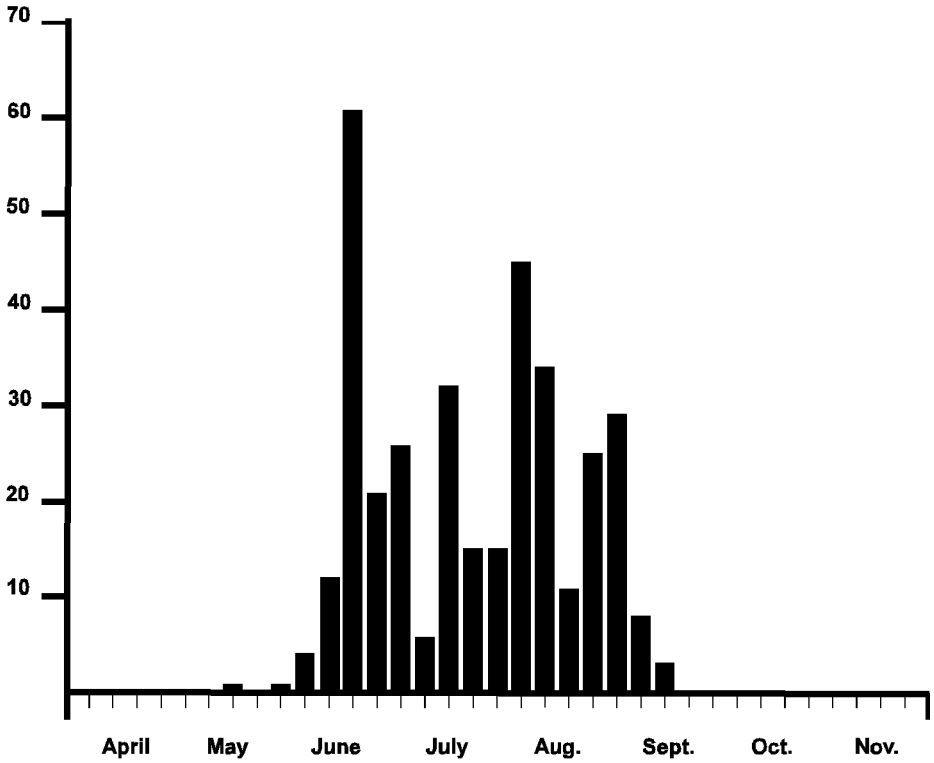
Argia moesta male

Argia moesta female tan phase—can also be blue



Argia moesta distribution based on 440 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

One of the most common odonates on West Virginia streams and rivers, *Argia moesta* is commonly observed from June into September. They are known to congregate in large numbers on exposed twigs or branches protruding above the surface of the water.



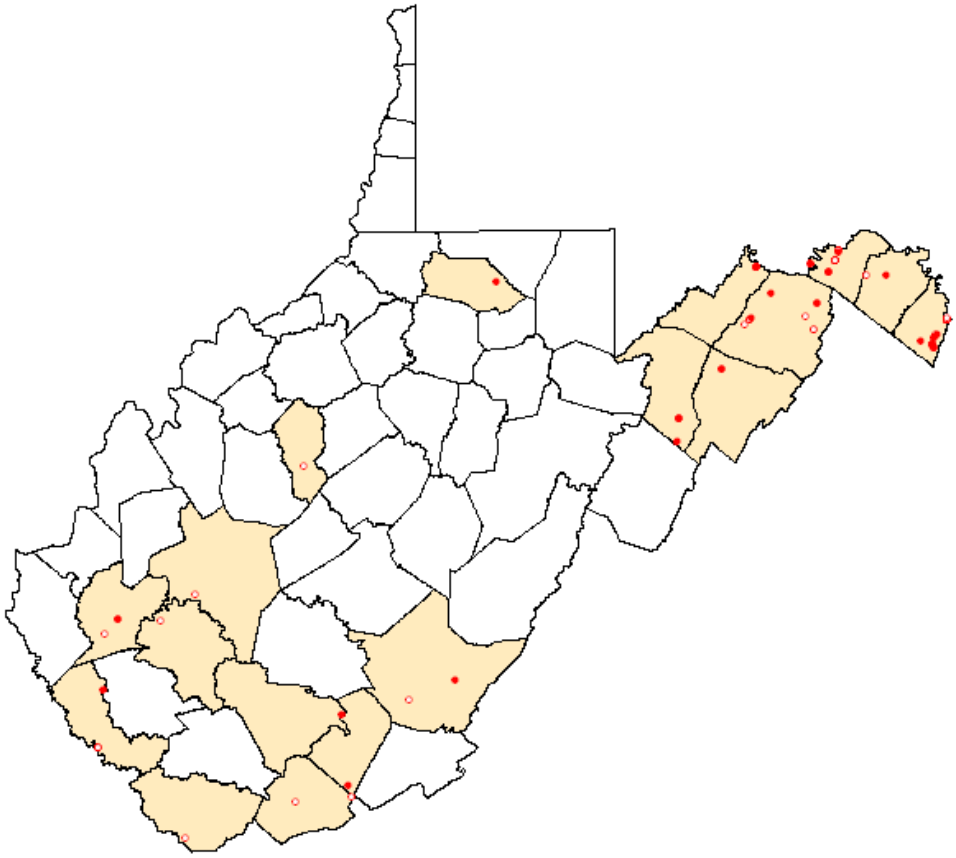
Argia moesta adults have been documented from 17 May — 19 September with 349 valid records.

Suborder Zygoptera
Family Coenagrionidae

Argia sedula
Blue-ringed Dancer

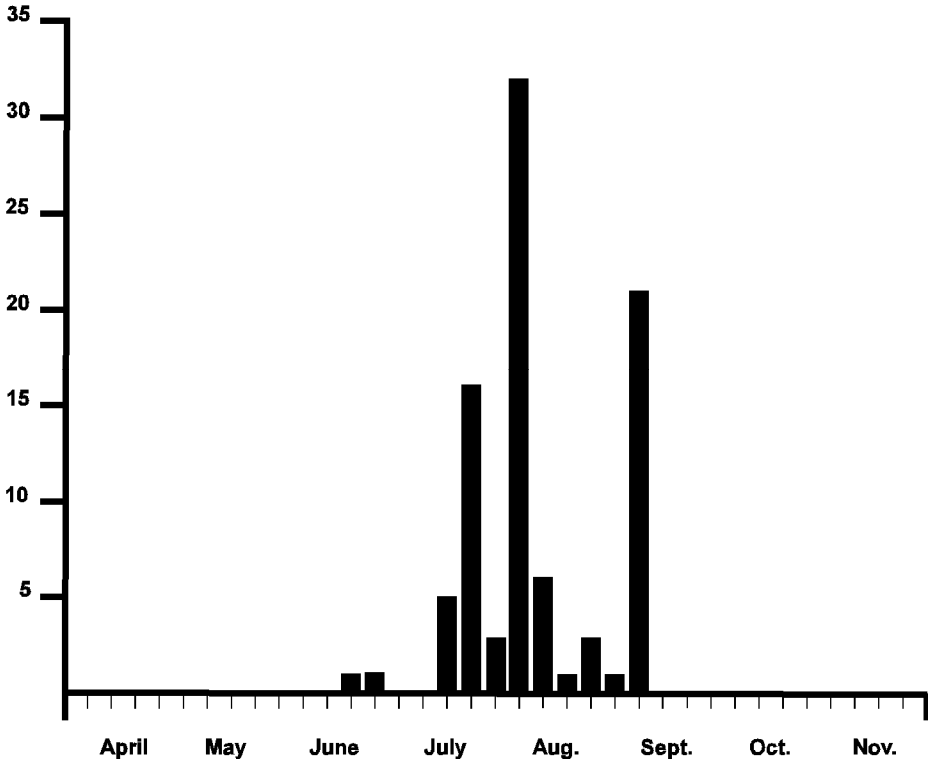
Argia sedula male

Argia sedula female



Argia sedula distribution based on 94 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

West Virginia's least common dancer, *Argia sedula* is most frequently encountered in the Eastern Panhandle along streams with riffles and pools.



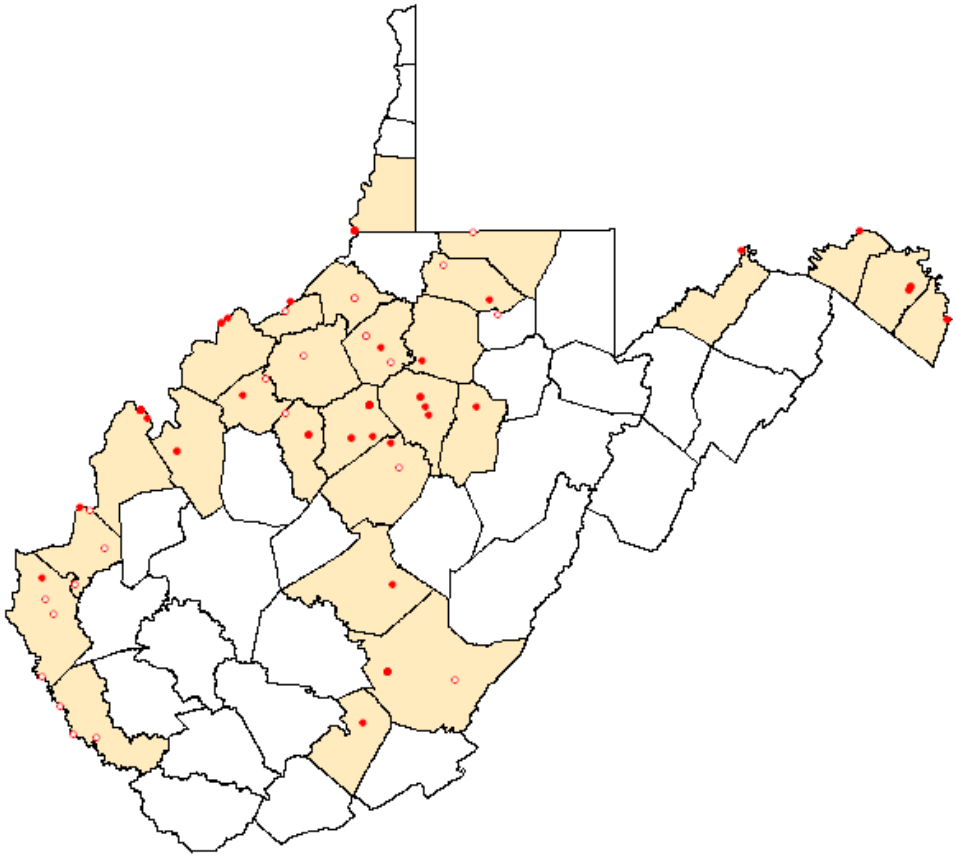
Argia sedula adults have been documented from 21 June — 9 September with 90 valid records.

Suborder Zygoptera
Family Coenagrionidae

Argia tibialis
Blue-tipped Dancer

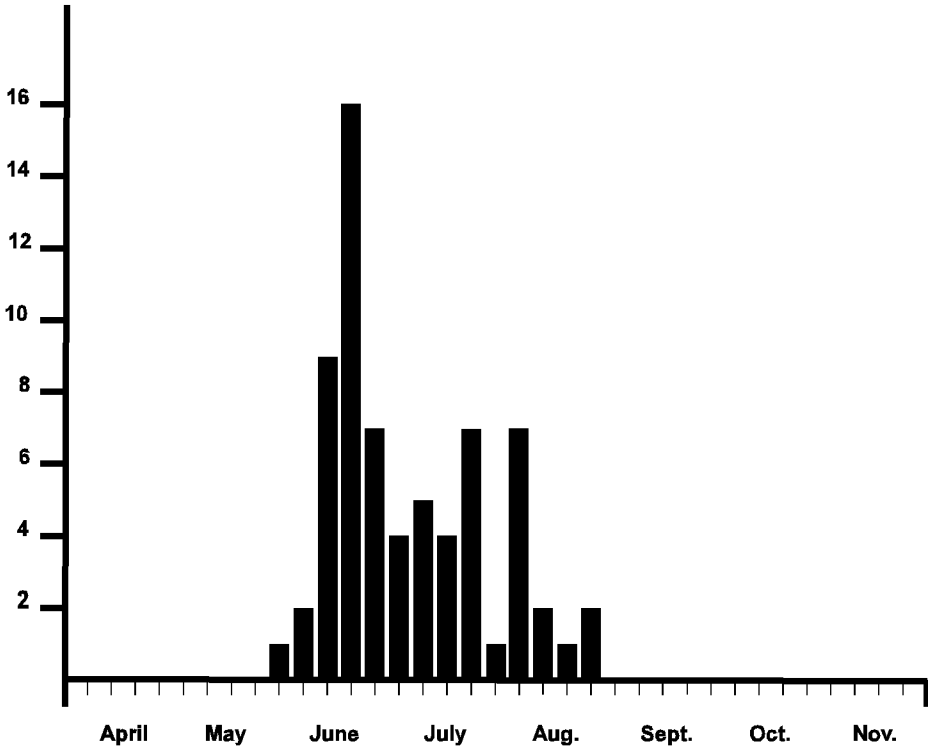
Argia tibialis male

Argia tibialis female



Argia tibialis distribution based on 92 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Argia tibialis is encountered most frequently on streams in the west central part of West Virginia. It may be more common, but the dark dorsal coloration of the male makes it difficult to detect against the dark water of streams. It may have a broader distribution than records indicate.



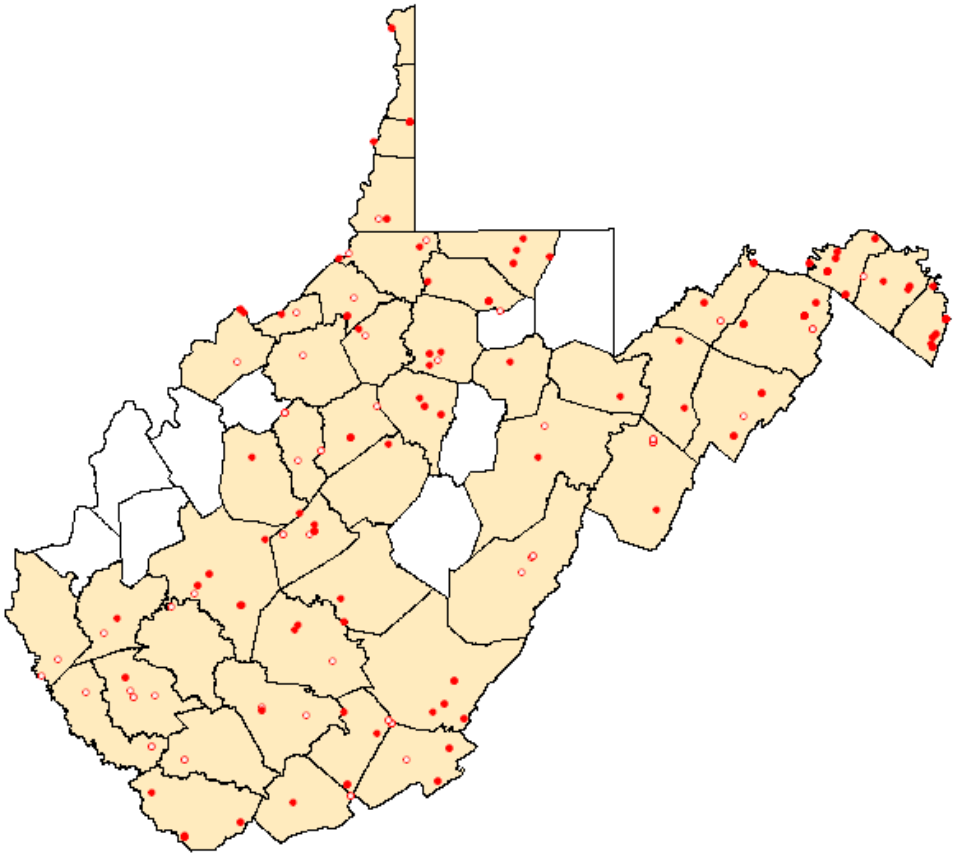
Argia tibialis adults have been documented from 27 May — 26 August with 68 valid records.

Suborder Zygoptera
Family Coenagrionidae

Argia translata
Blue-tipped Dancer

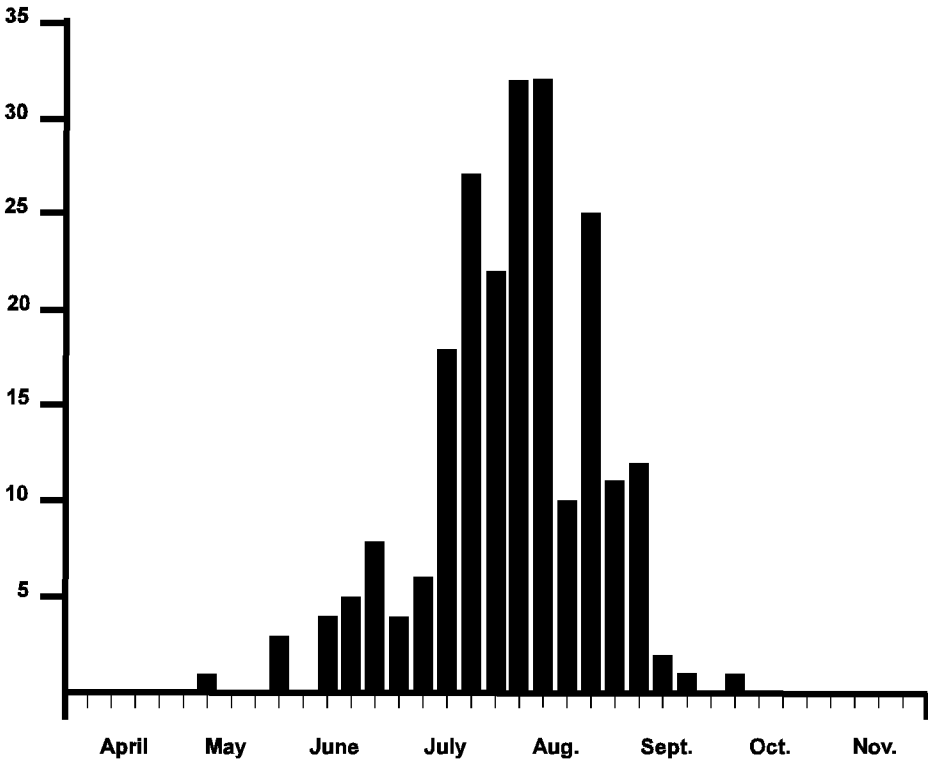
Argia translata male

Argia translata female



Argia translata distribution based on 241 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Argia translata is a ubiquitous resident of West Virginia streams and rivers in mid to late summer. It flies along the banks away from vegetation and perches on rocks, soil, and flotsam.



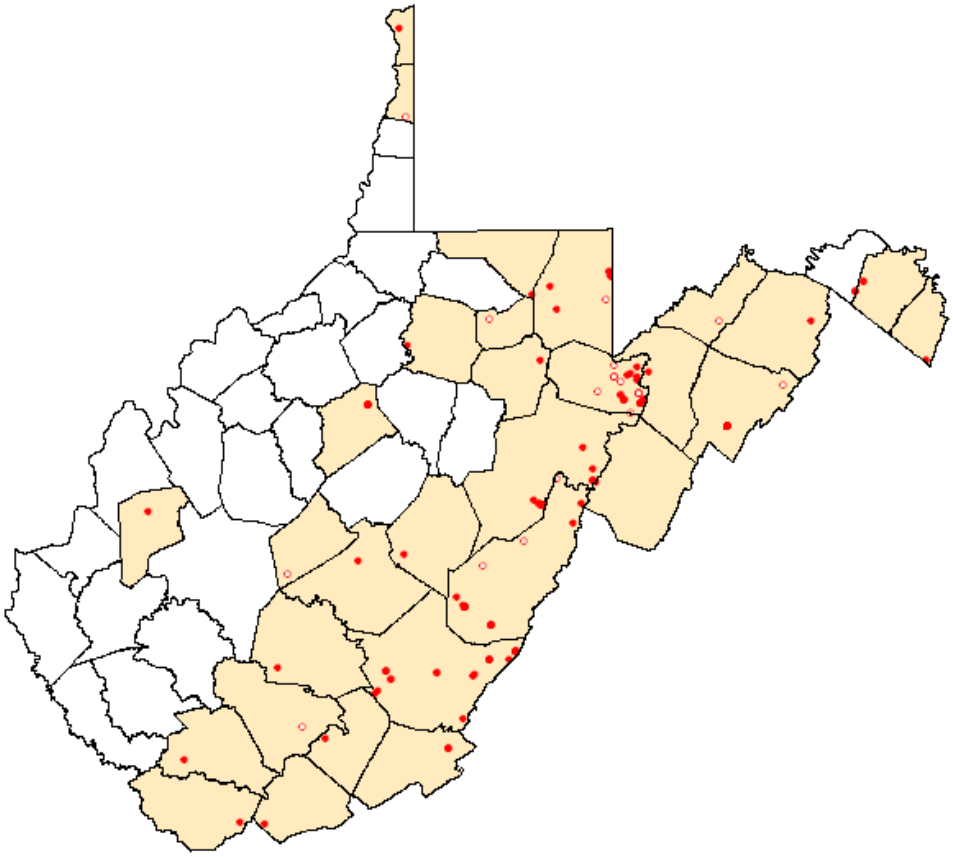
Argia translata adults have been documented from 11 May — 6 October with 224 valid records.

Suborder Zygoptera
Family Coenagrionidae

Chromagrion conditum
Aurora Damsel

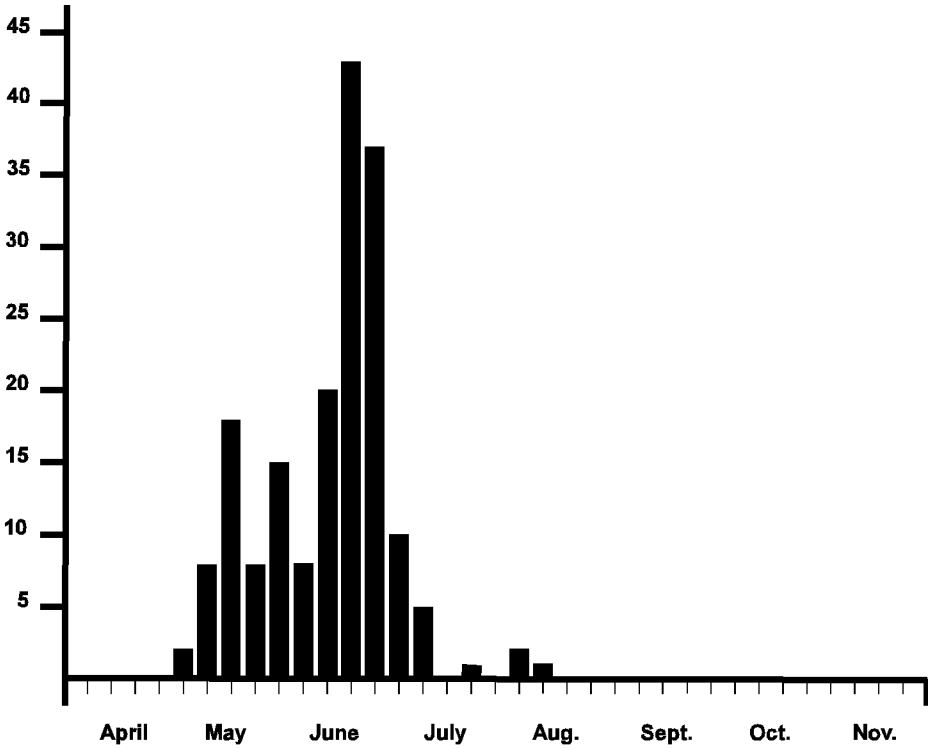
Chromagrion conditum male

Chromagrion conditum female



Chromagrion conditum distribution based on 183 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Chromagrion conditum primarily inhabits the mountains and foothills of West Virginia, and is mostly absent from the western part of the state. It is found most commonly at well vegetated ponds.



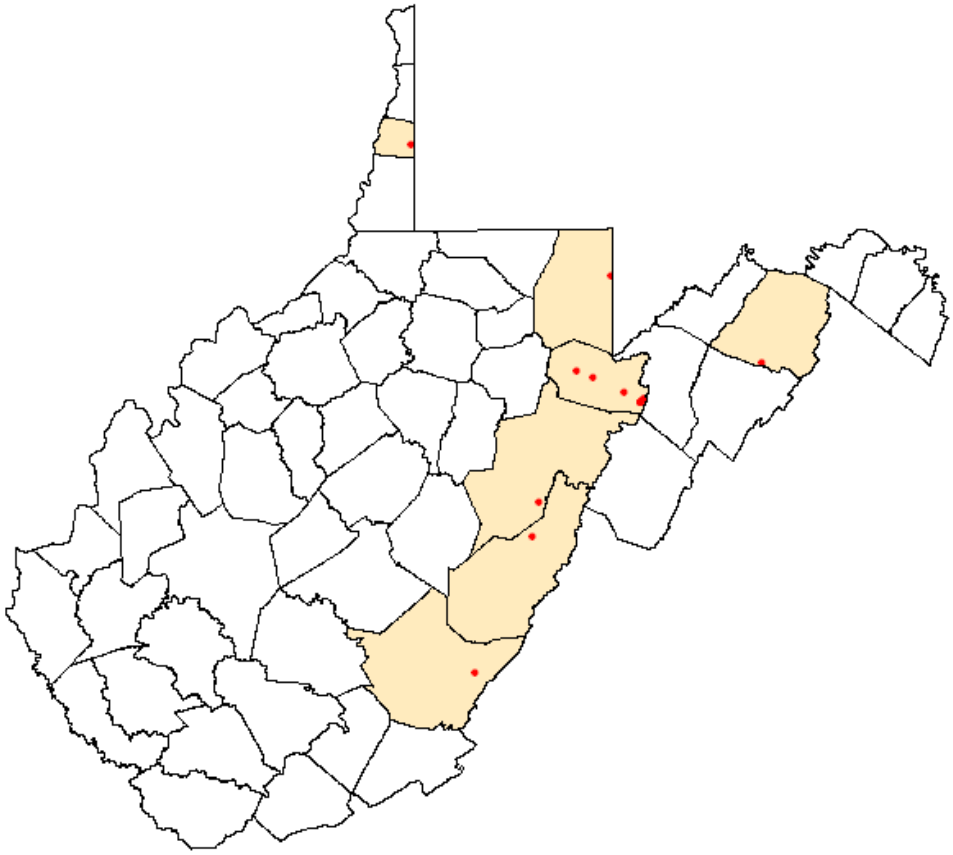
Chromagrion conditum adults have been documented from 1 May — 20 September with 179 valid records.

Suborder Zygoptera
Family Coenagrionidae

Enallagma annexum
Northern Bluet

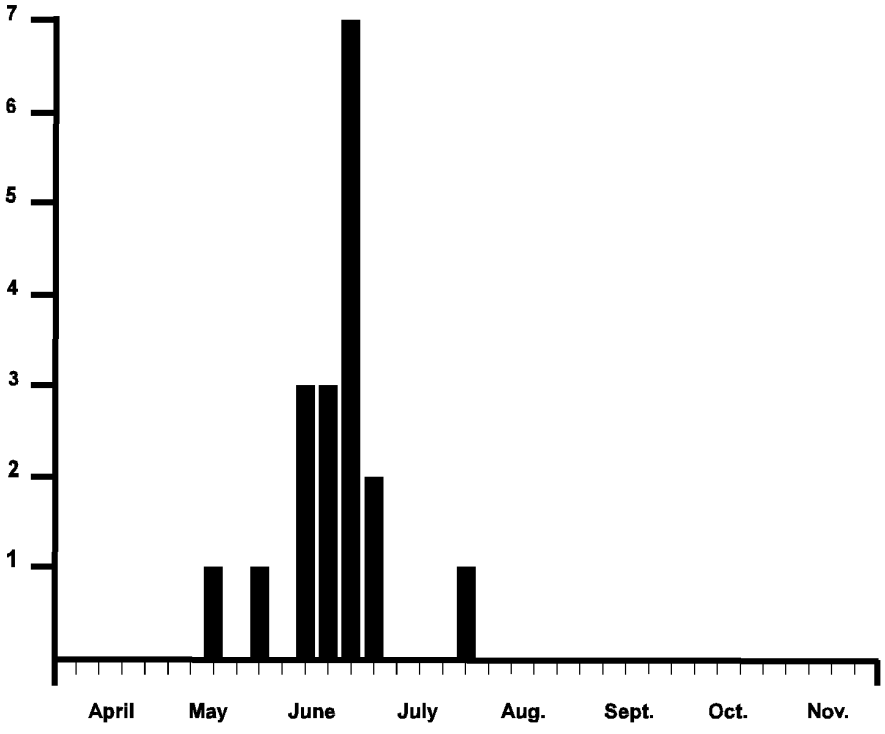
Enallagma annexum male

Enallagma annexum pair in tandem



Enallagma annexum distribution based on 19 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

As its common name implies, *Enallagma annexum* has the bulk of its distribution at northern latitudes with a southern extension down the Appalachians. Most of its West Virginia range is in mountain counties at marshy ponds and bogs. It was formerly included in a circumpolar taxon, but in 2005 was split from the Old World *Enallagma cyathigerum.*



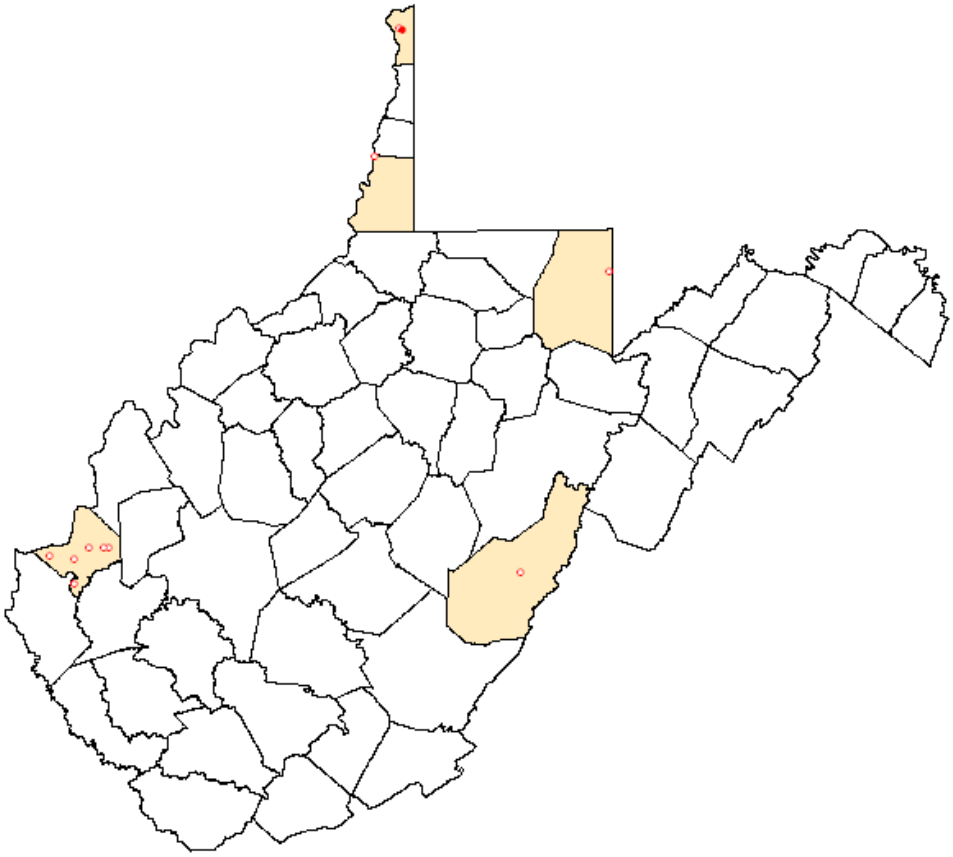
Enallagma annexum adults have been documented from 12 May — 3 August with 19 valid records.

Suborder Zygoptera
Family Coenagrionidae

Enallagma antennatum
Rainbow Bluet

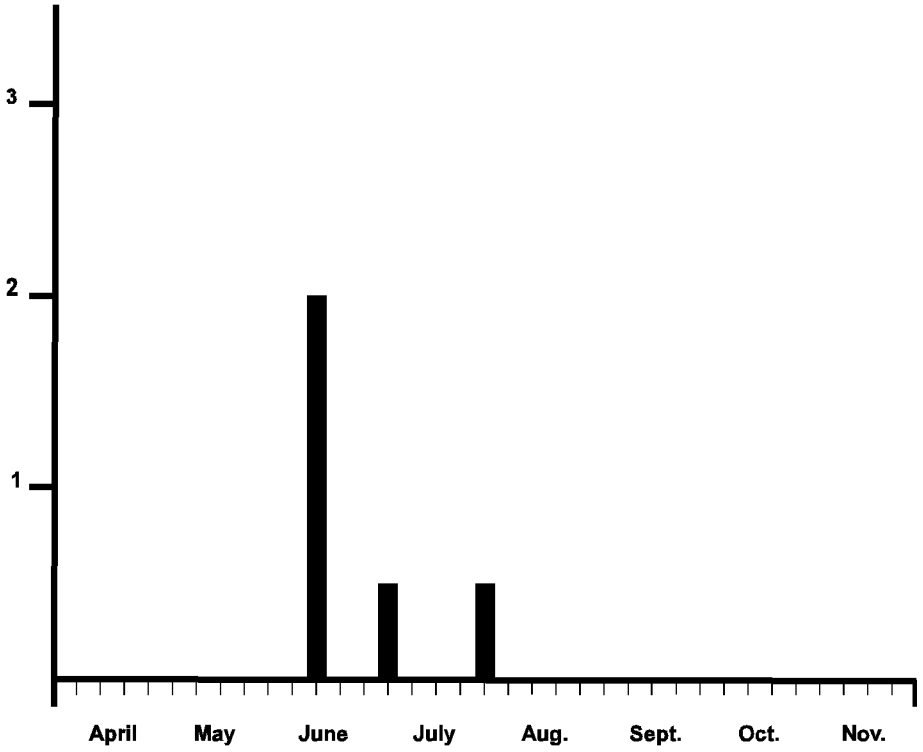
Enallagma antennatum male

Enallagma antennatum female



Enallagma antennatum distribution based on 11 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

One of the most colorful damsels in the eastern U.S., *Enallagma antennatum* has been documented in recent survey work at only one historic site. Although its habitat (well vegetated ponds) has been well sampled, no additional sites for this species have been documented.



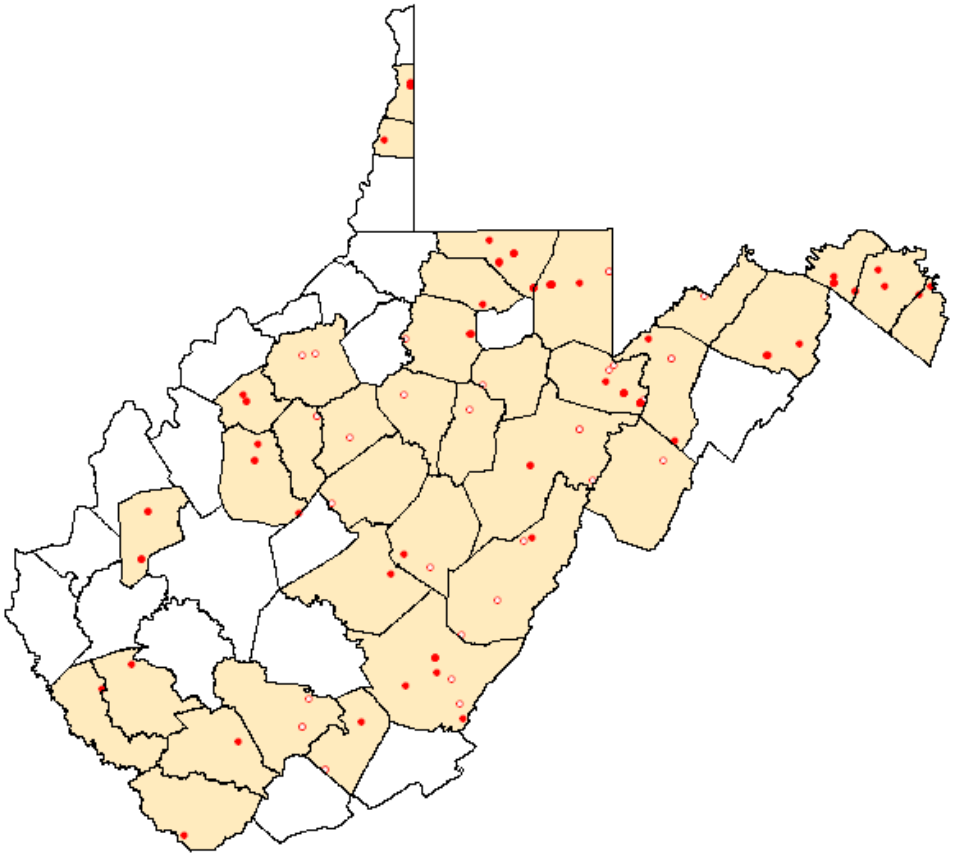
Enallagma antennatum adults have been documented from 9 June — 30 July with 4 valid records.

Suborder Zygoptera
Family Coenagrionidae

Enallagma aspersum
Azure Bluet

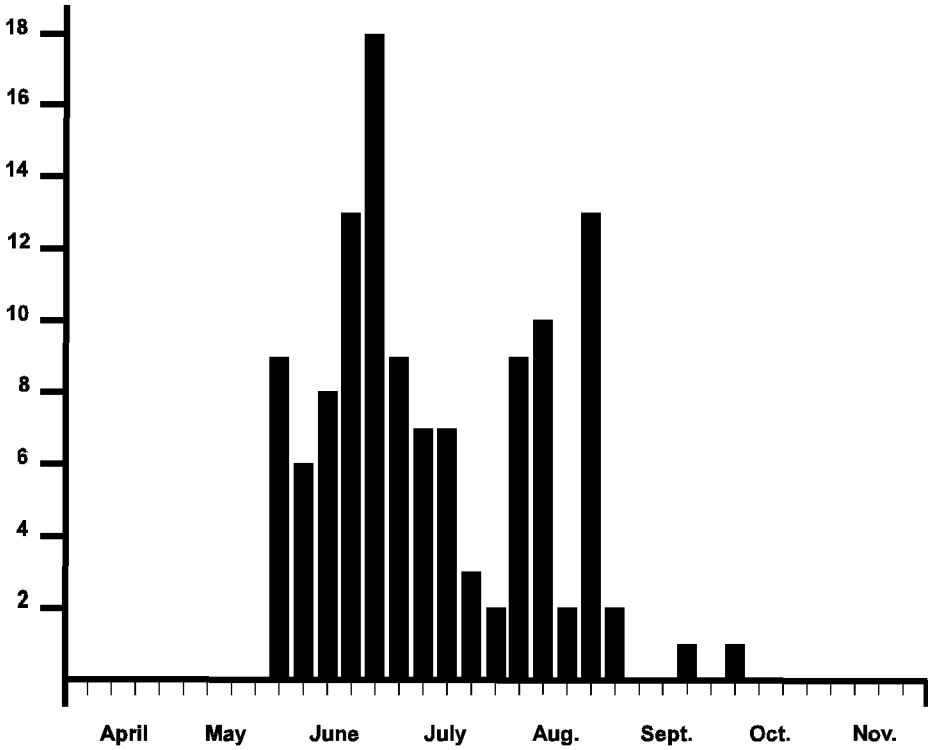
Enallagma aspersum male

Enallagma aspersum female



Enallagma aspersum distribution based on 123 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Enallagma aspersum is a widely distributed bluet in West Virginia, and likely occurs in every county. Locally common, it is most frequently encountered early in its flight period.



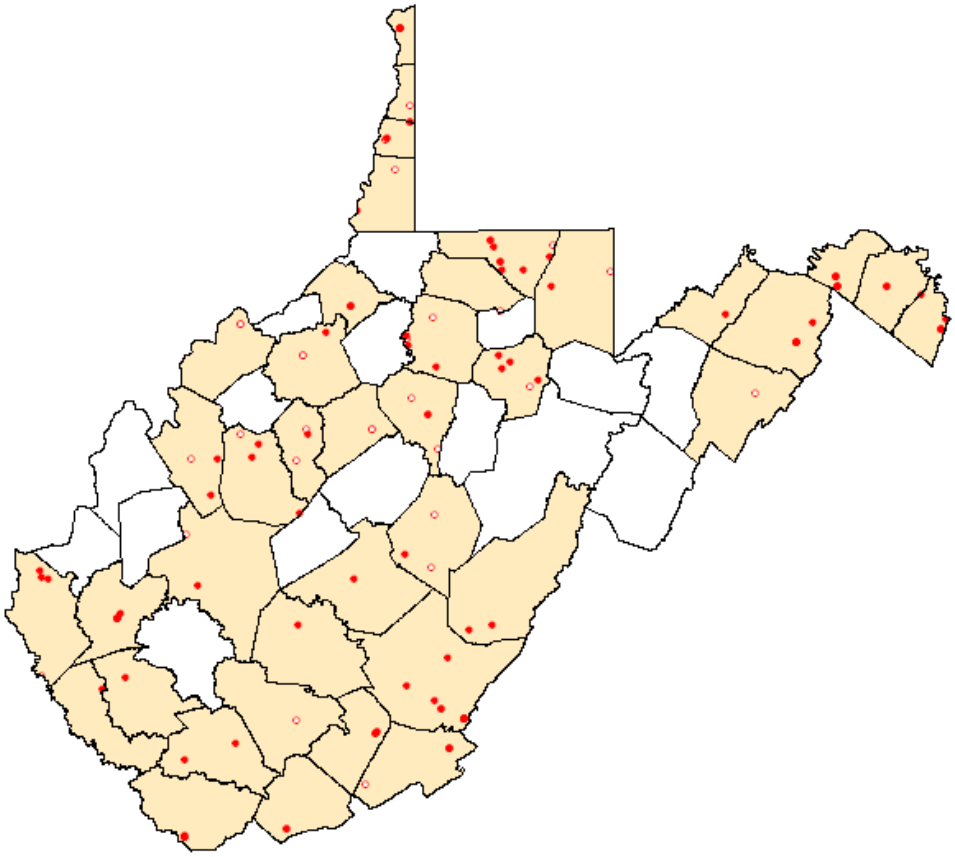
Enallagma aspersum adults have been documented from 25 May — 9 October with 120 valid records.

Suborder Zygoptera
Family Coenagrionidae

Enallagma basidens
Double-striped Bluet

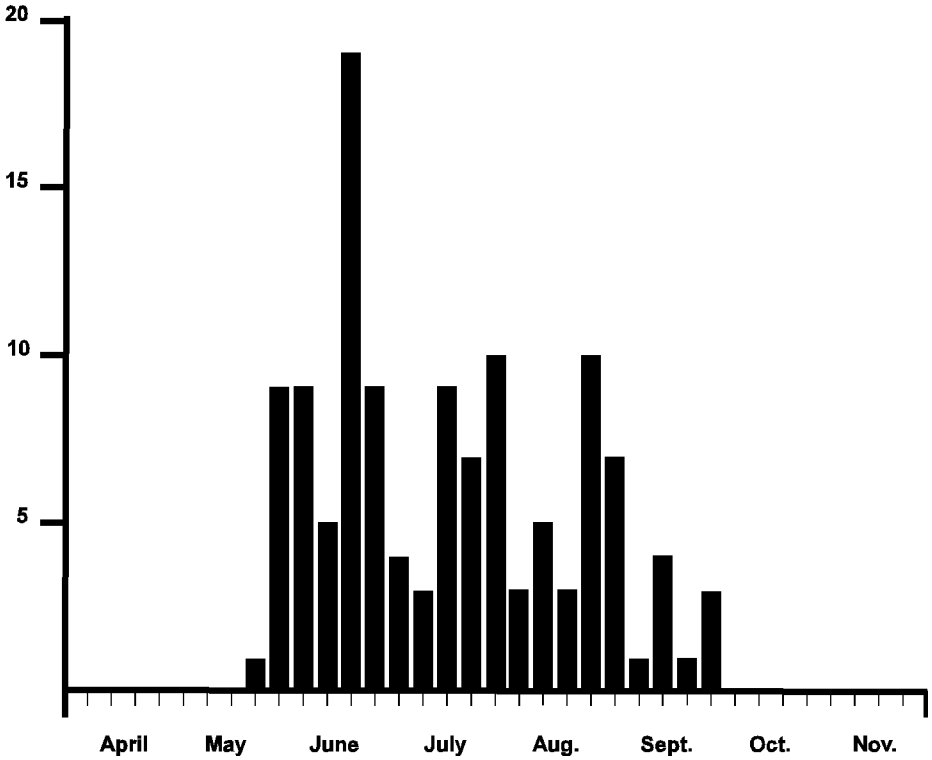
Enallagma basidens male

Enallagma basidens female



Enallagma basidens distribution based on 132 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

The diminutive *Enallagma basidens*, with almost hair-fine stripes on its thorax, is a commonly encountered bluet in well vegetated ponds and ditches. It likely occurs in every county.



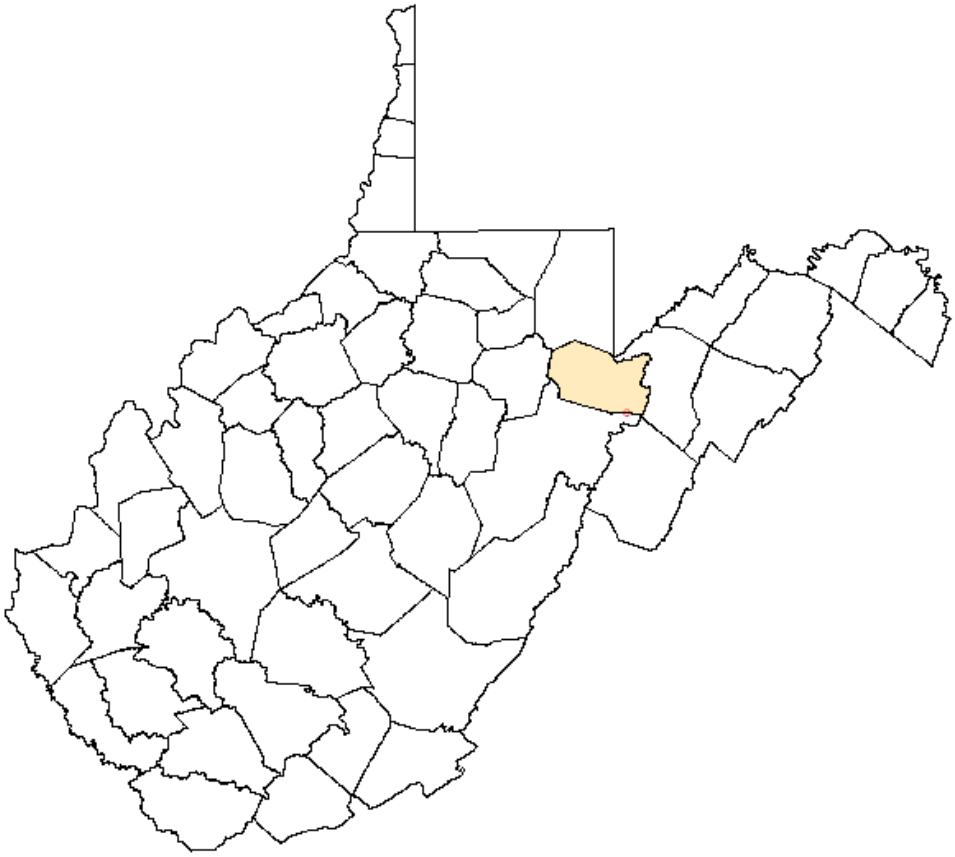
Enallagma basidens adults have been documented from 21 May — 3 October with 122 valid records.

Suborder Zygoptera
Family Coenagrionidae

Enallagma boreale
Boreal Bluet

Enallagma boreale male

Enallagma boreale female



Enallagma boreale distribution based on 1 record. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

In West Virginia, *Enallagma boreale* was documented from one larval specimen that was subsequently raised and identified in 1972. It was collected along Red Creek in the Dolly Sods Wilderness Area in Tucker County, but has not been documented since. Although habitat exists for this species at high elevations (fishless bogs, pools, and marshes), it is unknown if it still exists in West Virginia, or if the original determination was correct. The West Virginia type specimen may no longer exist.

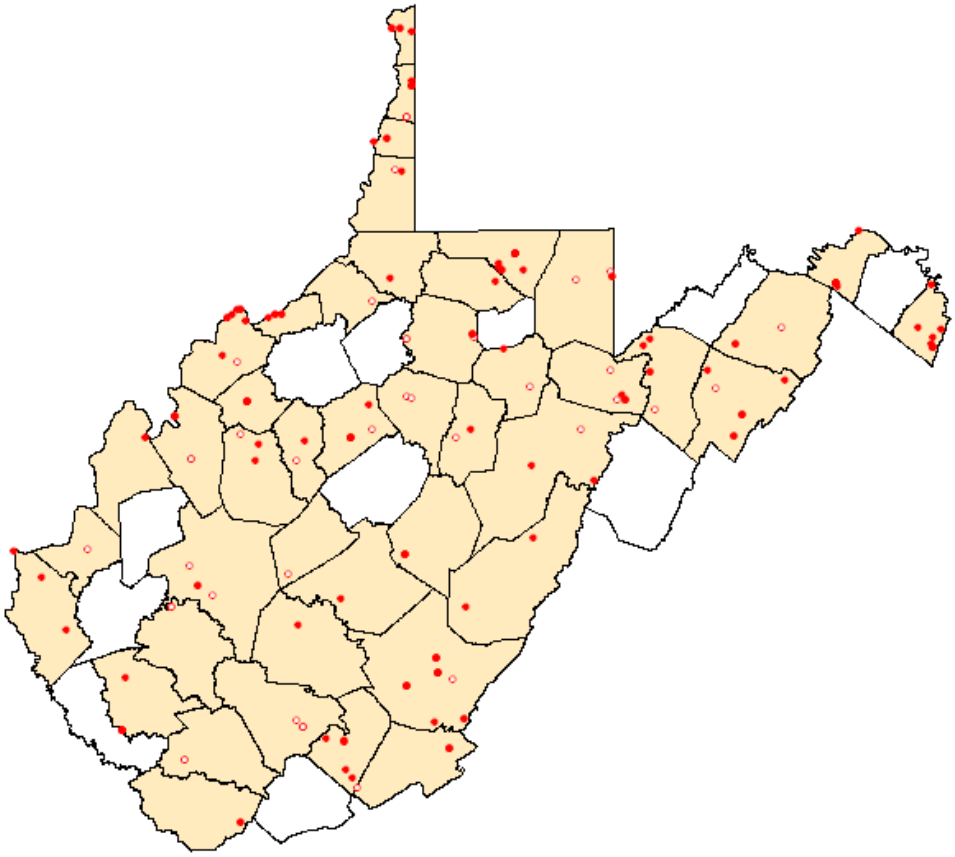
No *Enallagma boreale adults* have been documented in West Virginia.

Suborder Zygoptera
Family Coenagrionidae

Enallagma civile
Familiar Bluet

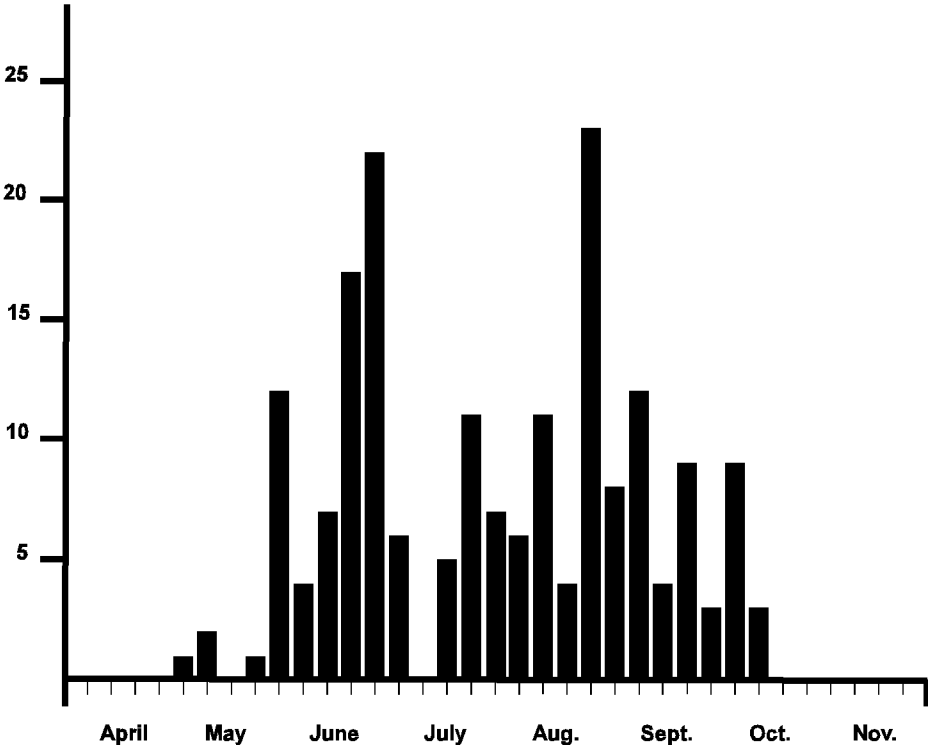
Enallagma civile male

Enallagma civile female



Enallagma civile distribution based on 191 records. Open dots are 1994 and earlier records solid dots are 1995-2010 records.

Enallagma civile has the longest flight period of any West Virginia bluet, and is the most frequently encountered. It is likely distributed statewide at most aquatic habitats including ponds, ditches, pools, and marshes.



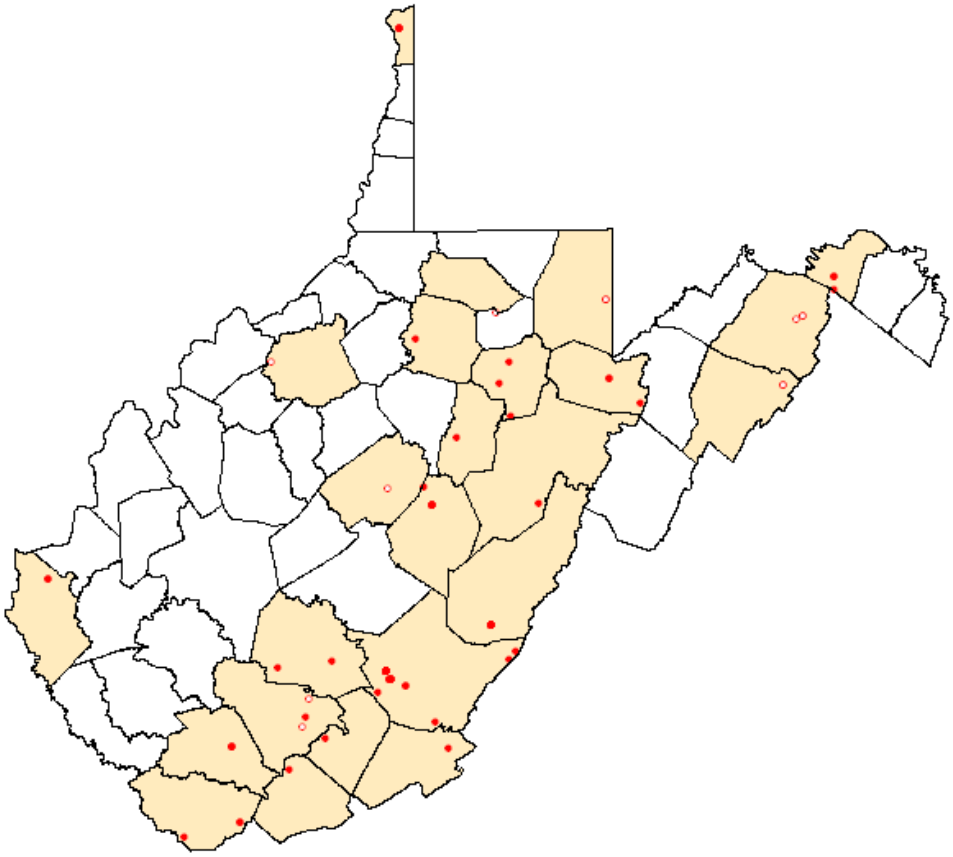
Enallagma civile adults have been documented from 5 May — 15 October with 187 valid records.

Suborder Zygoptera
Family Coenagrionidae

Enallagma divagans
Turquoise Bluet

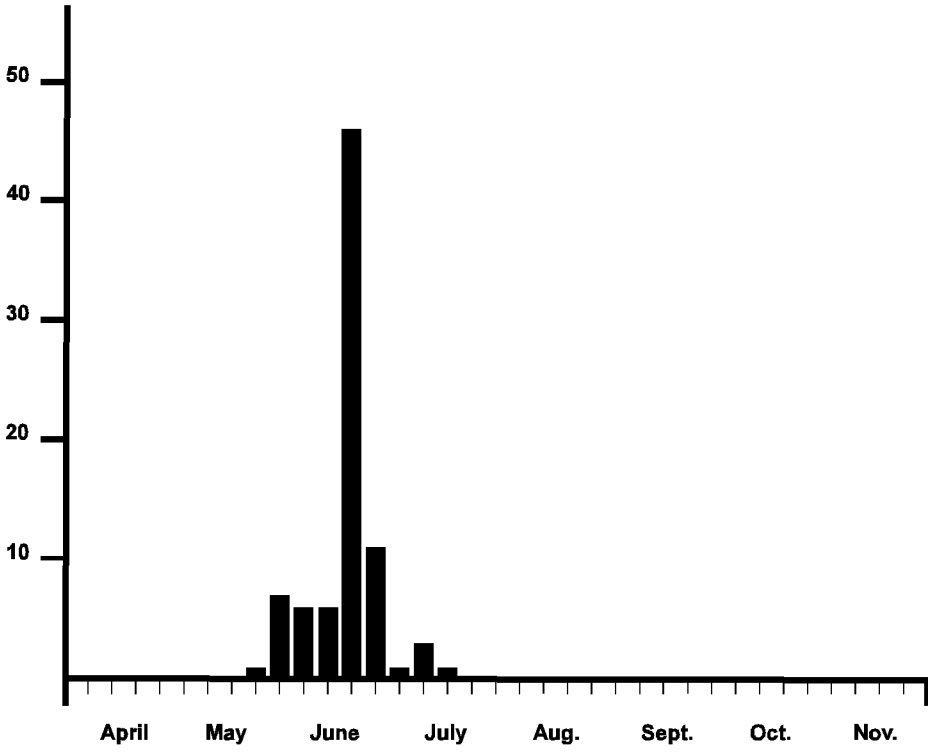
Enallagma divagans male

Enallagma divagans female



Enallagma divagans distribution based on 89 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Historically documented from only seven counties, *Enallagma divagans* is now known from an additional seventeen counties mostly in the mountains and foothills. This dark bluet prefers slow sections of streams.



Enallagma divagans adults have been documented from 22 May — 15 July with 82 valid records.

Suborder Zygoptera
Family Coenagrionidae

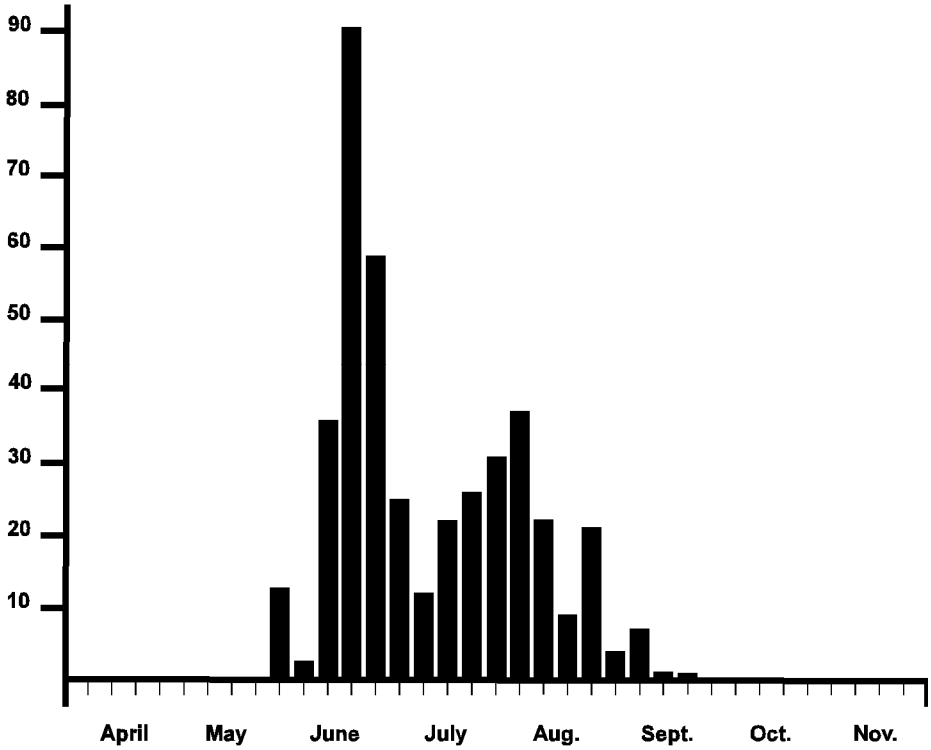
Enallagma exsulans
Stream Bluet

Enallagma exsulans male

Enallagma exsulans female

Enallagma exsulans distribution based on 434 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Enallagma exsulans is arguably the most commonly encountered damsel on West Virginia streams. It can occur in large numbers, especially in riffle areas with patches of water willow (*Justicia americana*) or overhanging vegetation.



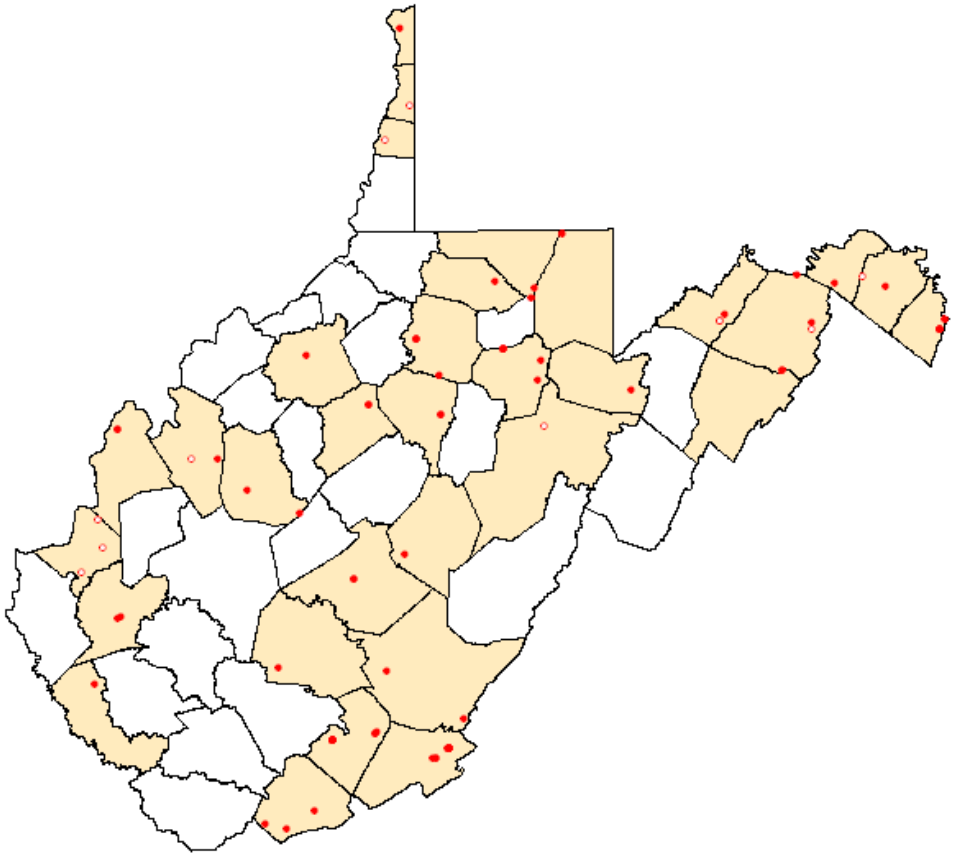
Enallagma exsulans adults have been documented from 24 May — 20 September with 420 valid records.

Suborder Zygoptera
Family Coenagrionidae

Enallagma geminatum
Skimming Bluet

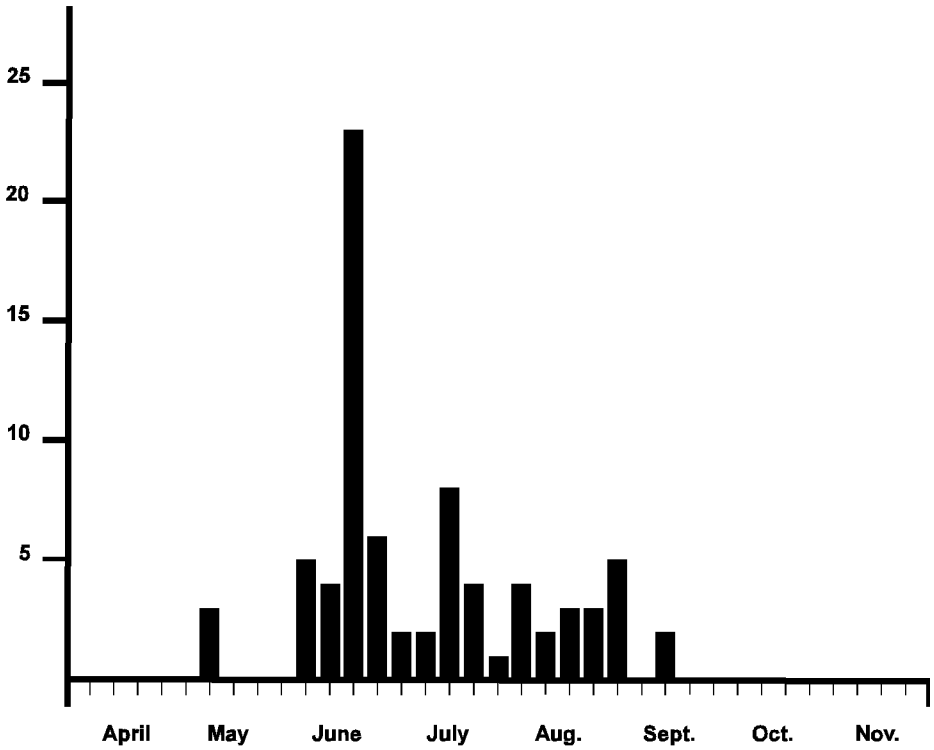
Enallagma geminatum male

Enallagma geminatum female



Enallagma geminatum distribution based on 82 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Enallagma geminatum, although widely distributed in West Virginia, likely occurs in more counties than records indicate. Its habit of skimming along the surface of ponds well out from the bank makes this odonate somewhat challenging to document.



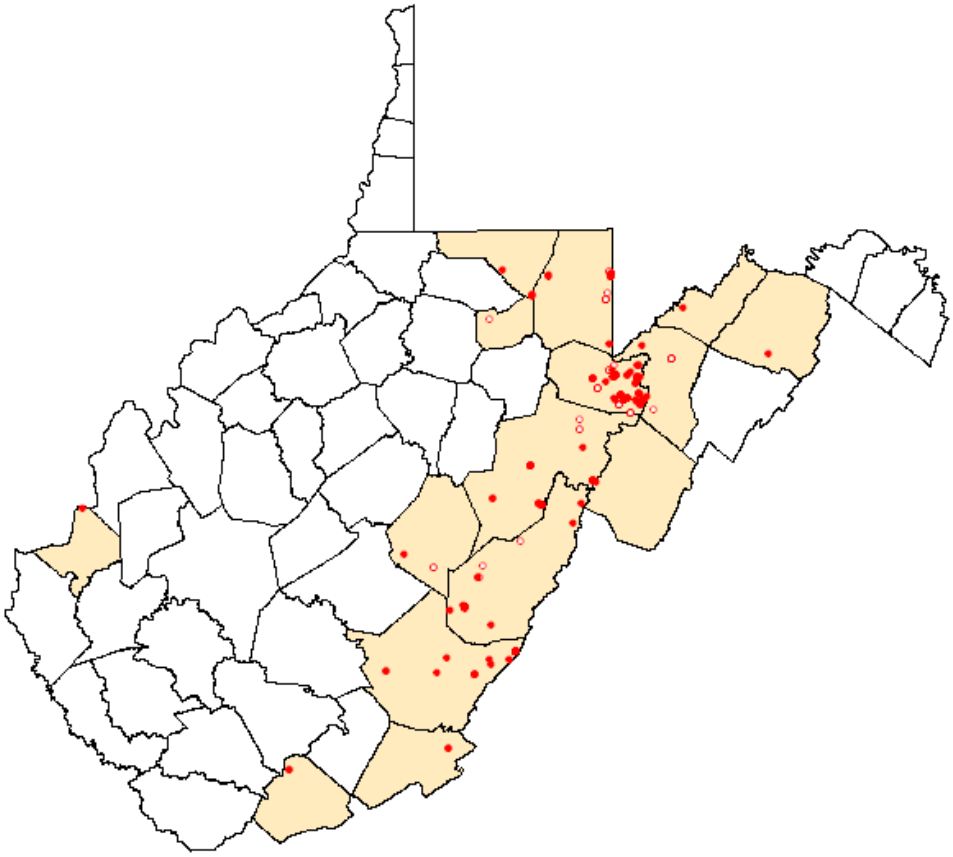
Enallagma geminatum adults have been documented from 5 May — 20 September with 77 valid records.

Suborder Zygoptera
Family Coenagrionidae

Enallagma hageni
Hagen's Bluet

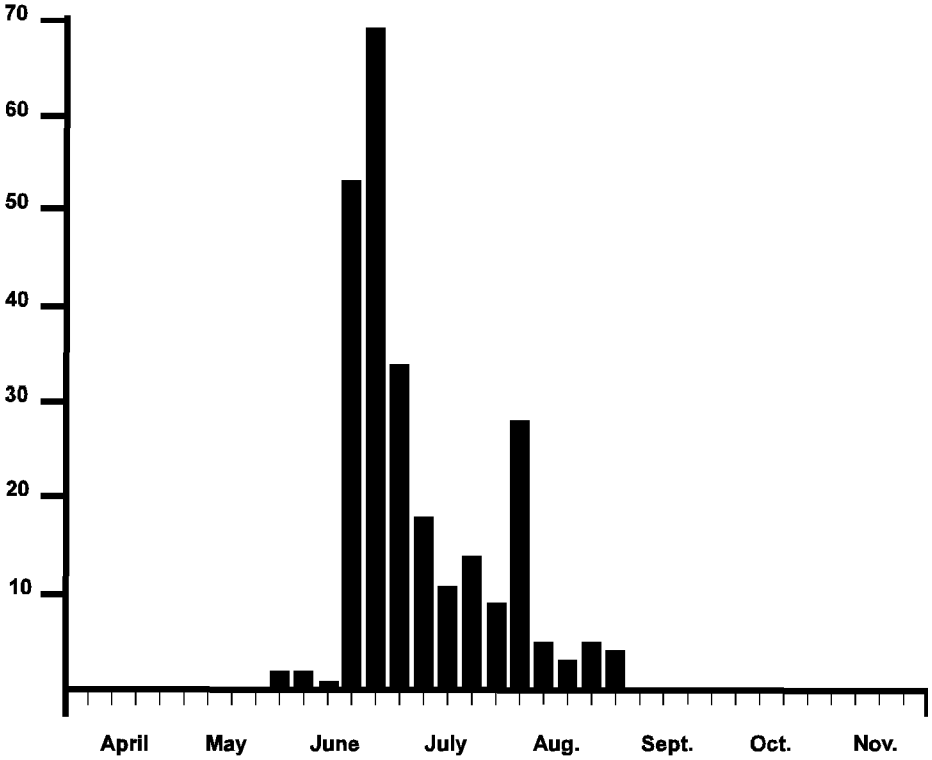
Enallagma hageni male

Enallagma hageni female



Enallagma hageni distribution based on 262 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Although found less commonly at lower elevations, *Enallagma hageni*'s stronghold is in high elevations (above 2500 ft). It is usually the only bluet there and is typically present in significant numbers and at every pond, ditch, and pool.



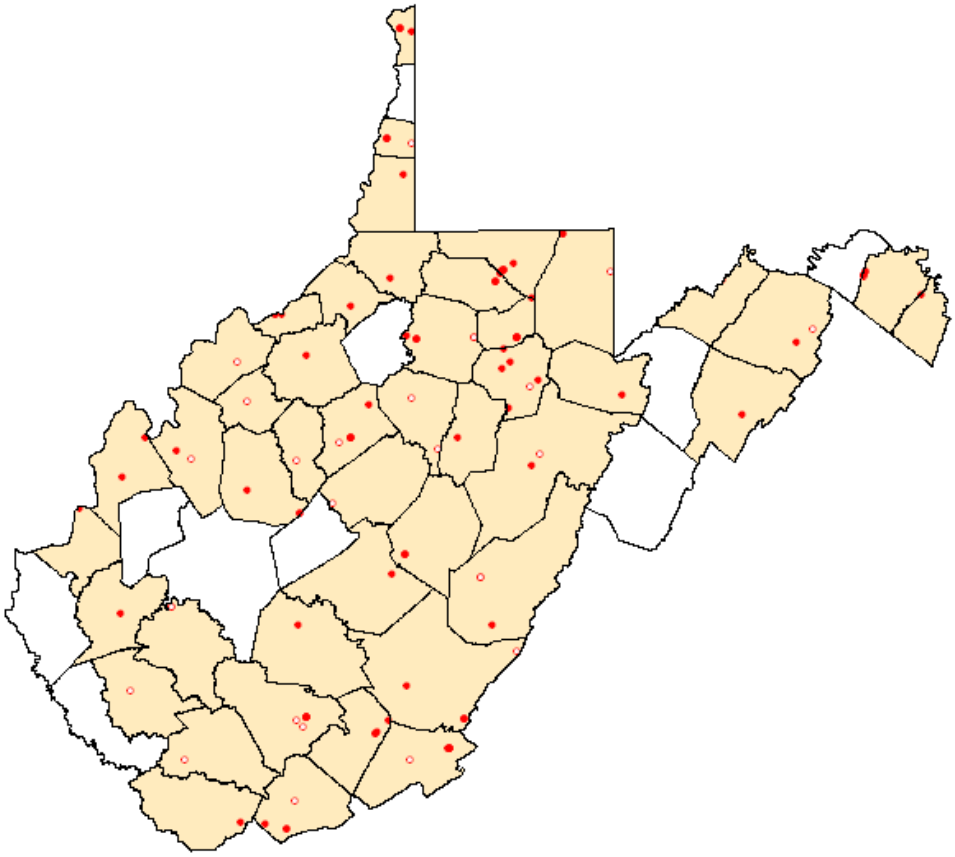
Enallagma hageni adults have been documented from 1 June — 3 September with 258 valid records.

Suborder Zygoptera
Family Coenagrionidae

Enallagma signatum
Orange Bluet

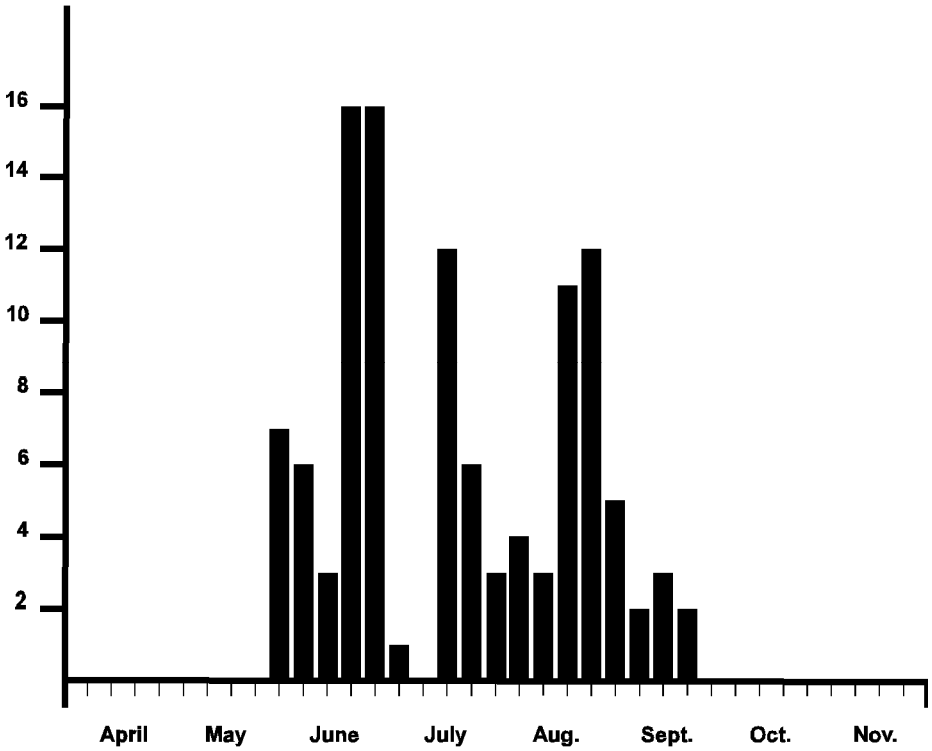
Enallagma signatum male

Enallagma signatum female



Enallagma signatum distribution based on 121 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Enallagma signatum likely occurs statewide at ponds and impoundments with floating vegetation near the shore. The bright orange coloration of the males make this species easy to detect and identify.



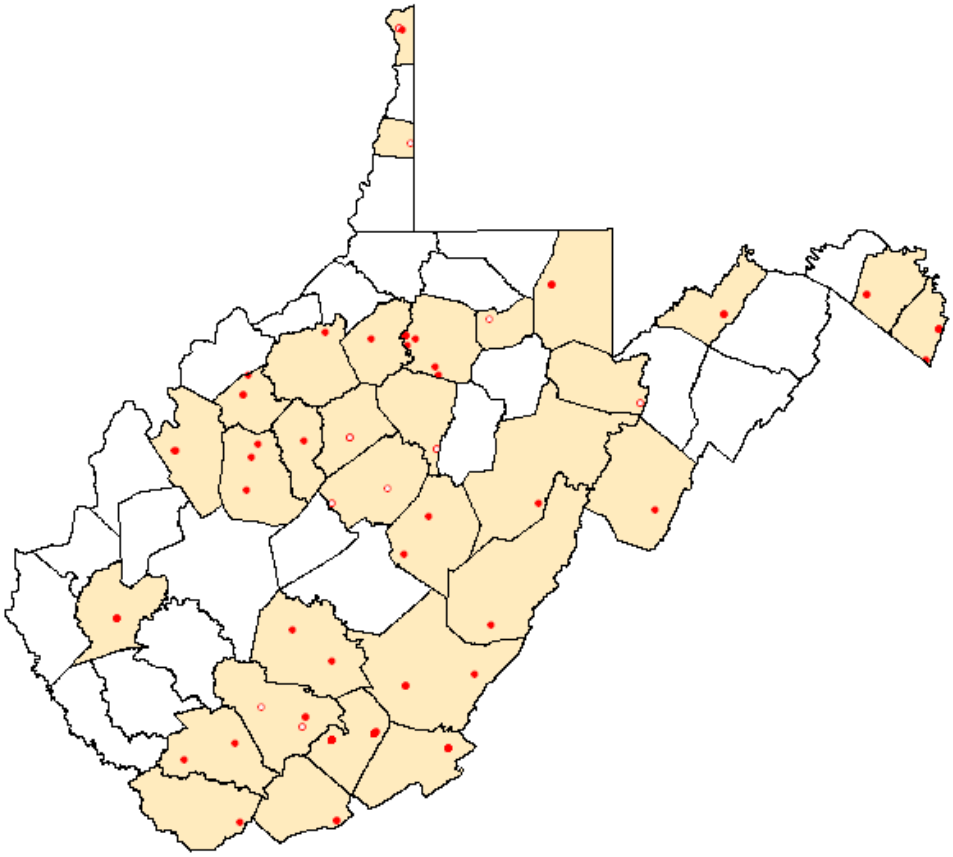
Enallagma signatum adults have been documented from 24 May — 1 October with 112 valid records.

Suborder Zygoptera
Family Coenagrionidae

Enallagma traviatum
Slender Bluet

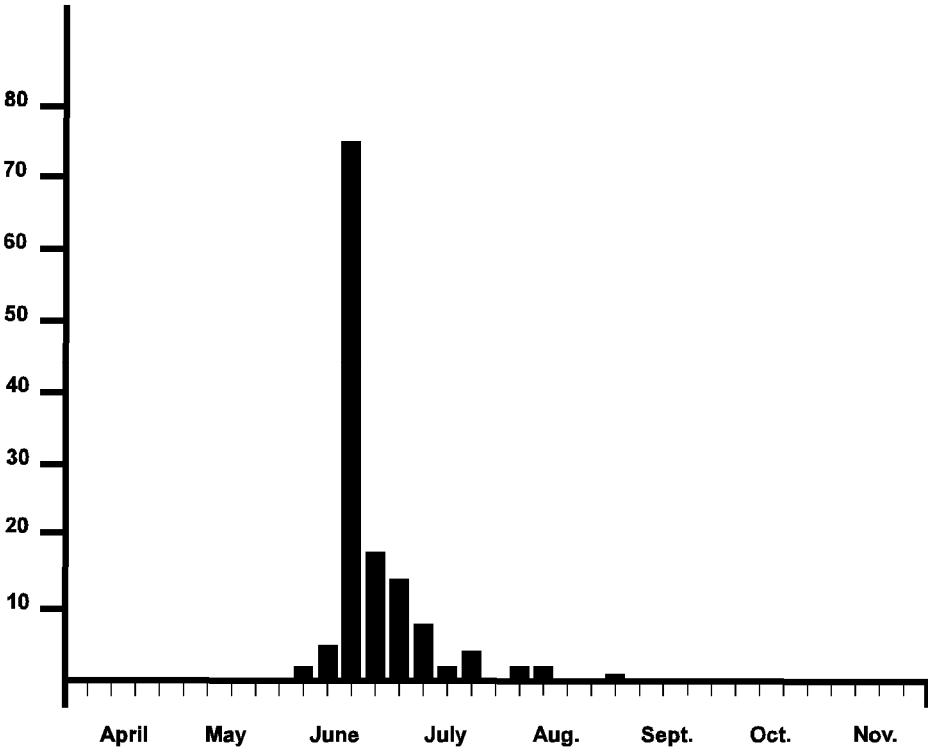
Enallagma traviatum male

Enallagma traviatum female



Enallagma traviatum distribution based on 133 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Enallagma traviatum is represented by two subspecies in West Virginia. *E.t. traviatum* occurs in the Eastern Panhandle, while *E.t. westfalli* occurs from the Allegheny Front west. Males of the two subspecies can be separated based on cerci morphology, but females can not. This species can be found in large numbers during June at ponds and impoundments.



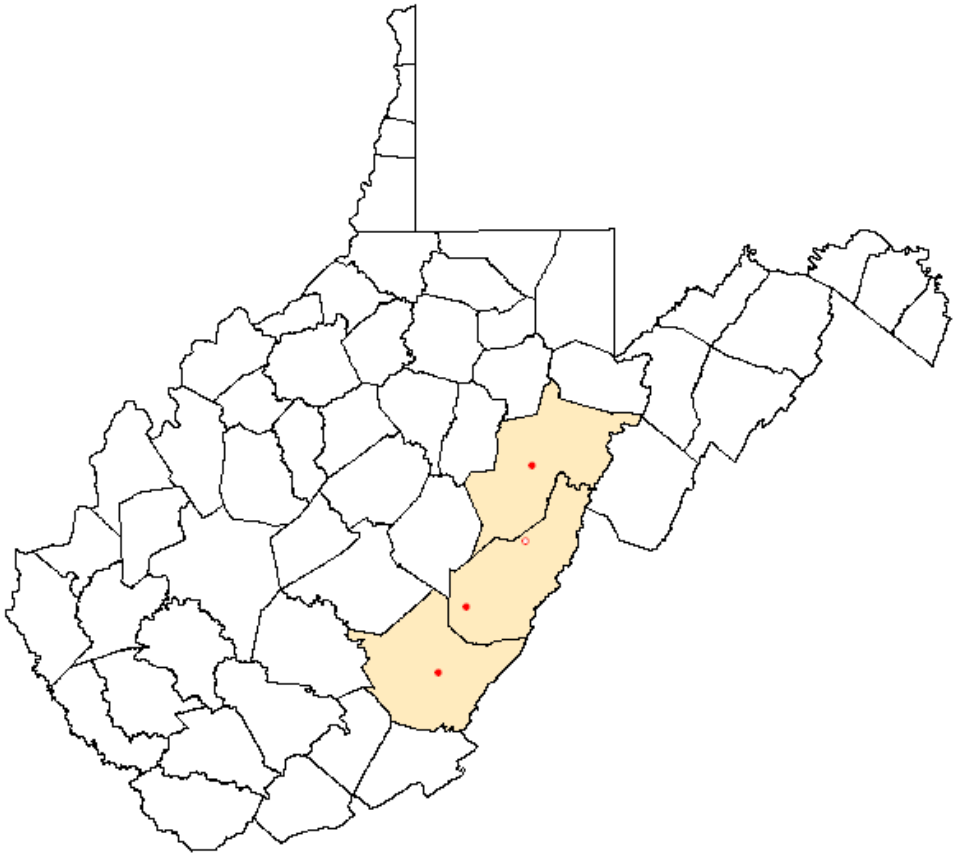
Enallagma traviatum adults have been documented from 1 June — 1 September with 133 valid records.

Suborder Zygoptera
Family Coenagrionidae

Enallagma vernale
Vernal Bluet

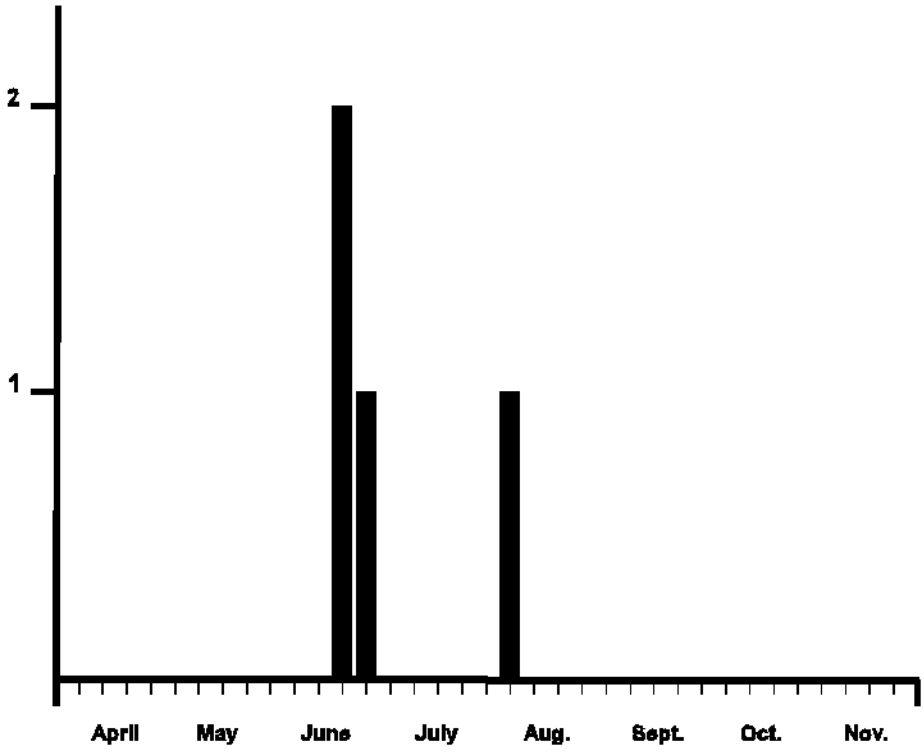
Enallagma vernale male

Enallagma vernale pair in tandem



Enallagma vernale distribution based on 4 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Formerly a subspecies of the circumpolar taxon *Enallagma cyathigerum*, *Enallagma vernale* was split out in 2005, although some experts question its taxonomic validity because of morphological overlaps with *E. annexum*. A northern bluet, the West Virginia population is well south of the other records, and could possibly be a disjunct population. When present, it is typically found at marshes and ponds at high elevations (above 2500 ft).



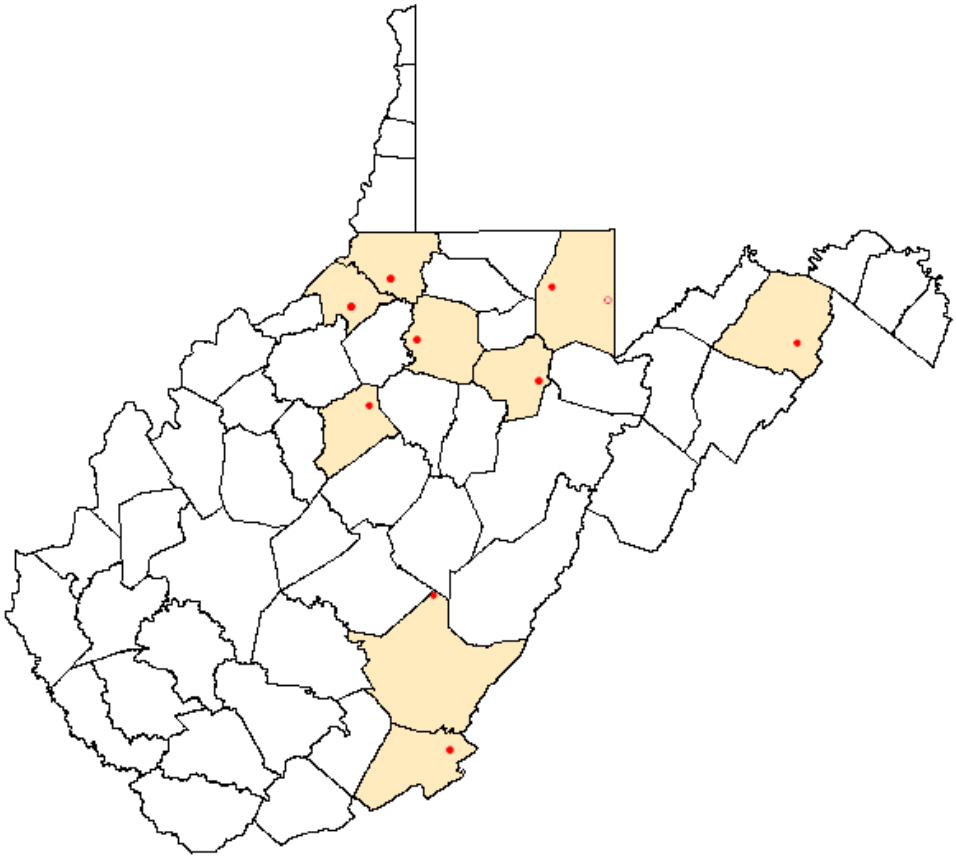
Enallagma vernale adults have been documented from 18 June

Suborder Zygoptera
Family Coenagrionidae

Enallagma vesperum
Vesper Bluet

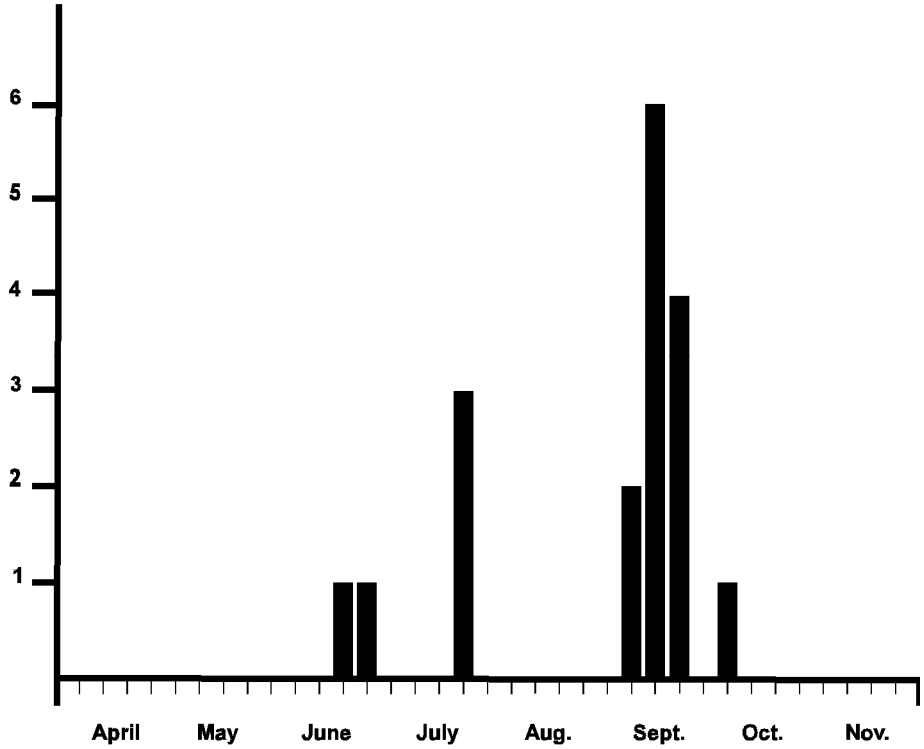
Enallagma vesperum male

Enallagma vesperum female



Enallagma vesperum distribution based on 18 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Historically known from one site in West Virginia, *Enallagma vesperum*'s distribution has been increased significantly to nine sites in eight additional counties. It prefers older, well established ponds with floating vegetation, especially lilypads (*Nymphaea* sp.). Because it often occurs well away from shore on floating vegetation, this bluet may have gone undetected at other sites.



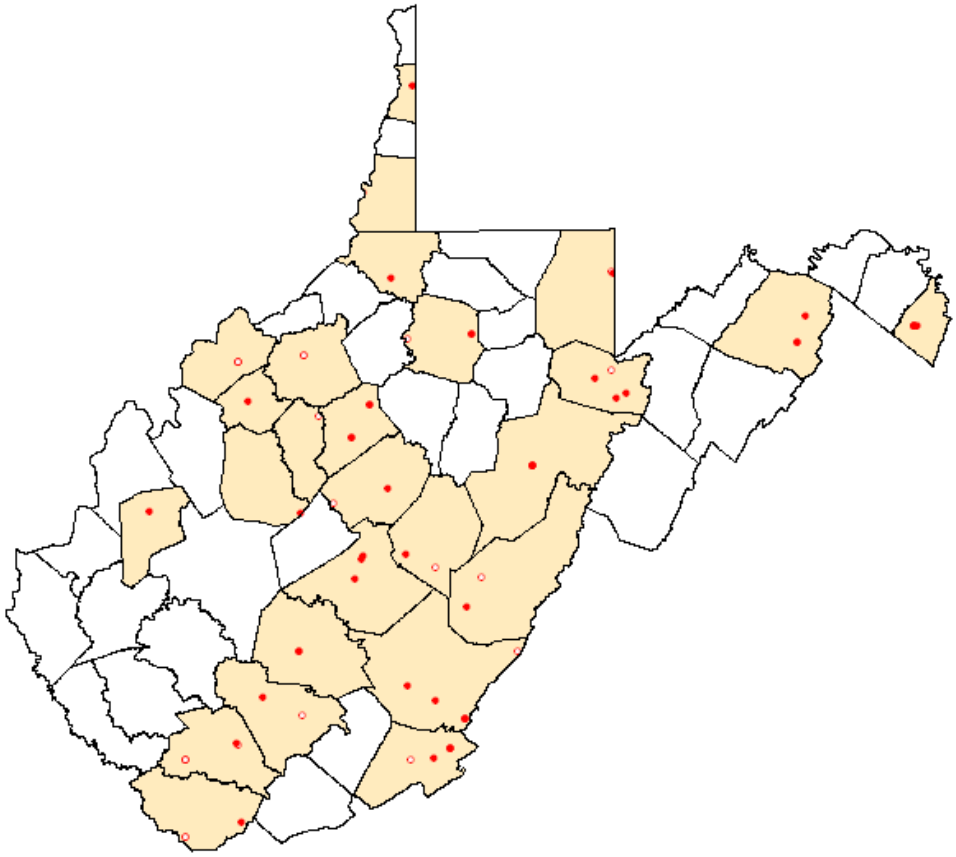
Enallagma vesperum adults have been documented from 20 June — 5 October with 18 valid records.

Suborder Zygoptera
Family Coenagrionidae

Ischnura hastata
Citrine Forktail

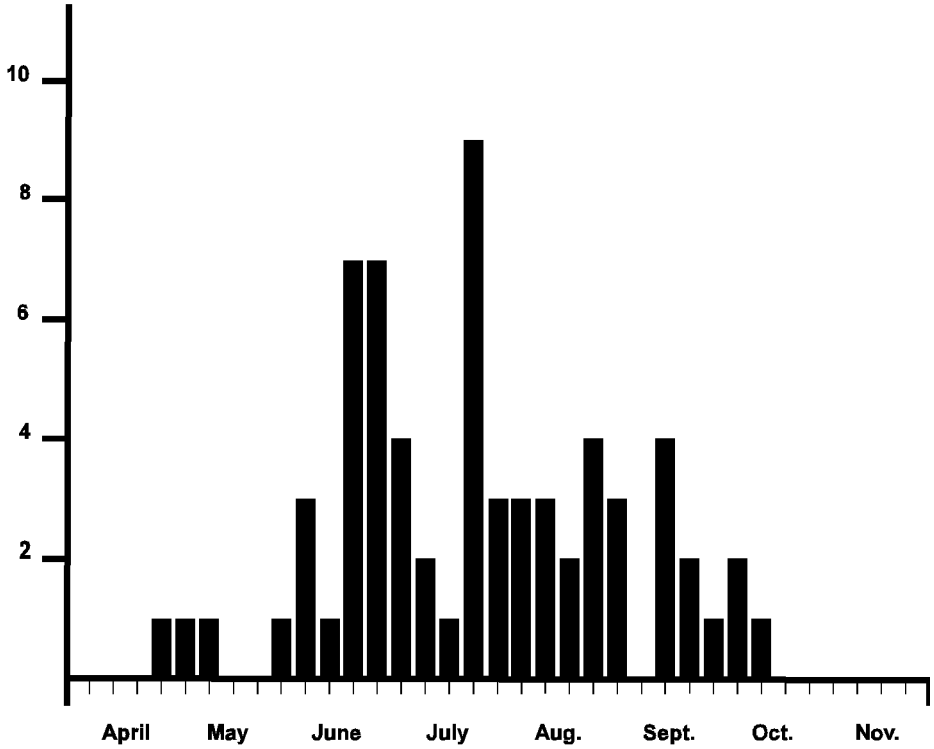
Ischnura hastata male

Ischnura hastata female



Ischnura hastata distribution based on 69 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

One of West Virginia's smallest and most delicate damsels, *Ischnura hastata* is widely distributed. Often difficult to detect in the thick grassy vegetation it prefers, it is likely more widely distributed than records indicate.



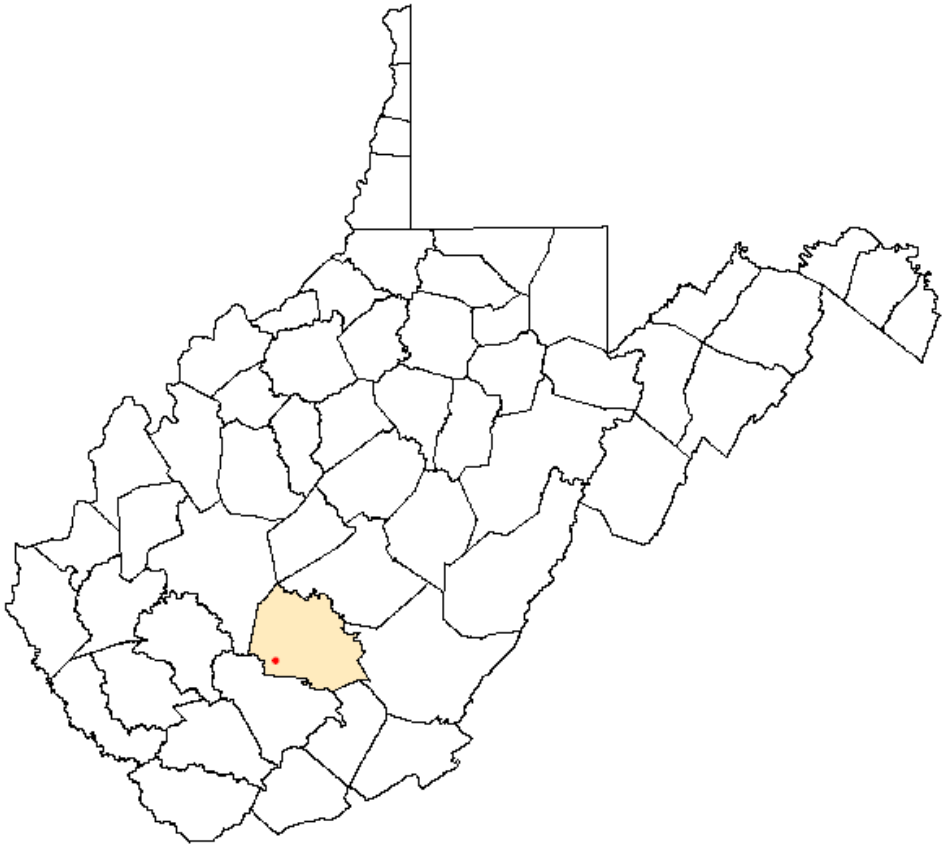
Ischnura hastata adults have been documented from 27 April — 13 October with 66 valid records.

Suborder Zygoptera
Family Coenagrionidae

Ischnura kellicotti
Lilypad Forktail

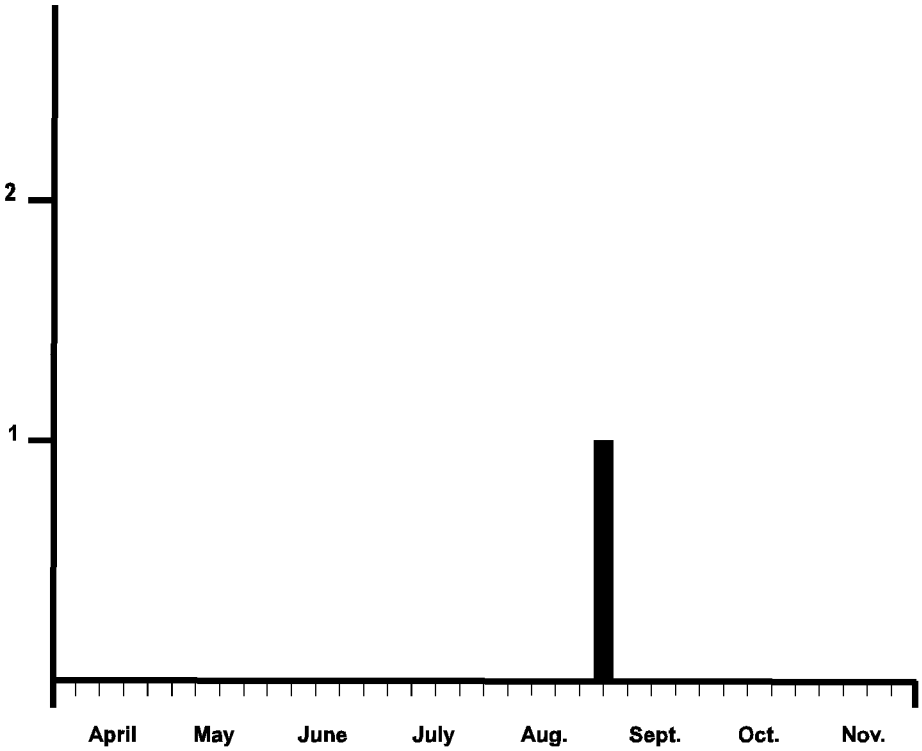
Ischnura kellicotti male

Ischnura kellicotti female



Ischnura kellicotti distribution based on 1 record. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

First documented in West Virginia in 2009, *Ischnura kellicotti* is currently only known from Plum Orchard Wildlife Management Area in Fayette County. Its requirement for lilypads (*Nymphaea* sp.) and older, well established ponds and impoundments makes choosing survey sites straightforward, although actual surveys may require a boat or swimming to gain access to areas were these forktails can be detected.



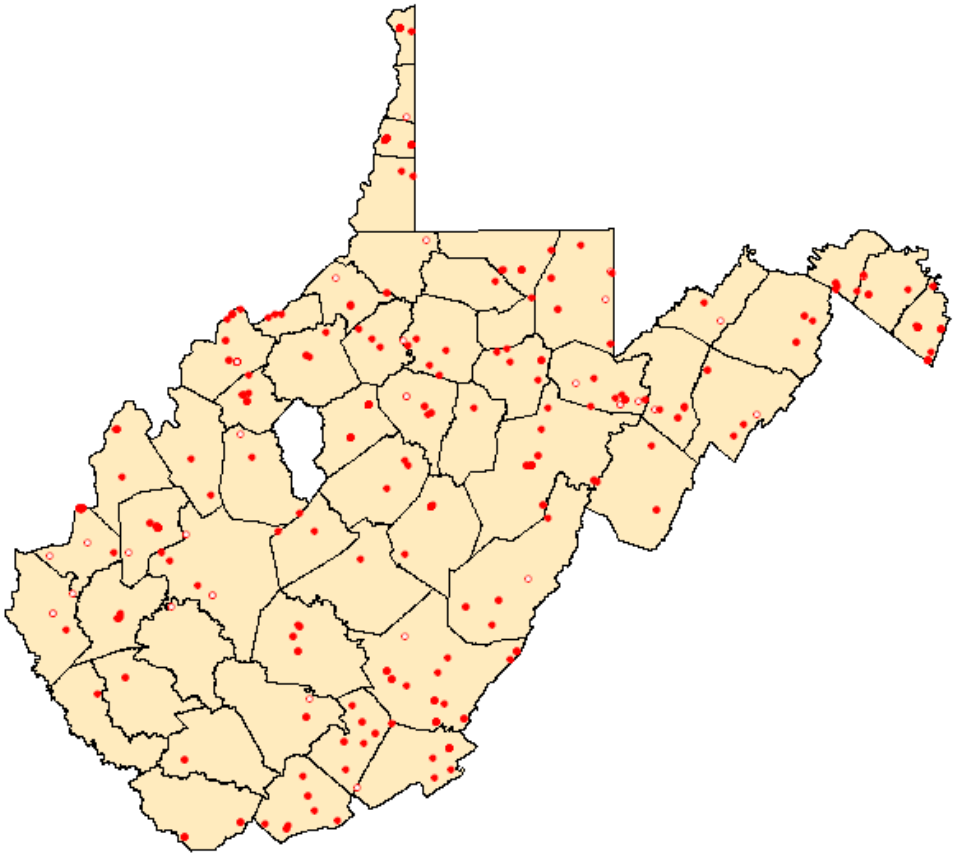
One *Ischnura kellicotti* adult has been documented from 5 September.

Suborder Zygoptera
Family Coenagrionidae

Ischnura posita
Fragile Forktail

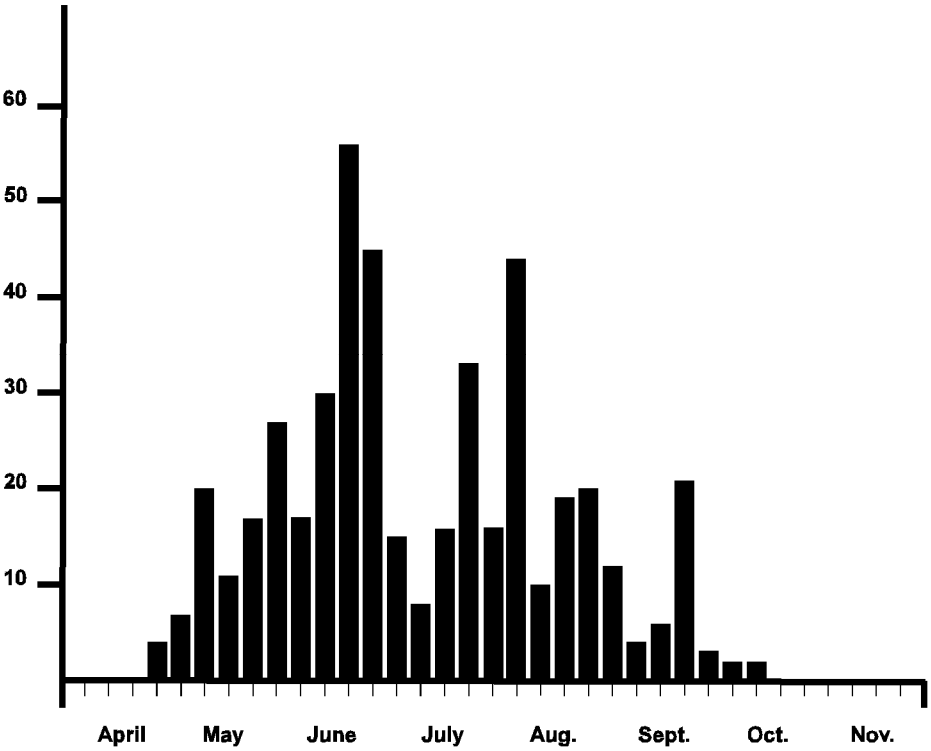
Ischnura posita male

Ischnura posita female



Ischnura posita distribution based on 489 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

The most frequently encountered, and likely the most numerous odonate in West Virginia, *Ischnura posita* is found statewide. It uses virtually any vegetated still water habitat including ponds, ditches, impoundments, marshes, and bogs.



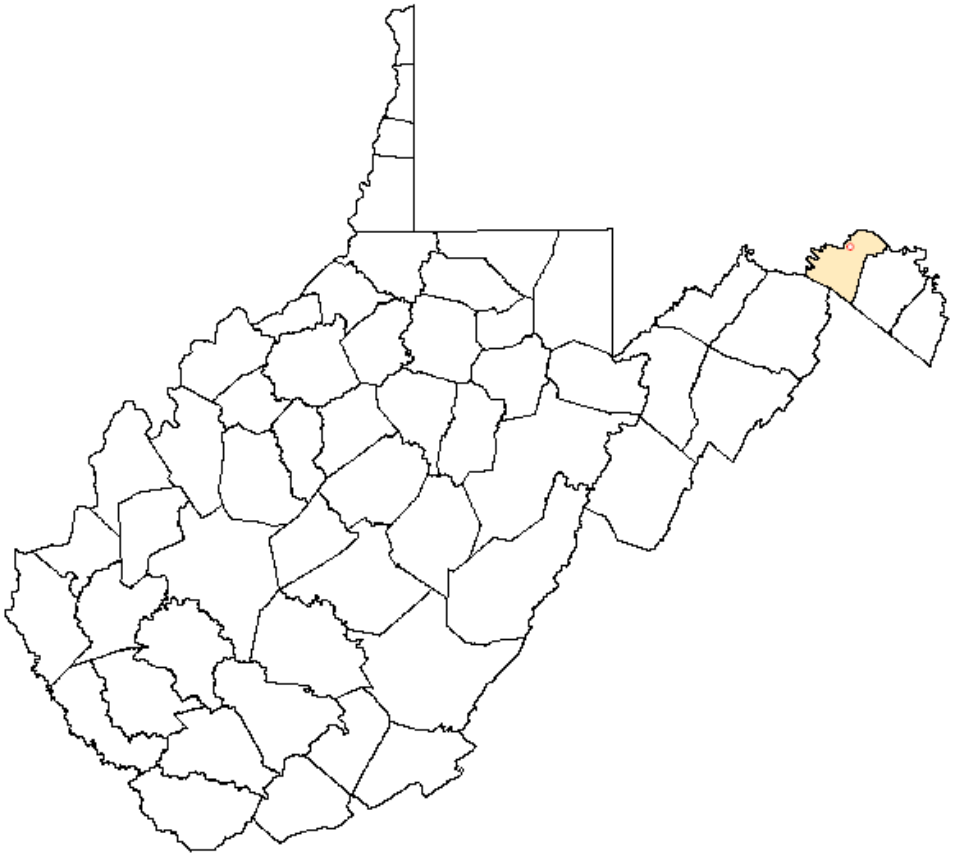
Ischnura posita adults have been documented from 23 April — 13 October with 465 valid records.

Suborder Zygoptera
Family Coenagrionidae

Ischnura prognata
Furtive Forktail

Ischnura prognata male

Ischnura prognata female



Ischnura prognata distribution based on 1 record. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

The earliest documented historical record of an odonate in West Virginia is *Ischnura prognata,* known from a single record from 1835. This southern forktail was documented from a seepy area near the historic hotel in Berkeley Springs. The seepy habitat no longer exists at this site, and no other specimens have ever been collected in the state, so this species should be considered an accidental occurrence.

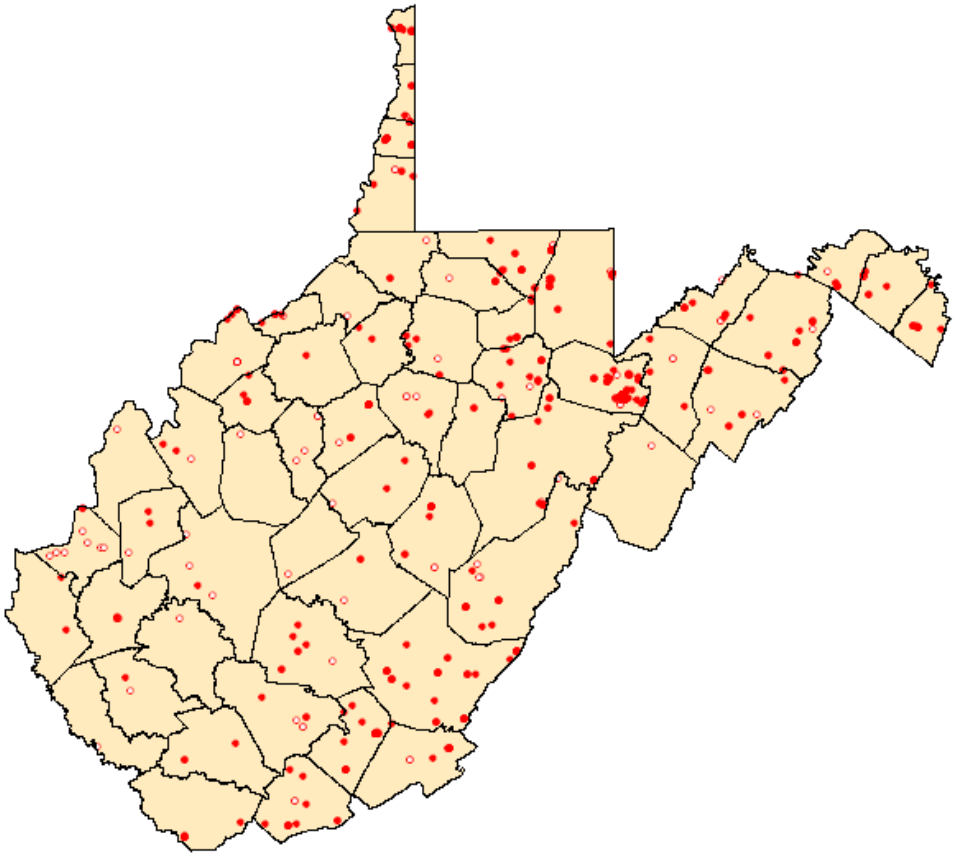
Ischnura prognata adults have no valid records for flight season in West Virginia.

Suborder Zygoptera
Family Coenagrionidae

Ischnura verticalis
Eastern Forktail

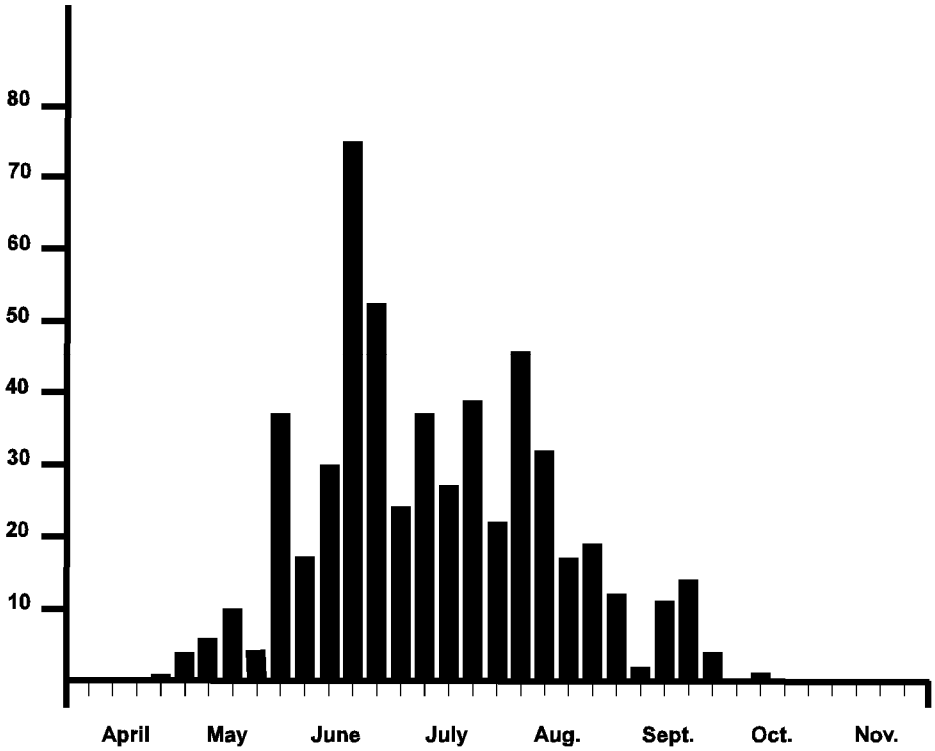
Ischnura verticalis male

Ischnura verticalis female



Ischnura verticalis distribution based on 576 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Another forktail only slightly less frequently encountered than the ubiquitous *Ischnura posita* is *Ischnura verticalis*. It is also found statewide and inhabits a similar broad variety of vegetated still water habitats.



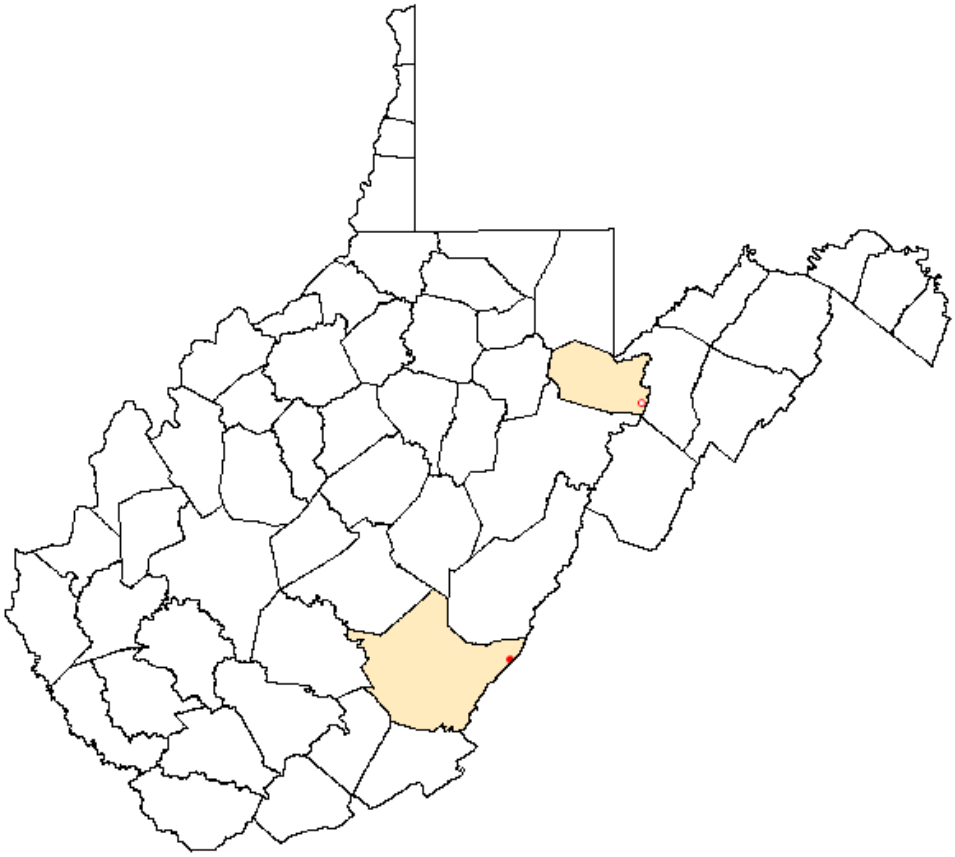
Ischnura verticalis adults have been documented from 28 April — 15 October with 543 valid records.

Suborder Zygoptera
Family Coenagrionidae

Nehalennia gracilis
Sphagnum Sprite

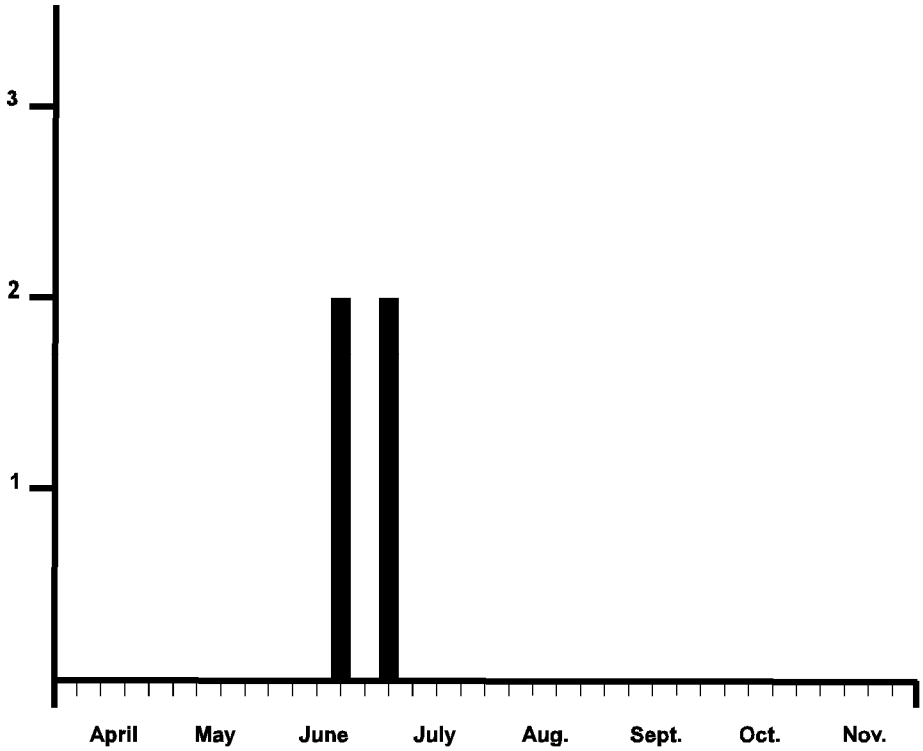
Nehalennia gracilis male

Nehalennia gracilis female



Nehalennia gracilis distribution based on 4 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Known from two sites in West Virginia, only one recently, *Nehalennia gracilis* approaches its southern limit in West Virginia. It is restricted to high elevation (above 2500 ft) wetlands including marshy ponds and bogs.



Nehalennia gracilis adults have been documented from 22 June — 28 June with 4 valid records.

Suborder Zygoptera
Family Coenagrionidae

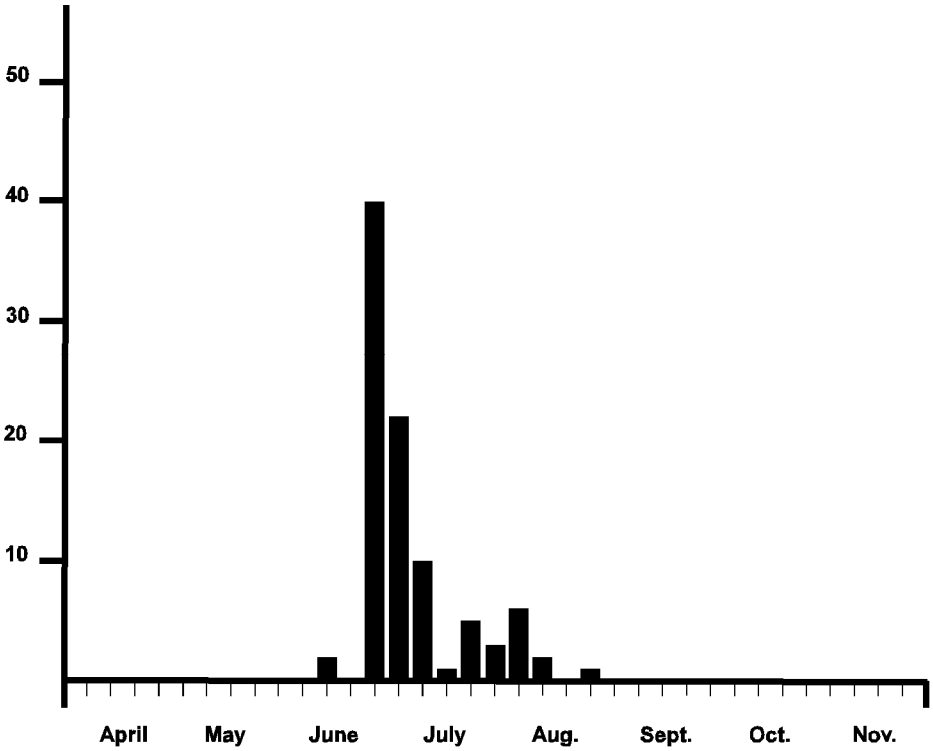
Nehalennia irene
Sedge Sprite

Nehalennia irene male

Nehalennia irene female

Nehalennia irene distribution based on 101 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Nehalennia irene is a fairly common inhabitant of high elevation (above 2500 ft) wetlands, ponds, and ditches. Most frequently encountered in Canaan Valley and Dolly Sods, it is somewhat uncommon elsewhere.



Nehalennia irene adults have been documented from 12 June — 21 August with 91 valid records.

Suborder Zygoptera
Family Coenagrionidae

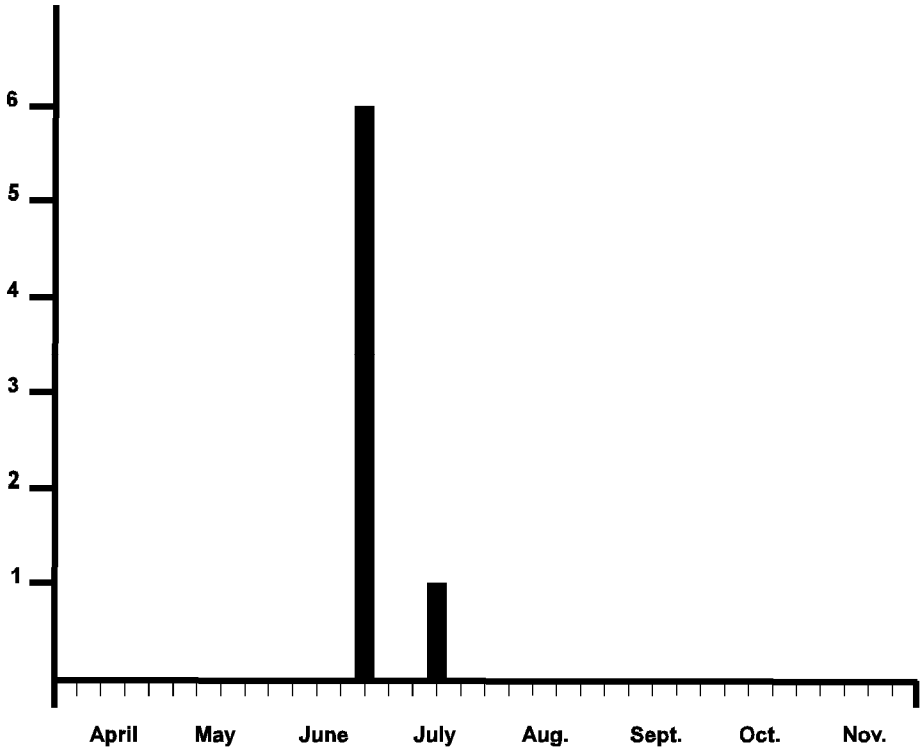
Telebasis byersi
Duckweed Firetail

Telebasis byersi male

Telebasis byersi female

Telebasis byersi distribution based on 7 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Telebasis byersi, an odonate common south and west of West Virginia, is found only at Greenbottom Wildlife Management Area in Cabell County. It prefers ponds with significant mats of floating vegetation, especially duckweed (*Spirodella* and *Lemna* sp.).



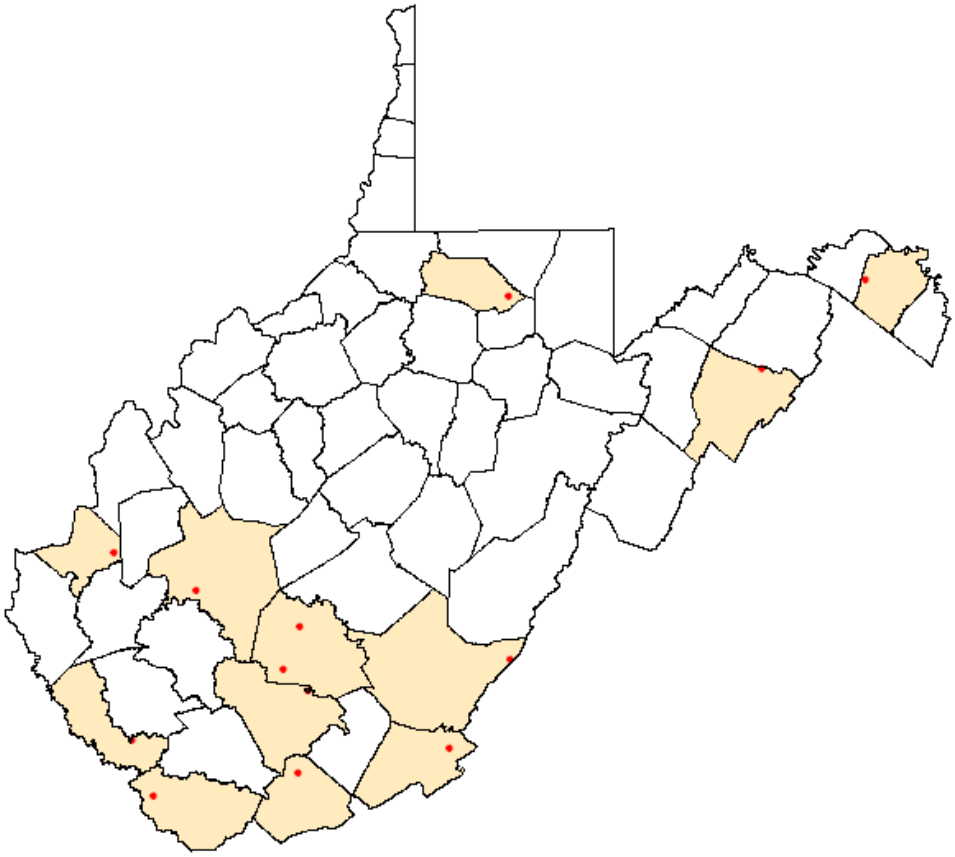
Telebasis byersi adults have been documented from 26 June — 11 July with 7 valid records.

Suborder Anisoptera
Family Petaluridae

Tachopteryx thoreyi
Gray Petaltail

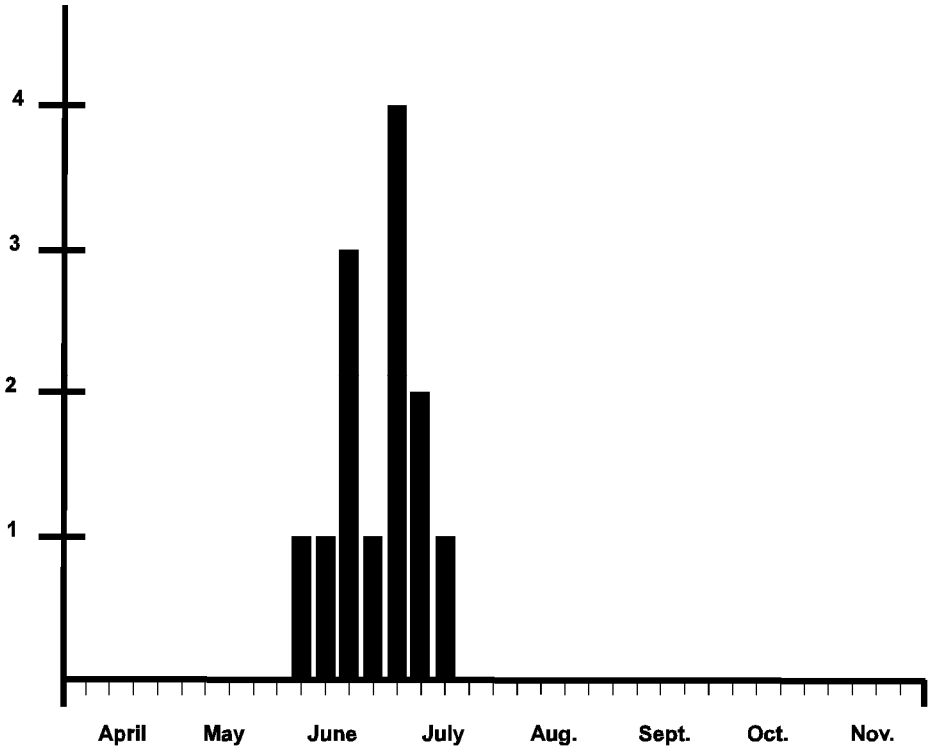
Tachopteryx thoreyi male

Tachopteryx thoreyi female



Tachopteryx thoreyi distribution based on 13 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Along with two species that occur in Asia, petaltails are among the oldest of the odonates. *Tachopteryx thoreyi* may be scattered throughout West Virginia, but is so well camouflaged and difficult to detect when not flying that it can easily be overlooked. It prefers forest edges and openings with seeps and springs.



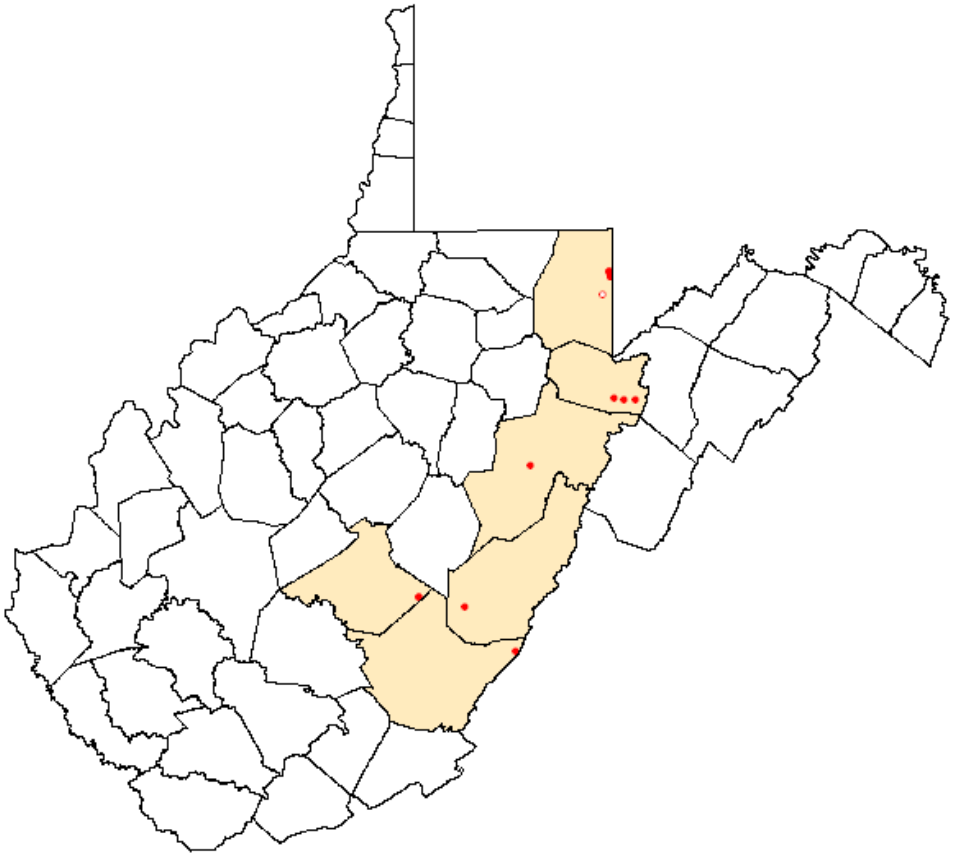
Tachopteryx thoreyi adults have been documented from 6 June — 11 July with 13 valid records.

Suborder Anisoptera
Family Aeshnidae

Aeshna canadensis
Canada Darner

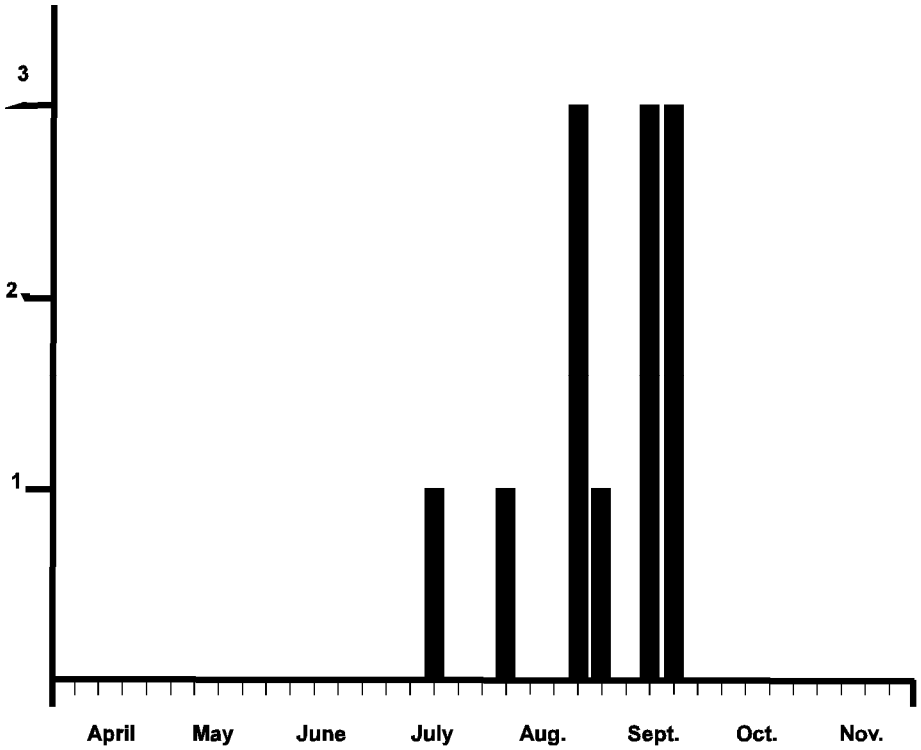
Aeshna canadensis male

Aeshna canadensis female



Aeshna canadensis distribution based on 17 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Aeshna canadensis is a northern species whose southern distribution extends down the Appalachians. It is typically found at high elevations (above 2500 ft) in marshes, beaver ponds, and bogs in late summer.



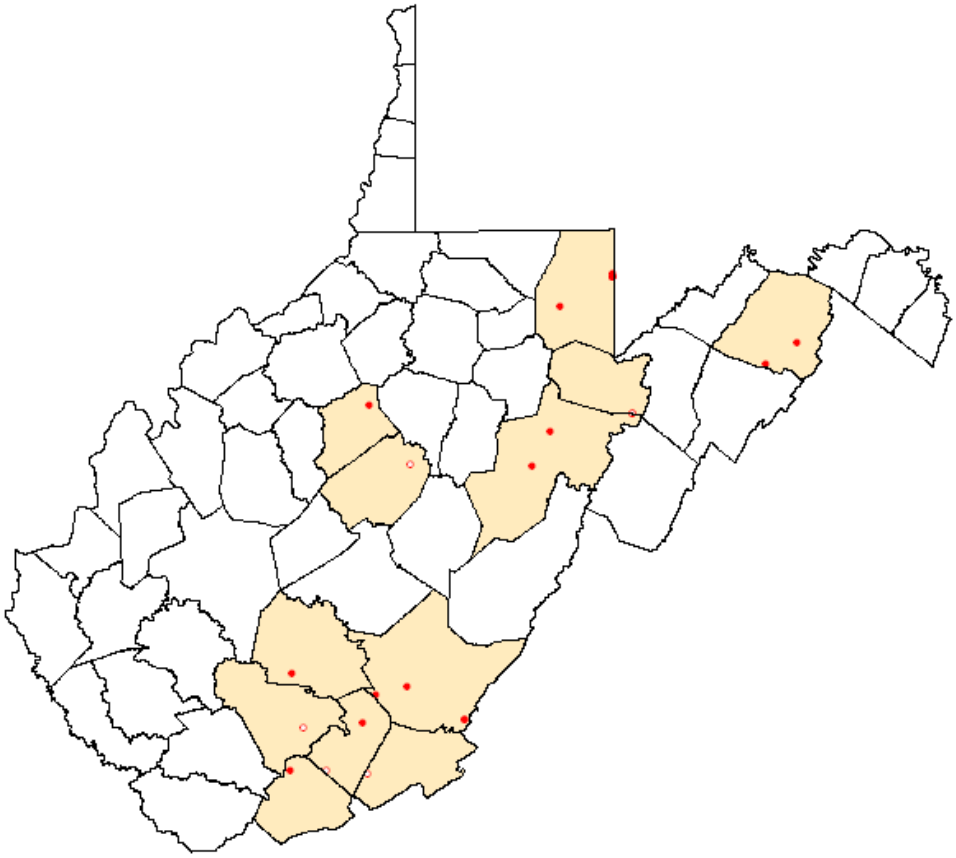
Aeshna canadensis adults have been documented from 11 July — 24 September with 12 valid records.

Suborder Anisoptera
Family Aeshnidae

Aeshna tuberculifera
Black-tipped Darner

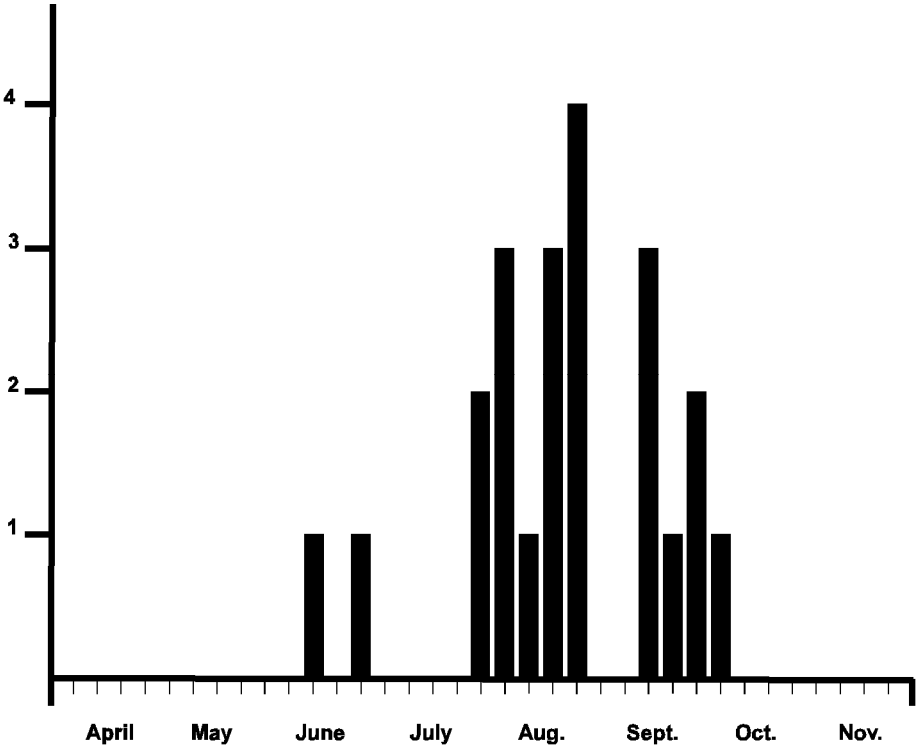
Aeshna tuberculifera male

Aeshna tuberculifera female ovipositing



Aeshna tuberculifera distribution based on 24 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Aeshna tuberculifera occurs in scattered locations in the mountain counties and foot hills in West Virginia. Like other mosaic darners, *A. tuberculifera* is active during late summer and fall and likely has a larger distribution than records indicate. The low number of documented counties is due to the difficulty of netting them to confirm identification.



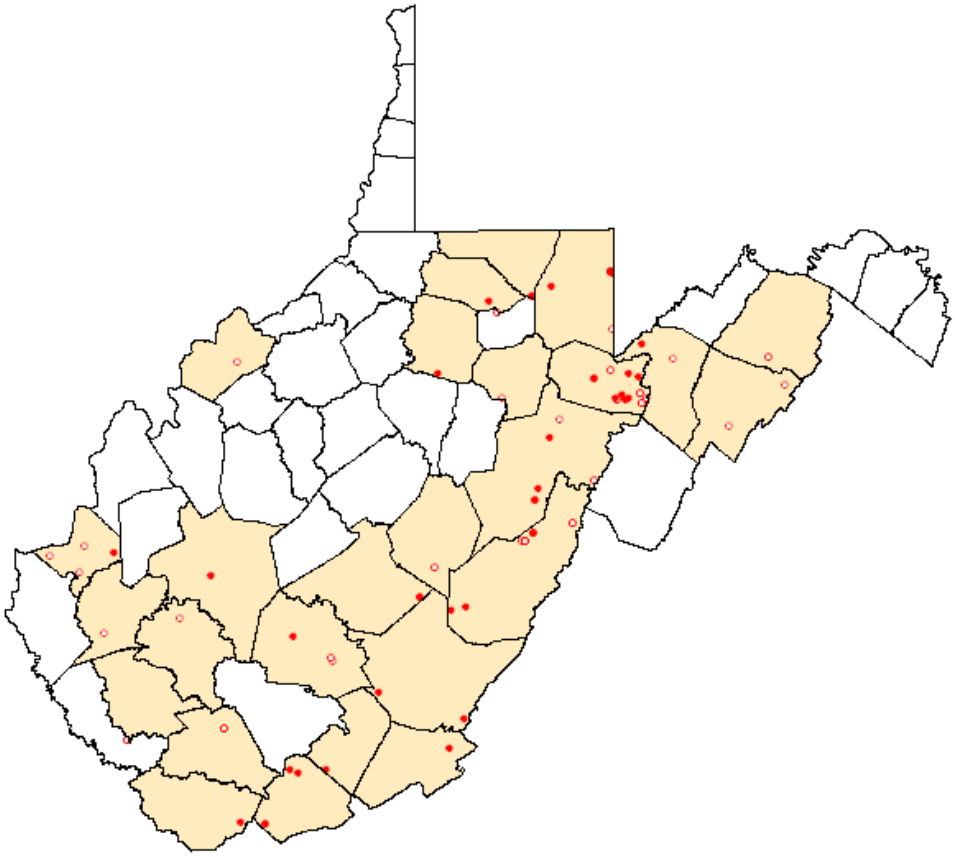
Aeshna tuberculifera adults have been documented from 6 June — 3 October with 22 valid records.

Suborder Anisoptera
Family Aeshnidae

Aeshna u. umbrosa
Shadow Darner

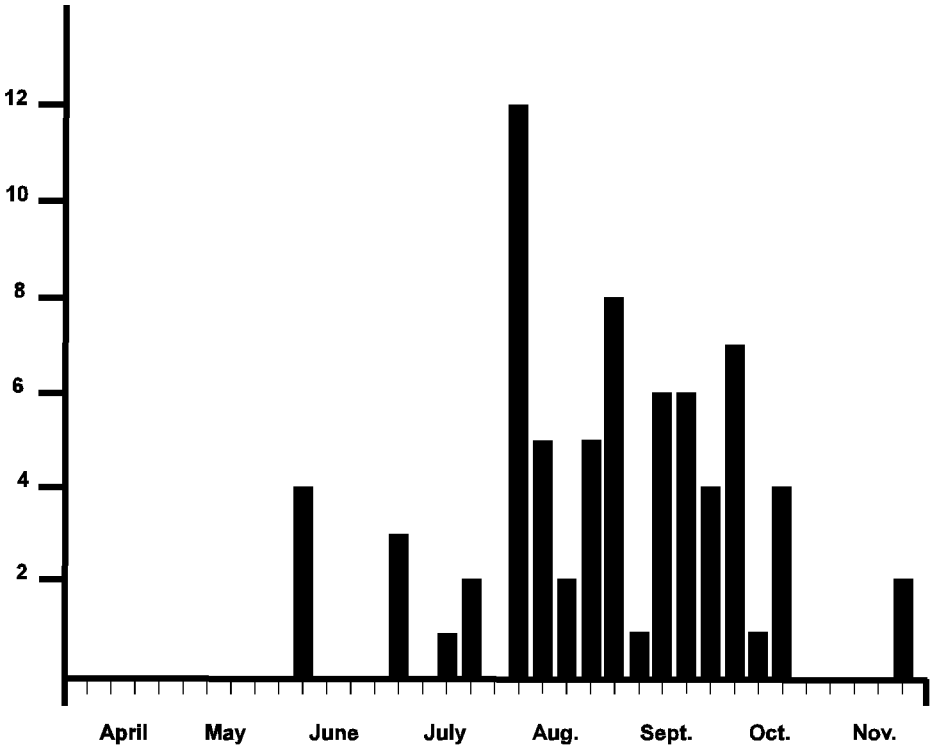
Aeshna umbrosa male

Aeshna umbrosa female



Aeshna u. umbrosa distribution based on 95 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Aeshna u. umbrosa is the most frequently encountered mosaic darner in West Virginia. It may occur statewide on slow sections of forested streams and shaded sides of ponds.



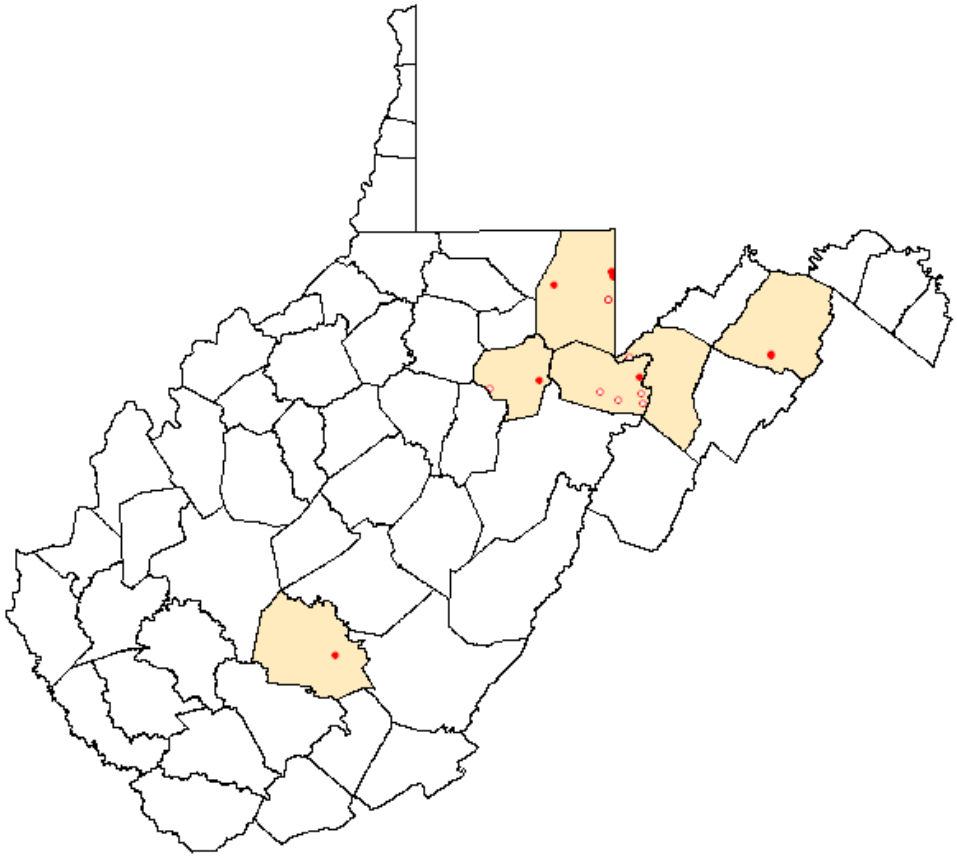
Aeshna u. umbrosa adults have been documented from 9 June — 22 November with 72 valid records.

Suborder Anisoptera
Family Aeshnidae

Aeshna verticalis
Green-striped Darner

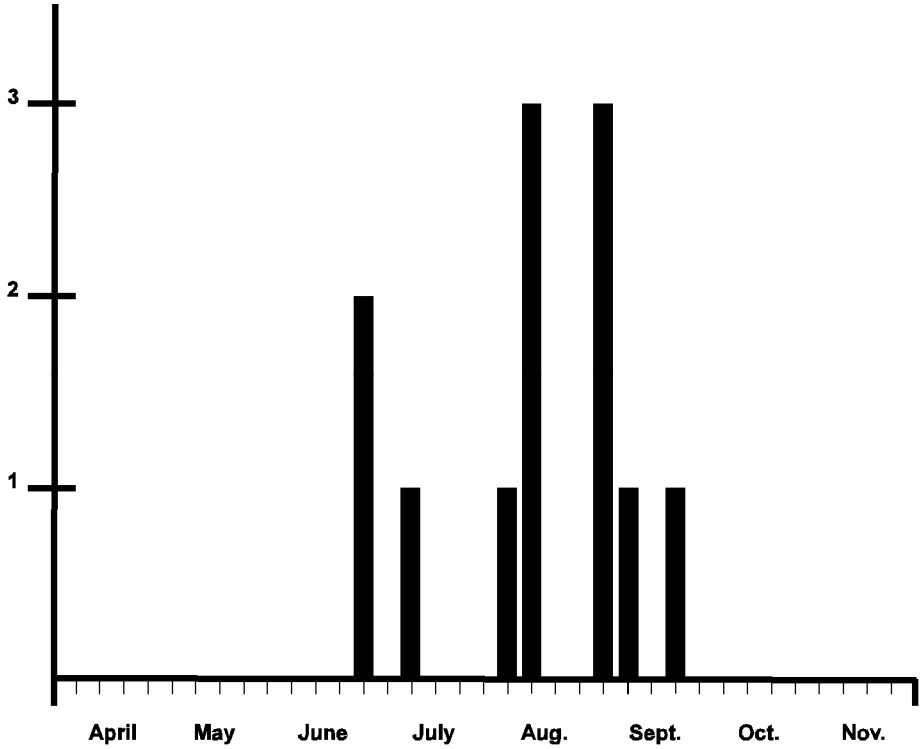
Aeshna verticalis male

Aeshna verticalis female



Aeshna verticalis distribution based on 19 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Aeshna verticalis is a northern species that approaches its southern limit of distribution in West Virginia. Uncommon across its range, it is most likely encountered in high elevation (above 2500 ft) wetland areas such as Canaan Valley in Tucker County and Cranesville Swamp in Preston County that have abundant marshy meadows and ponds.



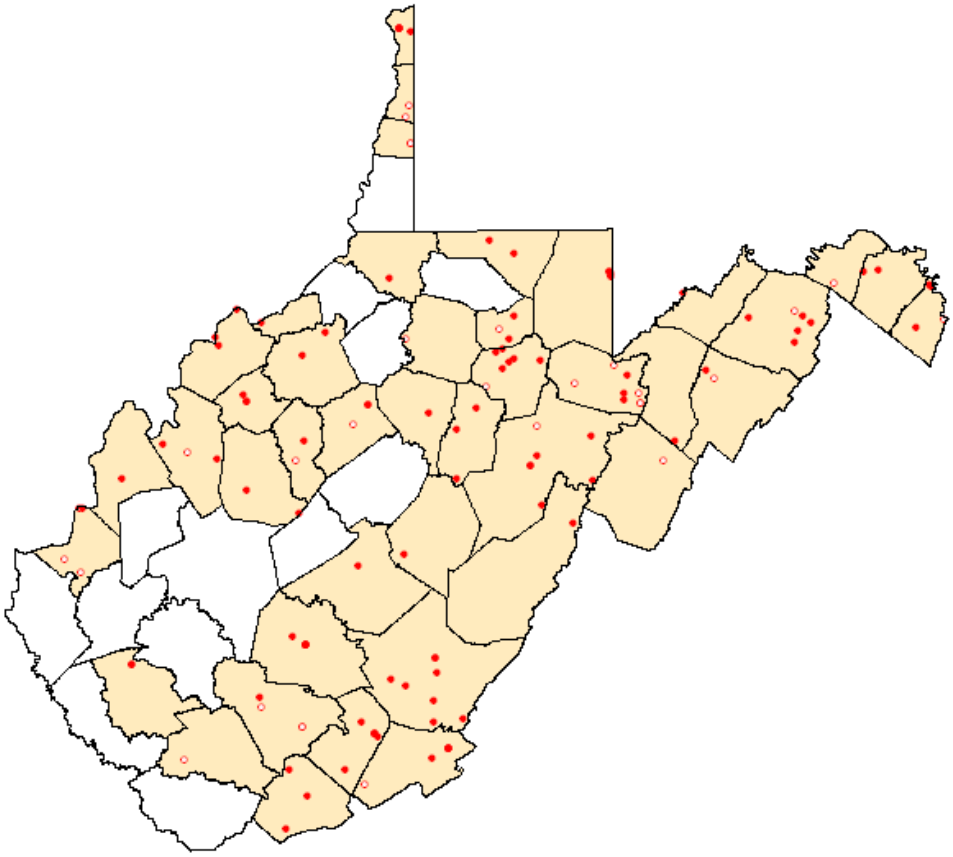
Aeshna verticalis adults have been documented from 26 June — 24 September with 12 valid records.

Suborder Anisoptera
Family Aeshnidae

Anax junius
Common Green Darner

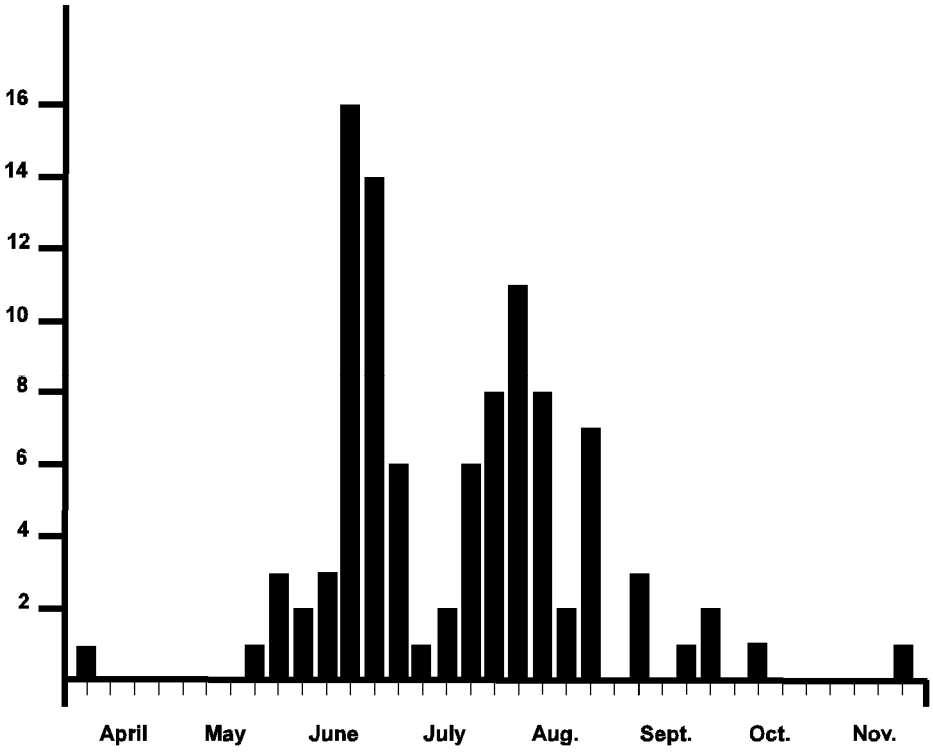
Anax junius pair ovipositing

Anax junius female



Anax junius distribution based on 127 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Likely occurring statewide at ponds and impoundments with emergent vegetation and in marshes, *Anax junius* is the most common darner in West Virginia. The bimodal pattern of the flight period reflects the movement of migrants heading north in the spring, followed by the emergence of their progeny during the summer and fall.



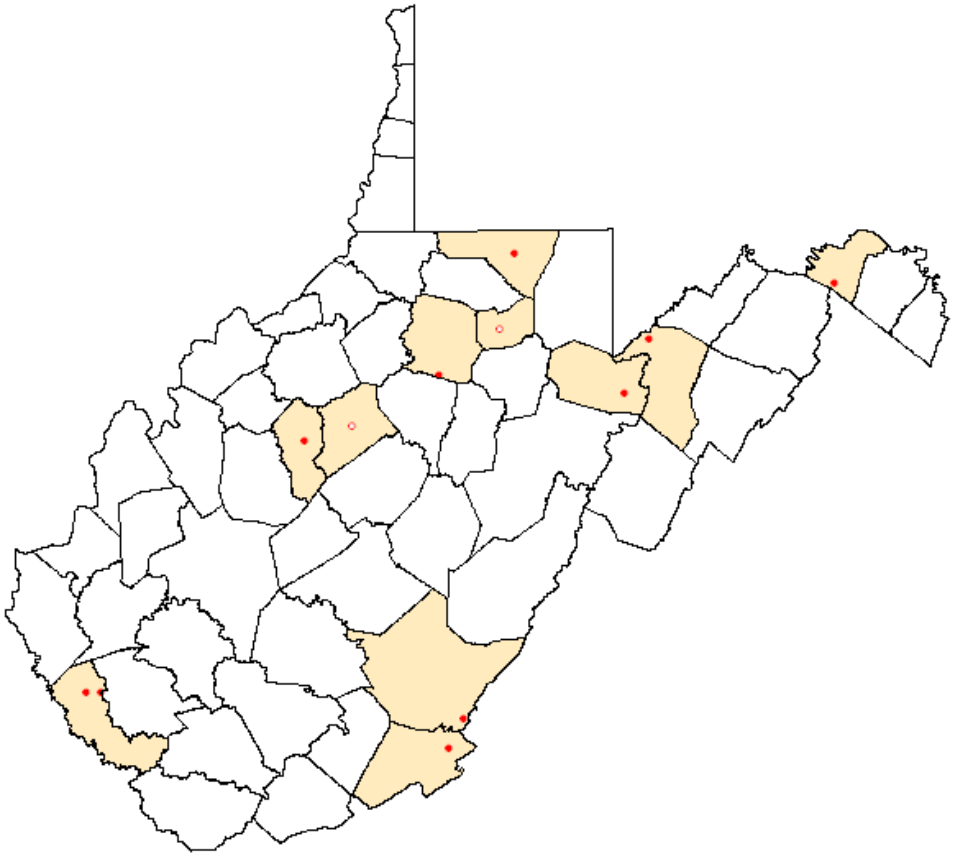
Anax junius adults have been documented from 5 April — 11 November with 99 valid records.

Suborder Anisoptera
Family Aeshnidae

Anax longipes
Comet Darner

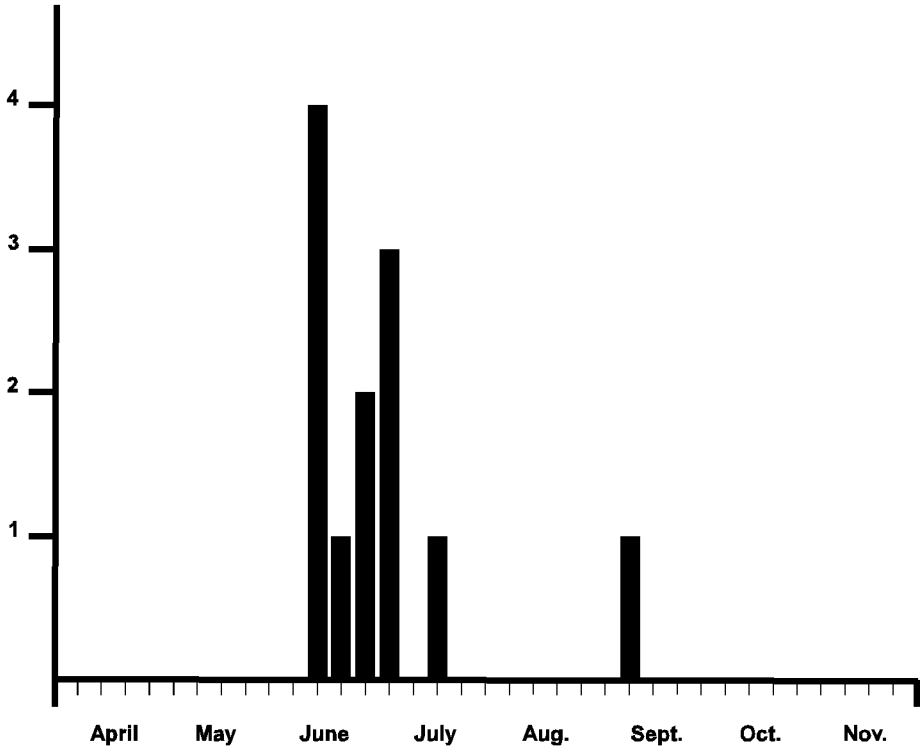
Anax longipes male

Anax longipes female



Anax longipes distribution based on 12 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Anax longipes is infrequently encountered in West Virginia, possibly reflecting their preference for ponds and marshes without fish inhabiting them, a rare condition in the state. Their bright green and red coloration make them easy to identify in flight, supporting the conclusion that they are indeed rare, not simply overlooked.



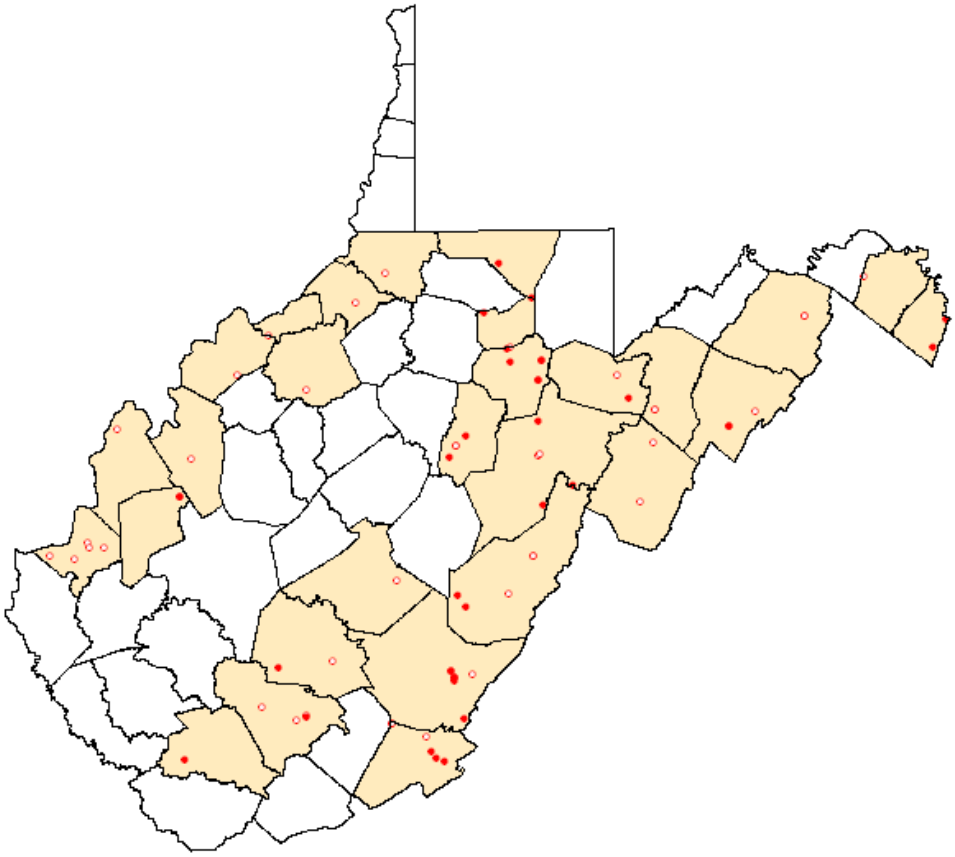
Anax longipes adults have been documented from 10 June — 9 September with 12 valid records.

Suborder Anisoptera
Family Aeshnidae

Basiaeschna janata
Springtime Darner

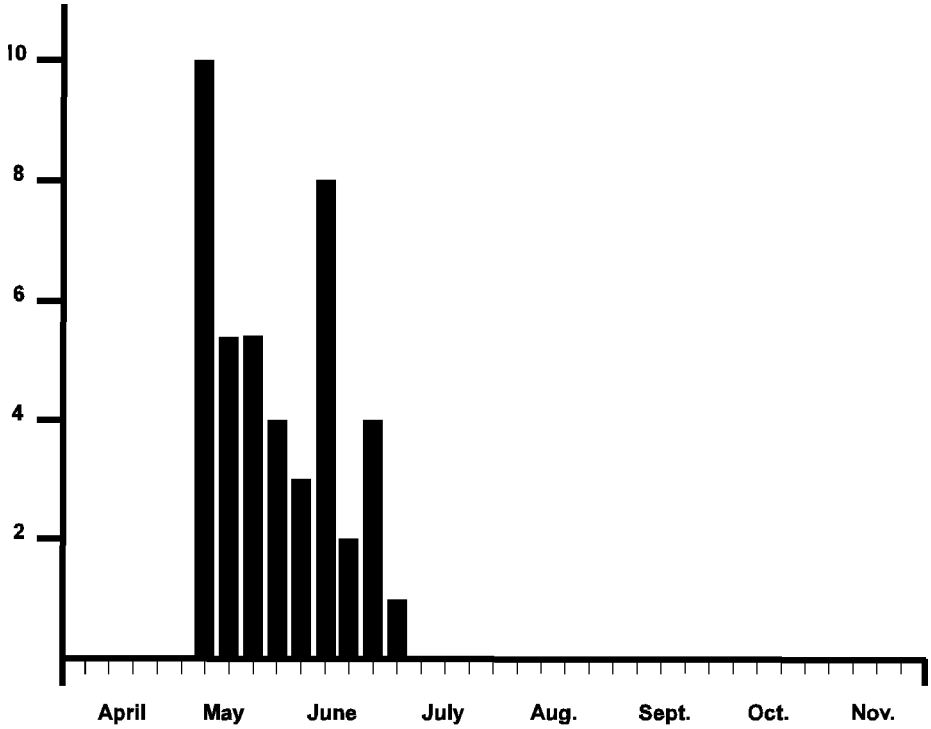
Basiaeschna janata male

Basiaeschna janata female



Basiaeschna janata distribution based on 74 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

One of West Virginia's earliest emerging odonates, *Basiaeschna janata* is found in flight over slow streams and ponds with bare banks by early May. Its early flight habits may have caused collectors to miss it in many areas.



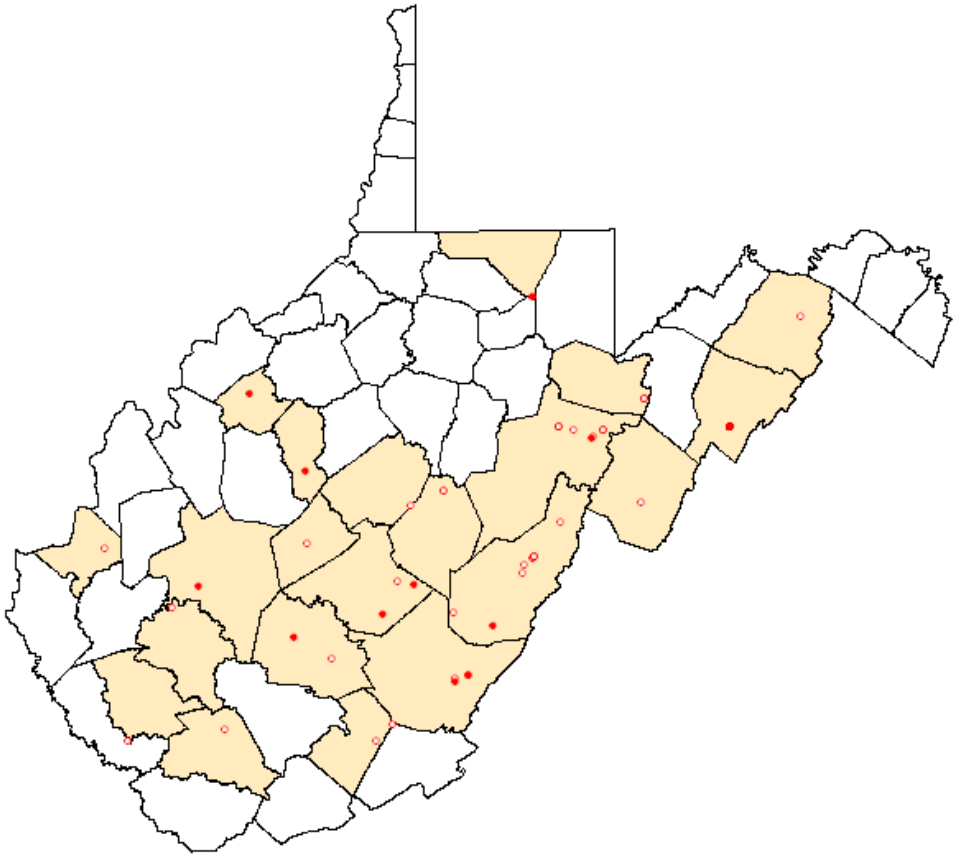
Basiaeschna janata adults have been documented from 5 May — 29 June with 42 valid records.

Suborder Anisoptera
Family Aeshnidae

Boyeria grafiana
Ocellated Darner

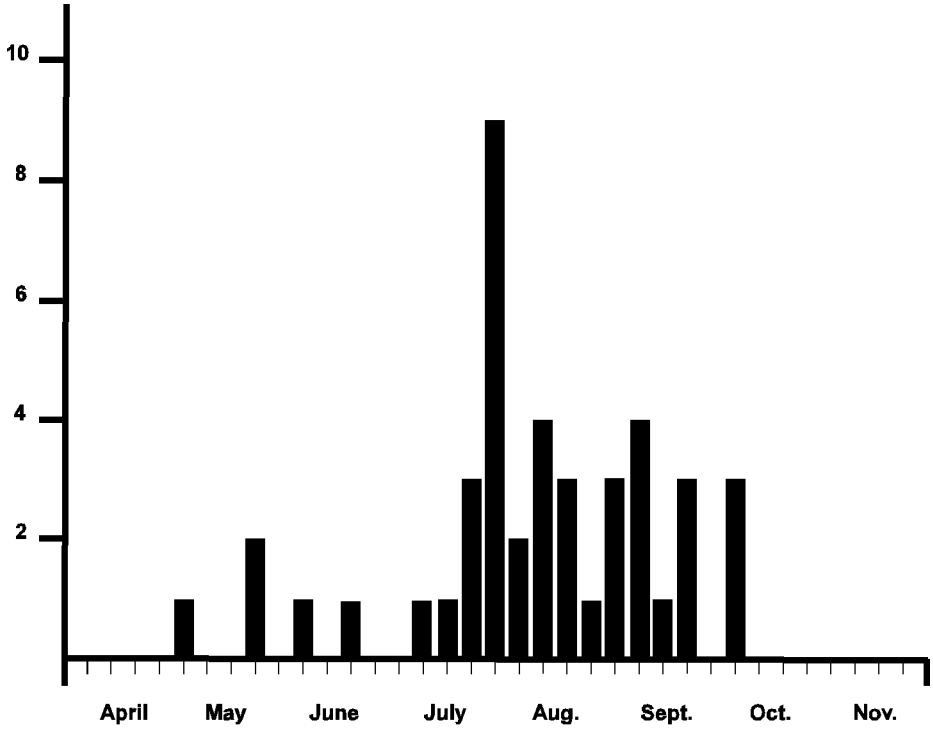
Boyeria grafiana male

Boyeria grafiana female



Boyeria grafiana distribution based on 63 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Boyeria grafiana is a northern species that is encountered fairly frequently down the Appalachians to GA, and likely occurs statewide in West Virginia. It prefers shaded rocky streams in late summer and frequently is active until dark.



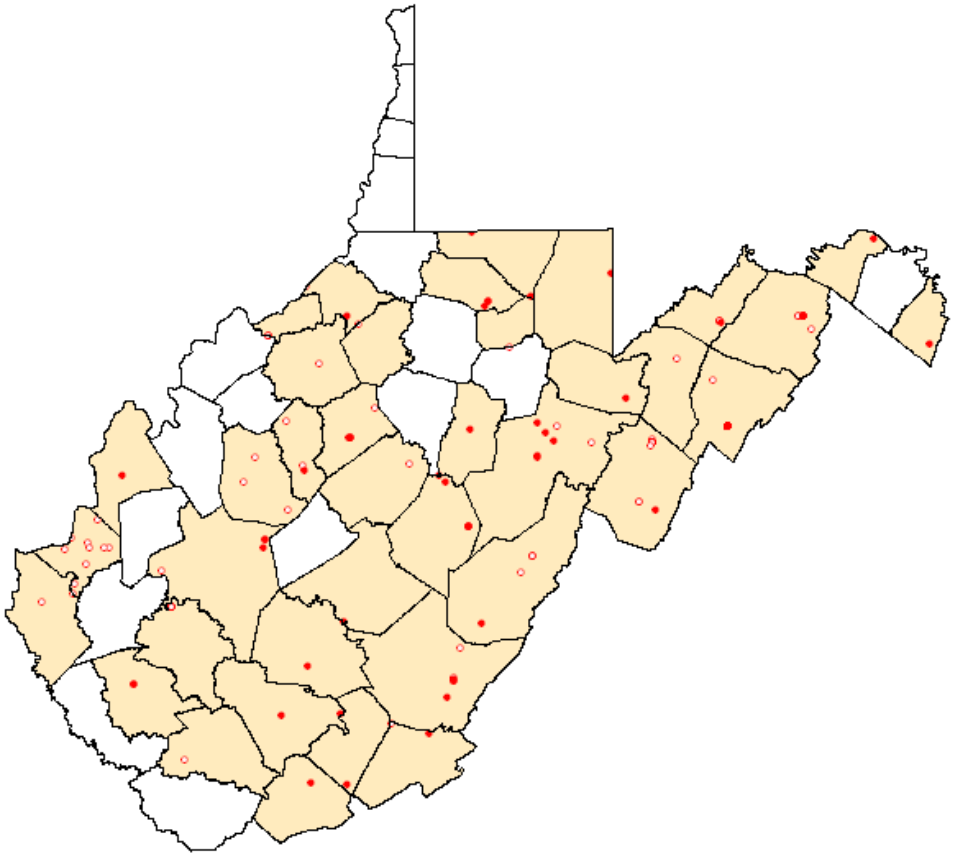
Boyeria grafiana adults have been documented from 3 May — 8 October with 43 valid records.

Suborder Anisoptera
Family Aeshnidae

Boyeria vinosa
Fawn Darner

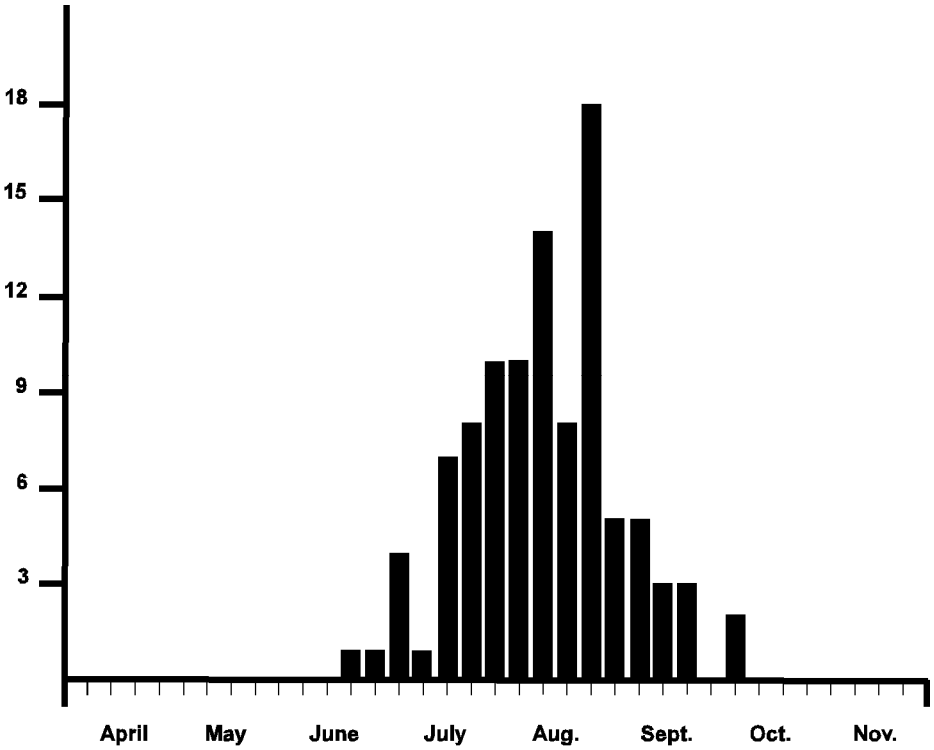
Boyeria vinosa male

Boyeria vinosa female



Boyeria vinosa distribution based on 147 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Boyeria vinosa is a common late summer darner on forested streams and rivers throughout West Virginia. It is inactive most of the day, but frequently flies until dark after becoming active in the afternoon, and may be attracted by porch lights.



Boyeria vinosa adults have been documented from 22 June — 7 October with 100 valid records.

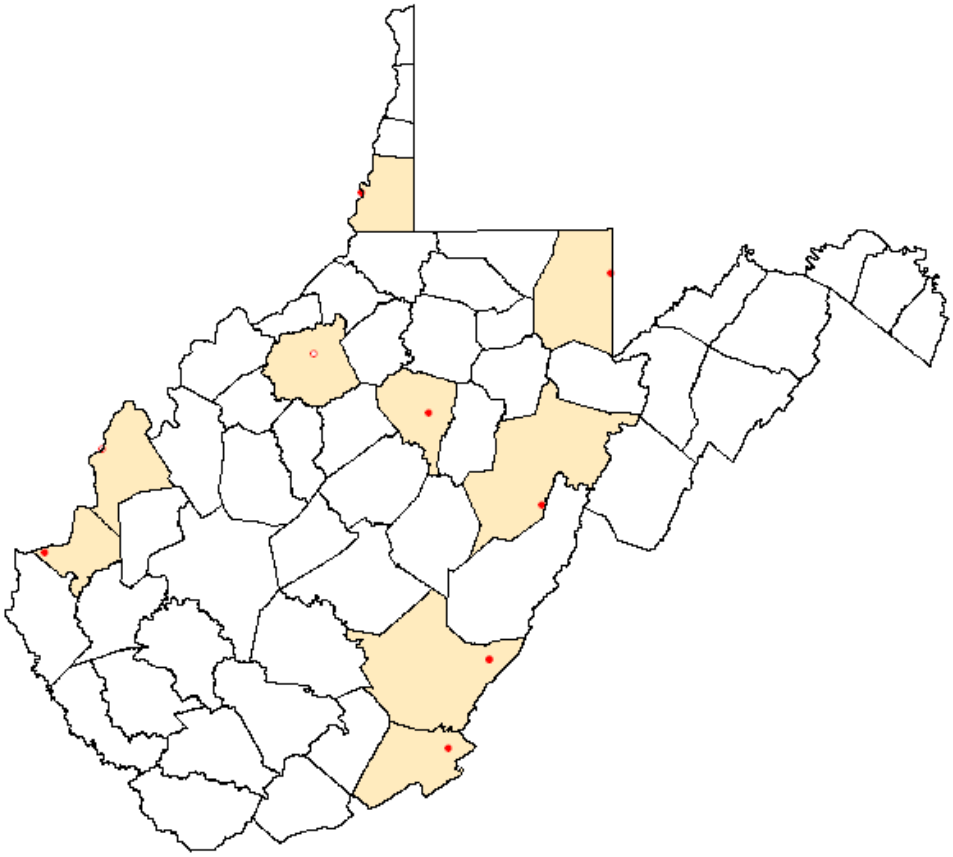
Suborder Anisoptera
Family Aeshnidae

Epiaeschna heros
SwampDarner

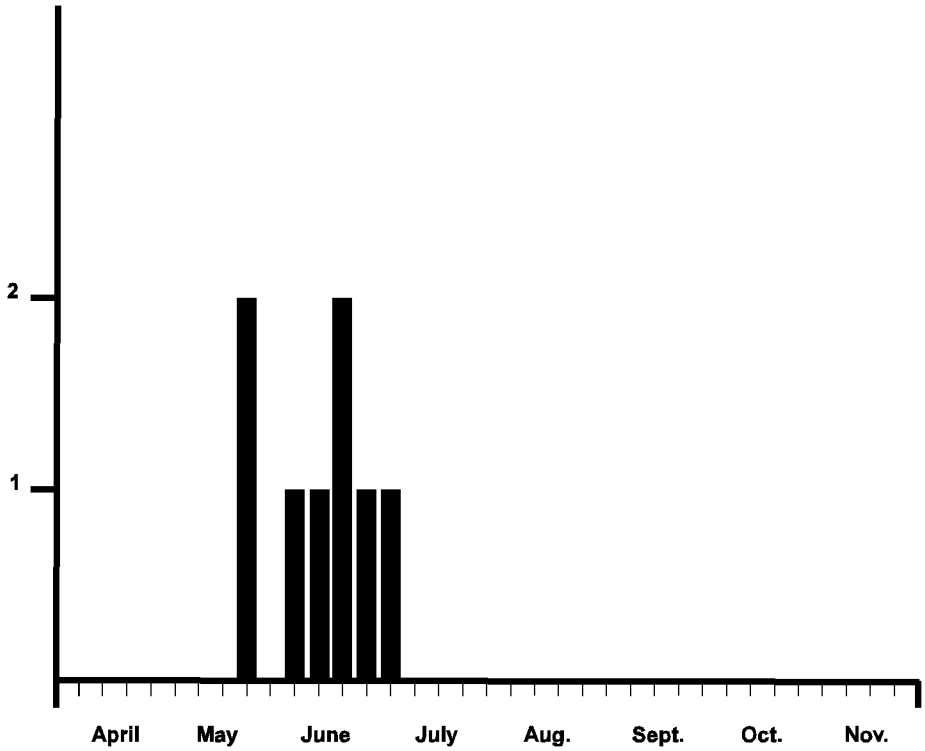
Epiaeschna heros male

Epiaeschna heros female ovipositing

Primarily a resident of southern swamps and coastal plain streams, *Epiaeschna heros* in West Virginia is found at forest pools, shaded oxbow ponds, flooded woodlands , and swamps. It is likely more common than records indicate.



Epiaeschna heros distribution based on 10 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.



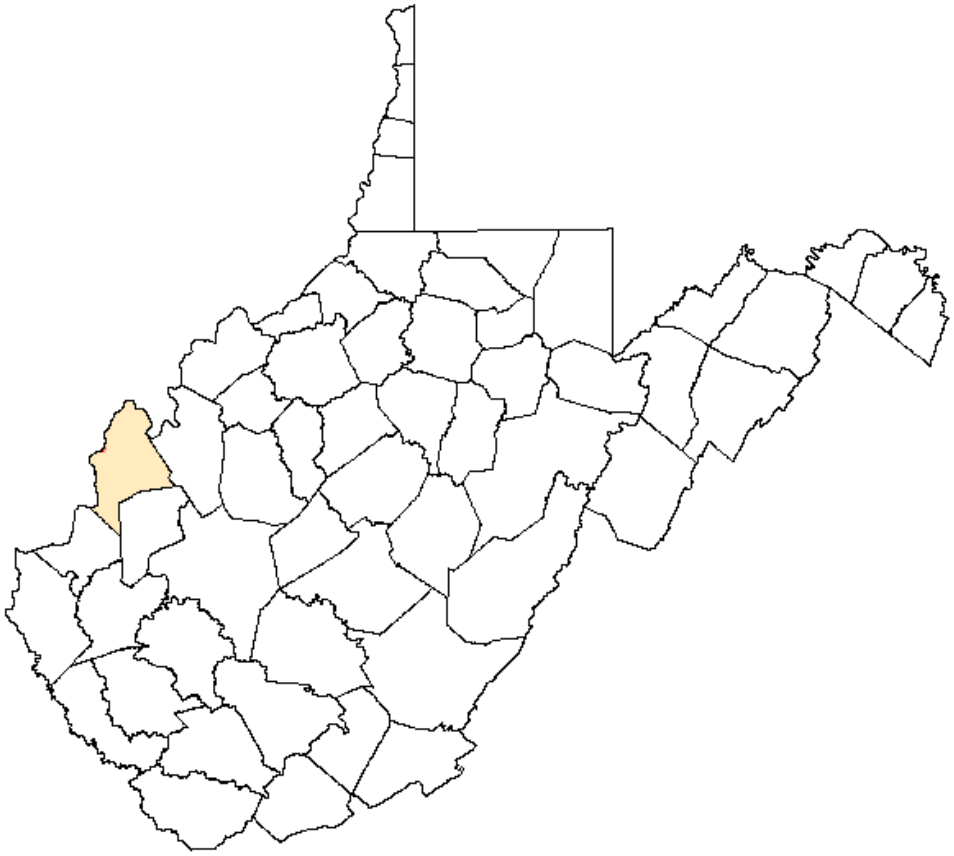
Epiaeschna heros adults have been documented from 20 May — 7 July with 8 valid records.

Suborder Anisoptera
Family Aeshnidae

Nasiaeschna pentacantha
CyranoDarner

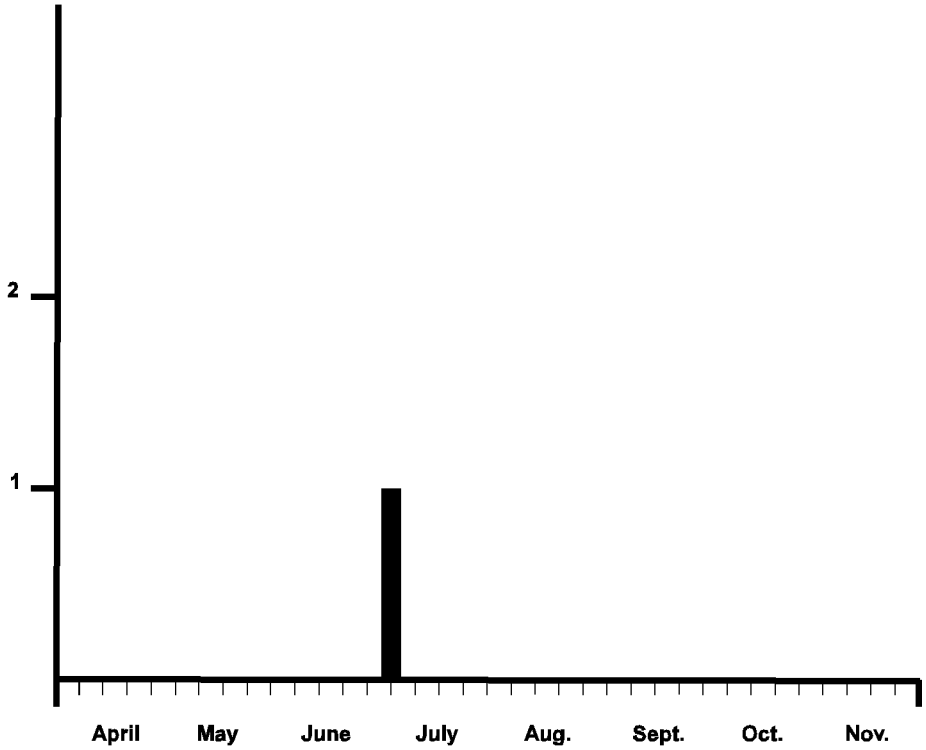
Nasiaeschna pentacantha male

Nasiaeschna pentacantha female ovipositing



Nasiaeschna pentacantha distribution based on 1 record. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Nasiaeschna pentacantha is a southern species primarily found at low elevations along the coastal plain and Mississippi River drainage. The single West Virginia record is from 1962 at a pond next to the Ohio River in Mason County. The pond, now in a cow pasture, has since filled in from sedimentation and no other records are known. This individual may have been a vagrant from Ohio populations.



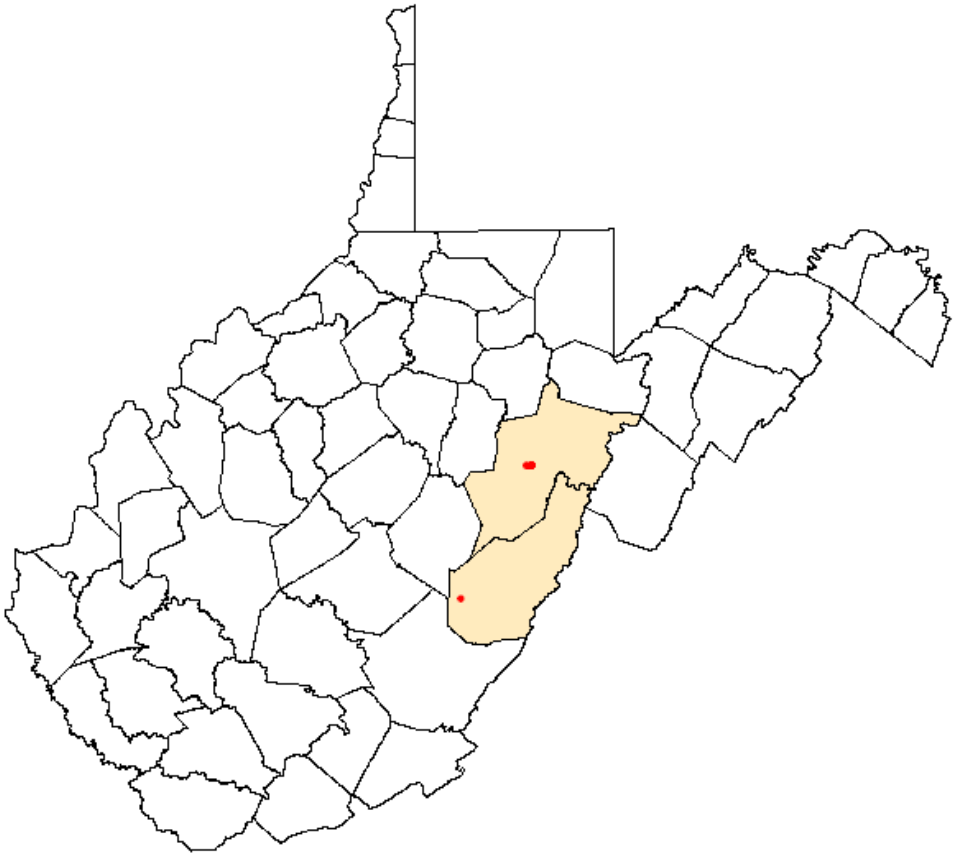
One *Nasiaeschna pentacantha* adult has been documented on 7 July.

Suborder Anisoptera
Family Aeshnidae

Rhionaeschna mutata
SpatterdockDarner

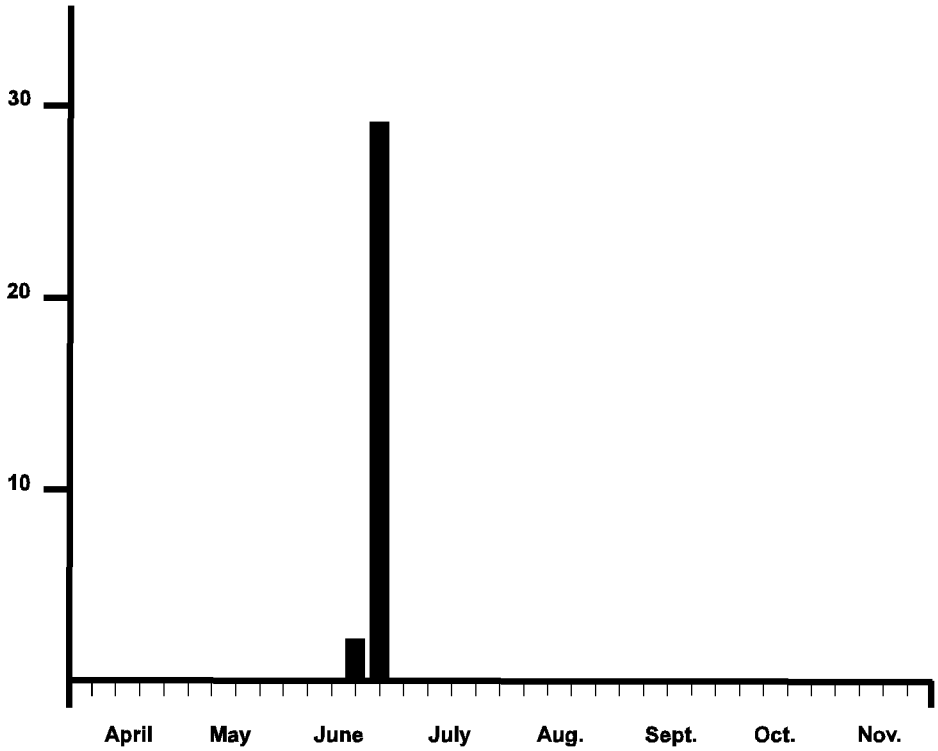
Rhionaeschna mutata male—sexes similar

Rhionaeschna mutata head detail



Rhionaeschna mutata distribution based on 31 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Rhionaeschna mutata occurs at fishless ponds supporting spatterdock (*Nuphar* sp.) at two sites in West Virginia. Rare or uncommon range wide, it is categorized as threatened, endangered, or a species of conservation concern in most states or provinces where it occurs. Formerly in the genus *Aeshna*, it is now considered more closely related to some neotropical darners and was reclassified to *Rhionaeschna* in 2003.



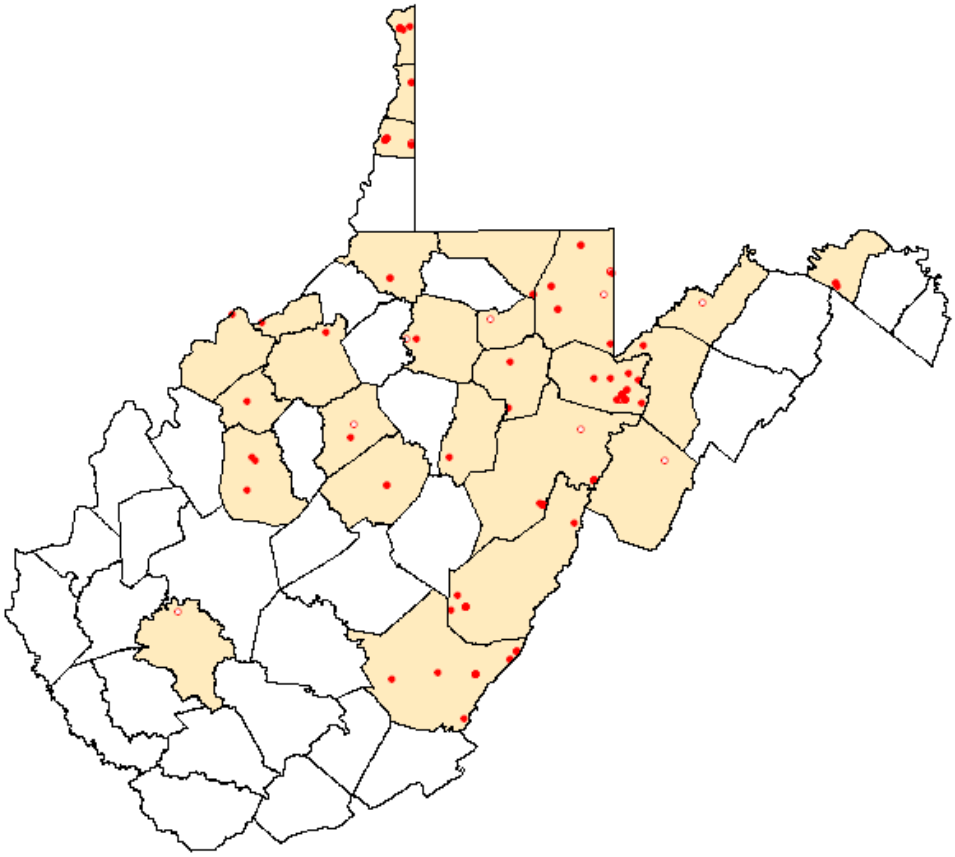
Rhionaeschna mutata adults have been documented from 18 June—28 June with 31 valid records.

Suborder Anisoptera
Family Gomphidae

Arigomphus villosipes
Unicorn Clubtail

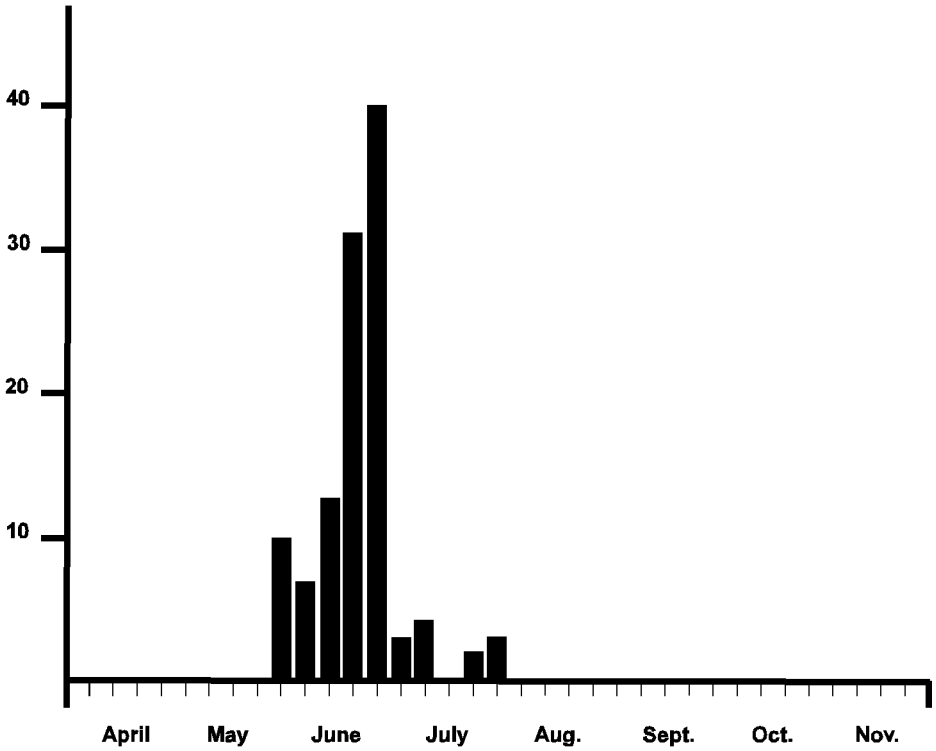
Arigomphus villosipes male

Arigomphus villosipes female



Arigomphus villosipes distribution based on 124 records. Open dots are 1994 and earlier records;, solid dots are 1995-2010 records.

One of WestVirginia's two pond clubtails, *Arigomphus villosipes* is fairly common in the northern part of the state. The lack of records in the south may reflect collectors lack of access to ponds in this area, although this species will also use slow stream pools.



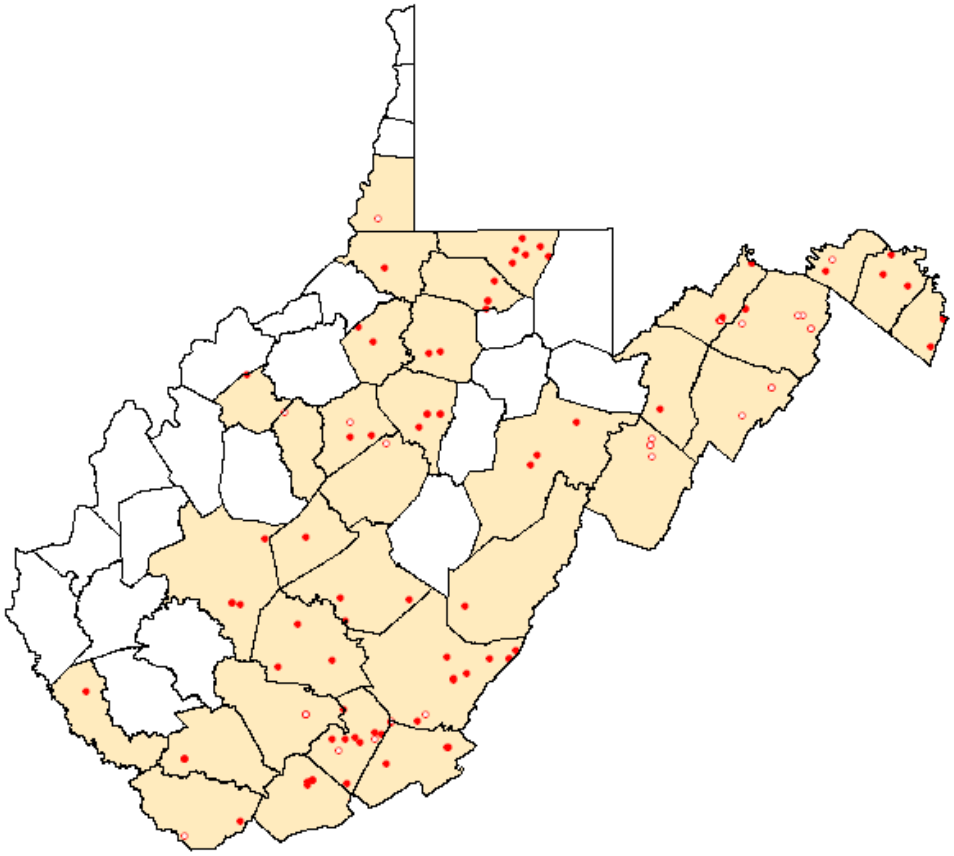
Arigomphus villosipes adults have been documented from 28 May —1 August with 113 valid records.

Suborder Anisoptera
Family Gomphidae

Dromogomphus spinosus
Black-shouldered Spinyleg

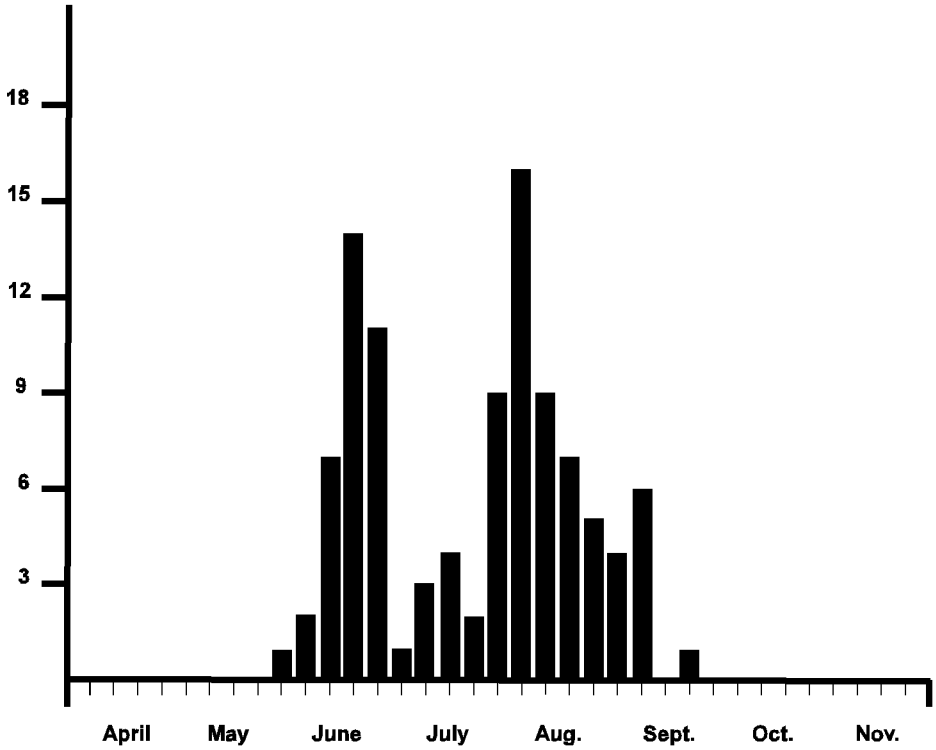
Dromogomphus spinosus male

Dromogomphus spinosus female



Dromogomphus spinosus distribution based on 118 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Dromogomphus spinosus is one of West Virginia most common clubtails and is frequently encountered in the summer on streams and rivers throughout the state. It is especially easy to see perched on gravel roads and trails that parallel rivers such as the Monongahela and Greenbrier.



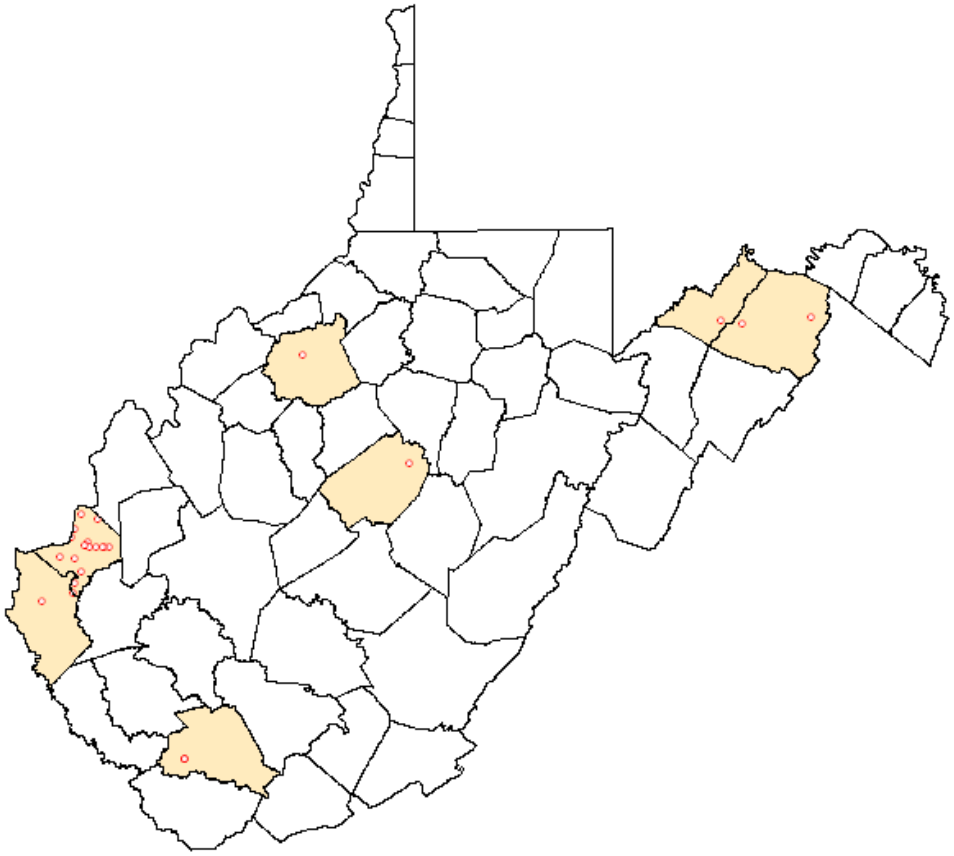
Dromogomphus spinosus adults have been documented from 1 June —21 September with 102 valid records.

Suborder Anisoptera
Family Gomphidae

Dromogomphus spoliatus
Flag-tailed Spinyleg

Dromogomphus spoliatus male

Dromogomphus spoliatus female



Dromogomphus spoliatus distribution based on 26 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Dromogomphus spoliatus is known only from larval records mostly from the 1970s and has not been documented in West Virginia since then. A species primarily of the central plains, it reaches the eastern limit of its distribution in West Virginia. A focused effort at historical sites may be able to determine if this species still inhabits the state. It is mostly found on rivers with mud bottomed pools.

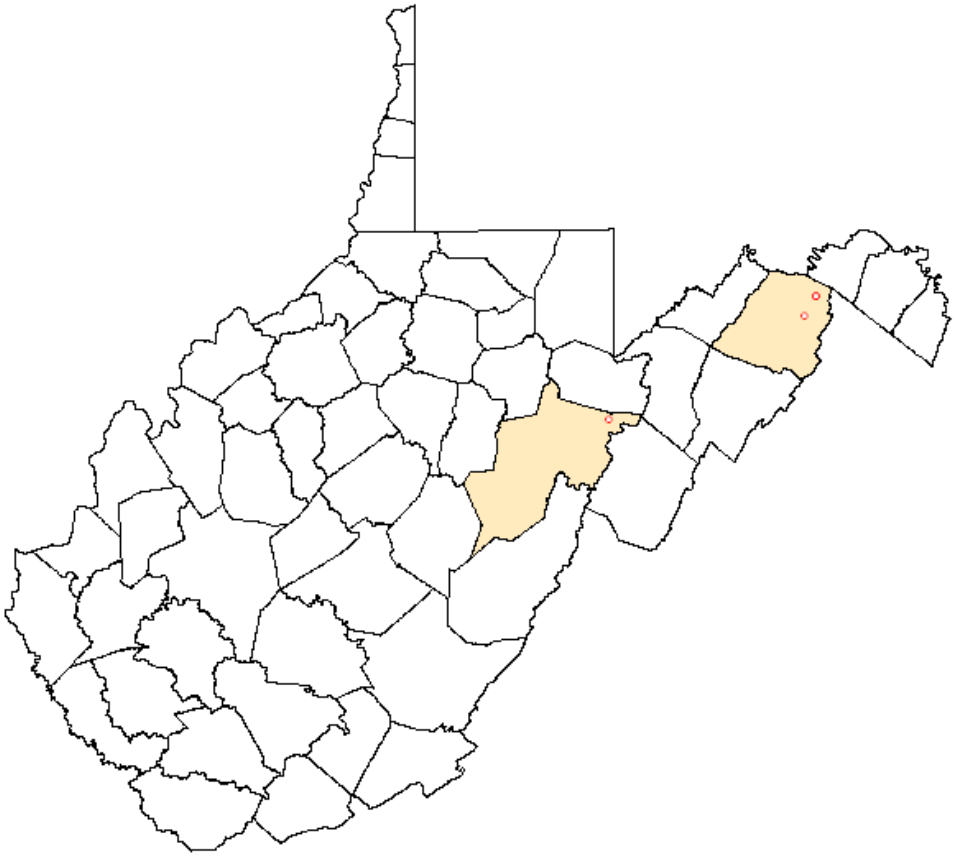
No *Dromogomphus spoliatus* adults have been documented in West Virginia.

Suborder Anisoptera
Family Gomphidae

Gomphus abbreviatus
Spine-crowned Clubtail

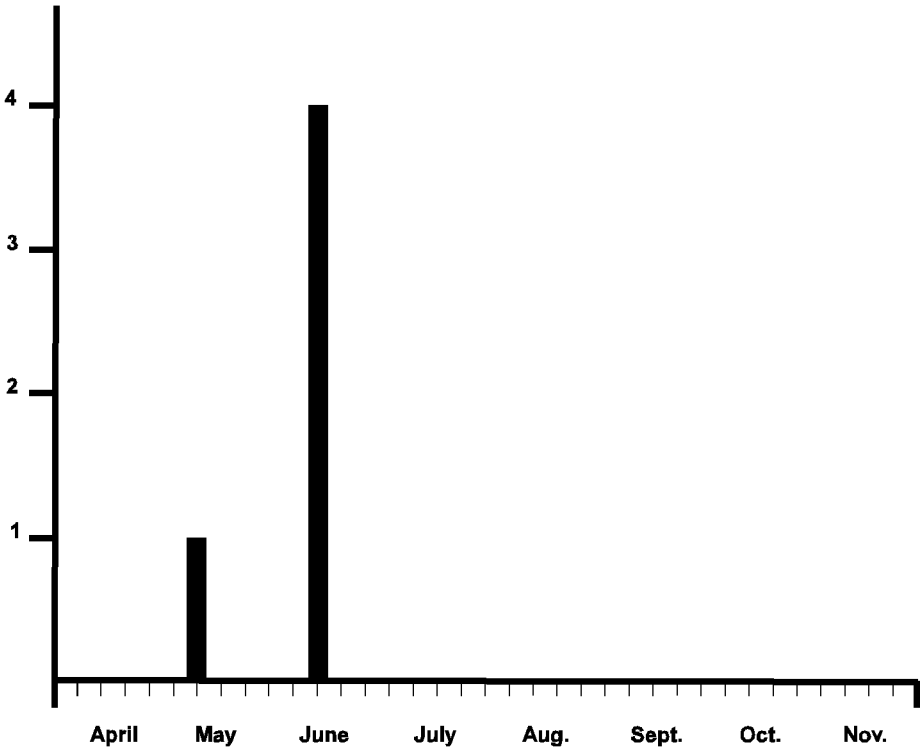
Gomphus abbreviatus male

Gomphus abbreviatus female



Gomphus abbreviatus distribution based on 5 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Gomphus abbreviatus is an increasingly rare northern species, which is considered threatened, endangered, or a species of conservation concern by most states and provinces. It has been found in Hampshire and Randolph counties, but has not been documented in the state since 1973. It prefers clean streams or rivers with muck bottomed pools.



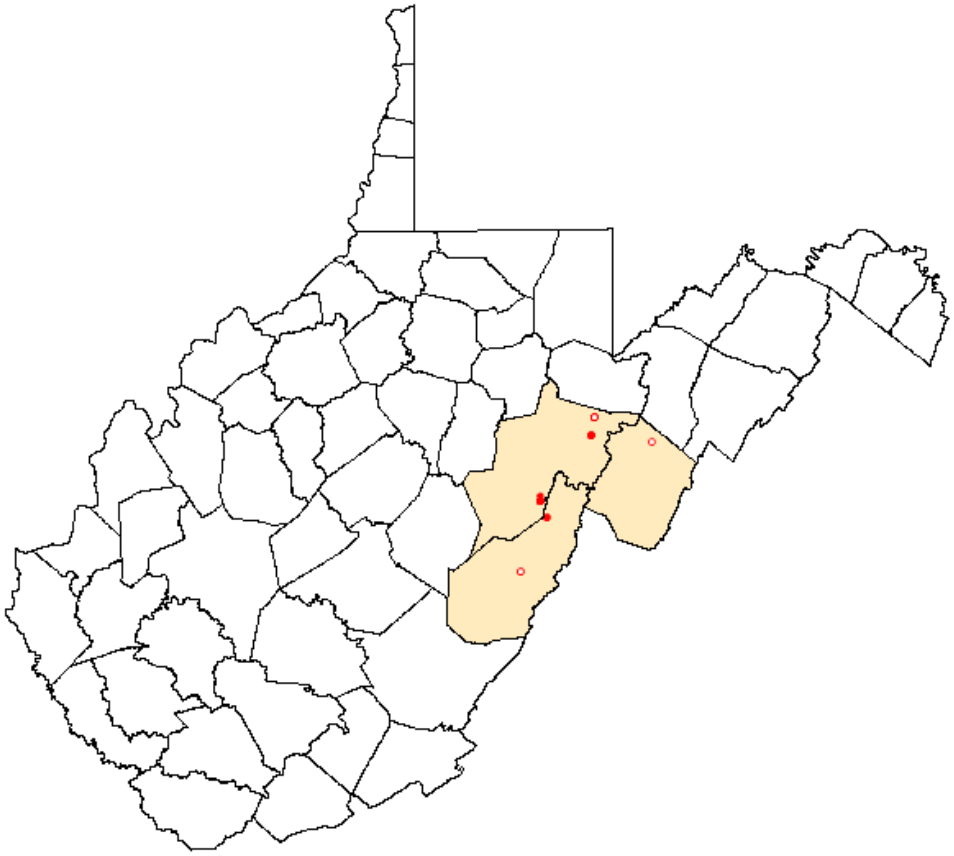
Gomphus abbreviatus adults have been documented from 10 May —10 June with 5 valid records.

Suborder Anisoptera
Family Gomphidae

Gomphus adelphus
Moustached Clubtail

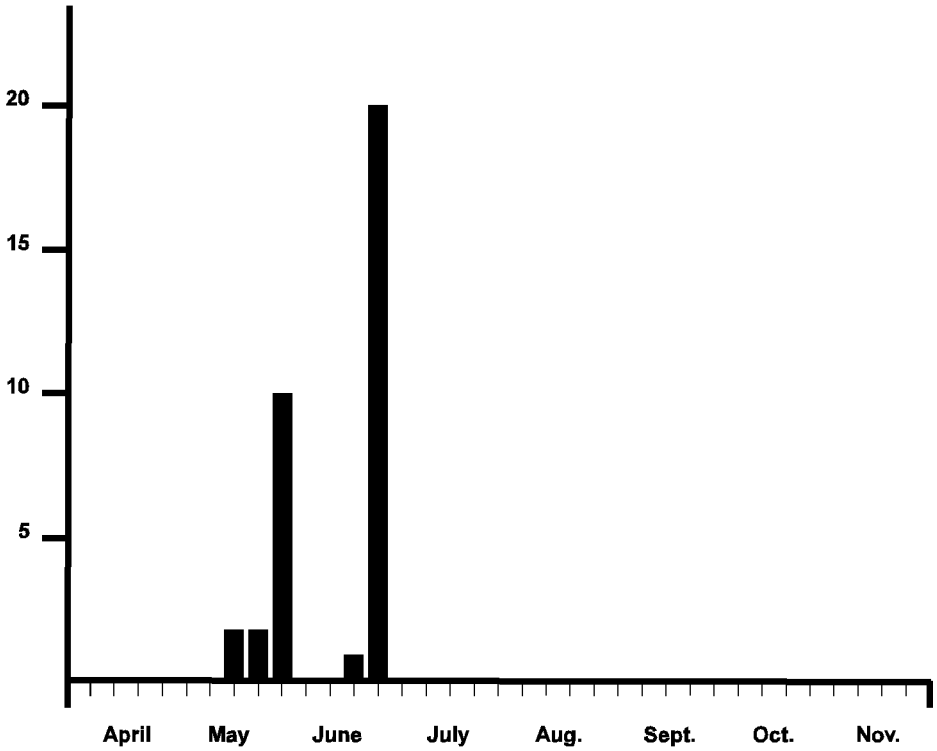
Gomphus adelphus male

Gomphus adelphus female



Gomphus adelphus distribution based on 36 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Gomphus adelphus is regularly encountered in clear, clean mountain streams in Randolph, Pendleton, and Pocahontas counties. It is a northern species whose southern distribution stretches down the Appalachians.



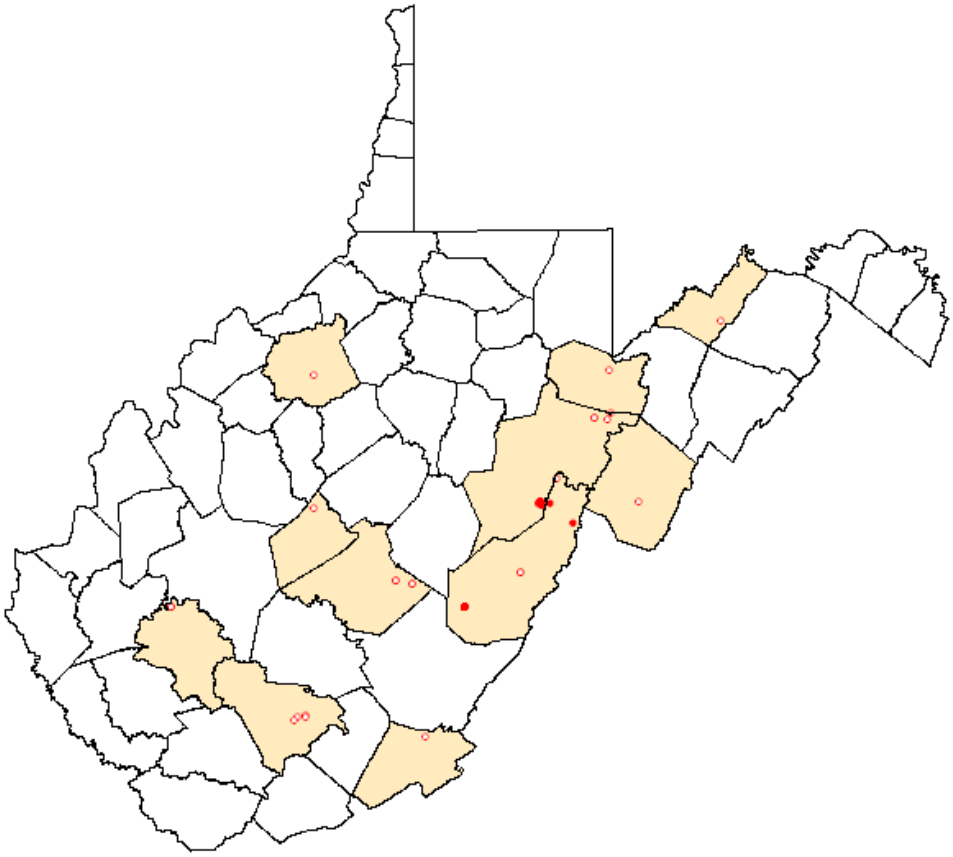
Gomphus adelphus adults have been documented from 14 May —25 June with 35 valid records.

Suborder Anisoptera
Family Gomphidae

Gomphus descriptus
Harpoon Clubtail

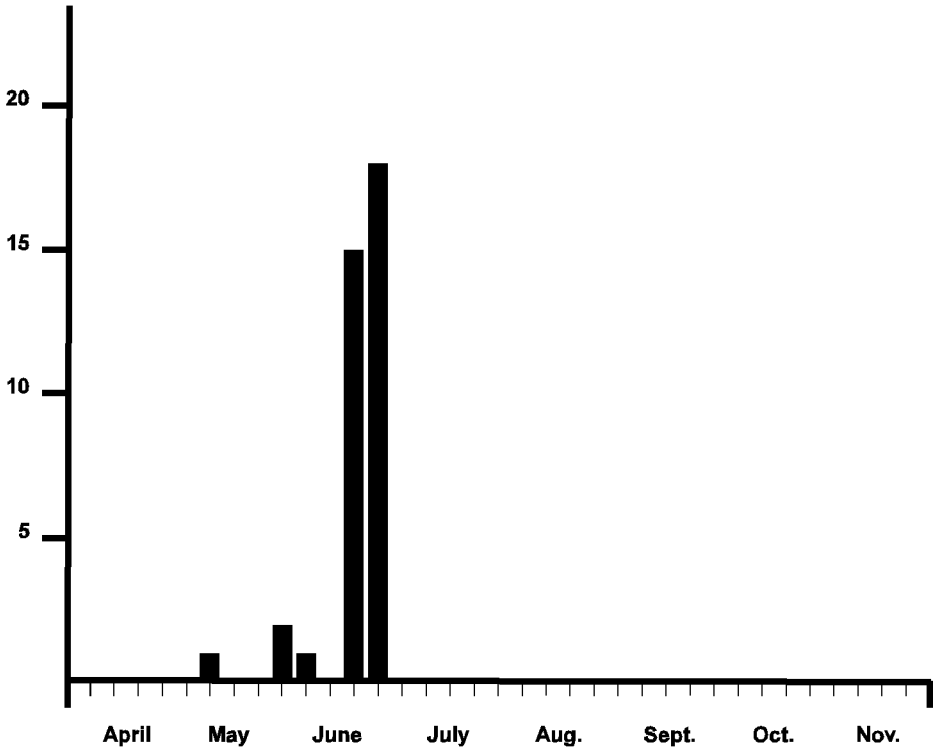
Gomphus descriptus male

Gomphus descriptus female



Gomphus descriptus distribution based on 58 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Although historically documented from several counties west of the mountains, all recent records of *Gomphus descriptus* in West Virginia come from clean, clear streams in Randolph and Pocahontas counties. This apparent range contraction may reflect degraded habitat in western counties.



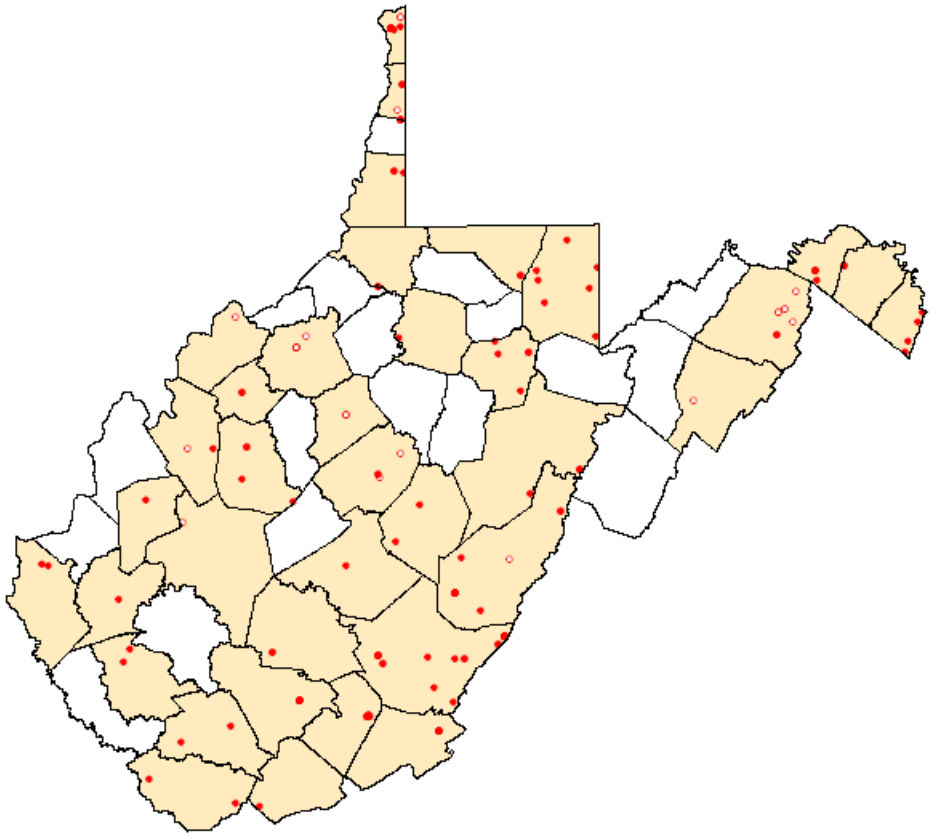
Gomphus descriptus adults have been documented from 12 May —24 June with 37 valid records.

Suborder Anisoptera
Family Gomphidae

Gomphus exilis
Lancet Clubtail

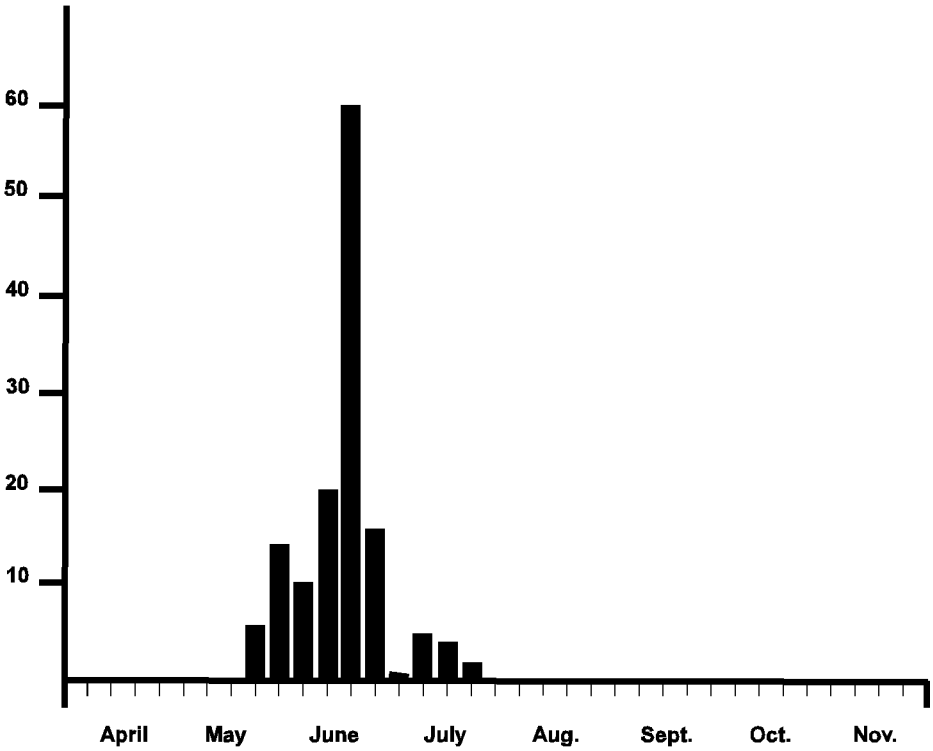
Gomphus exilis male

Gomphus exilis female



Gomphus exilis distribution based on 166 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Gompus exilis, a pond breeding clubtail, is likely the most abundant clubtail in West Virginia. It probably occurs in every county, and can be quite numerous at some sites.



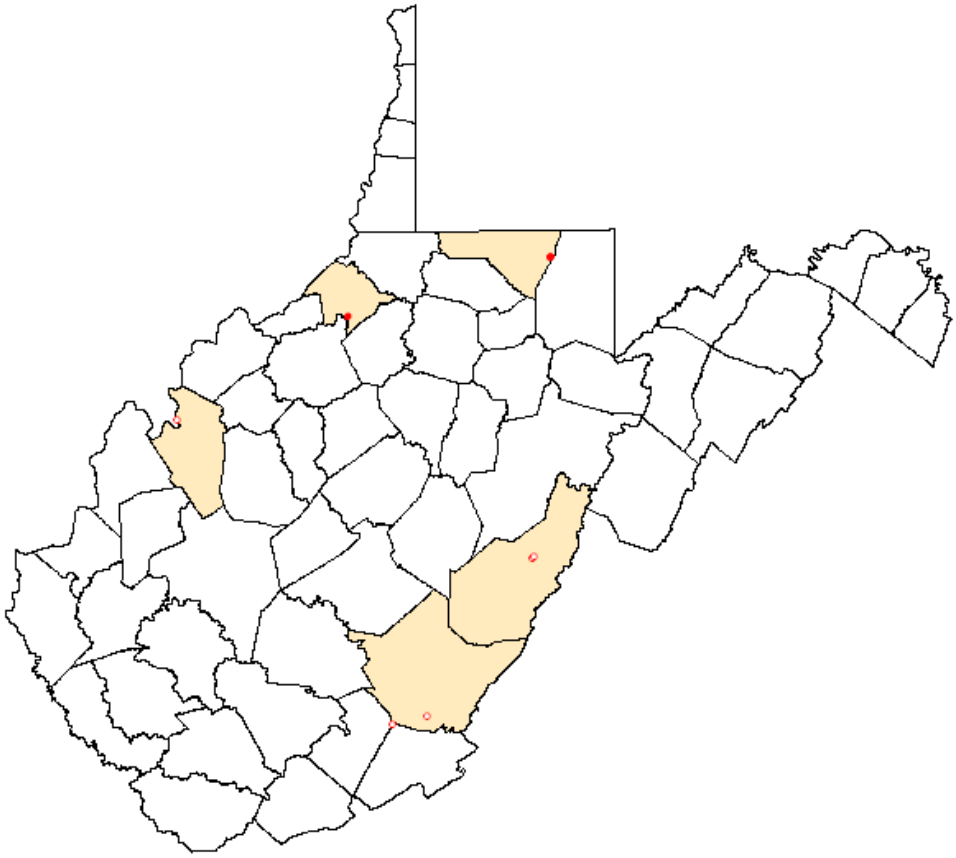
Gomphus exilis adults have been documented from 10 May —22 July with 139 valid records.

Suborder Anisoptera
Family Gomphidae

Gomphus fraternus
Midland Clubtail

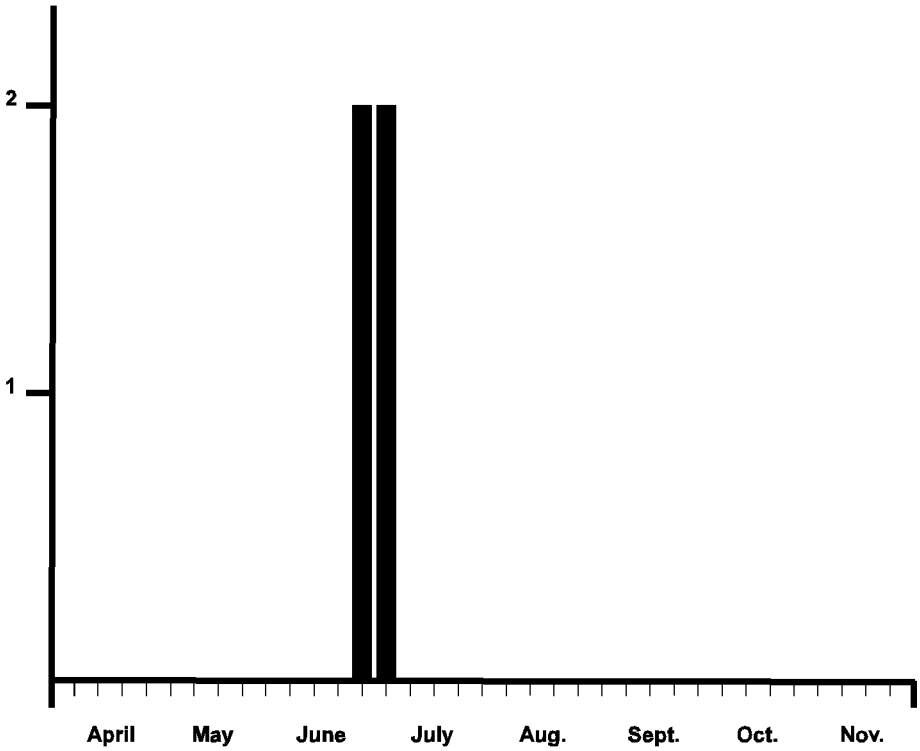
Gomphus fraternus male

Gomphus fraternus female



Gomphus fraternus distribution based on 9 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Not documented in West Virginia since 1974, *Gomphus fraternus* was rediscovered in 2007 at Cheat River in Monongalia County and later at Middle Island Creek in Tyler County. Primarily a Midwestern species, it prefers riffles and small rapid areas of larger streams and rivers.



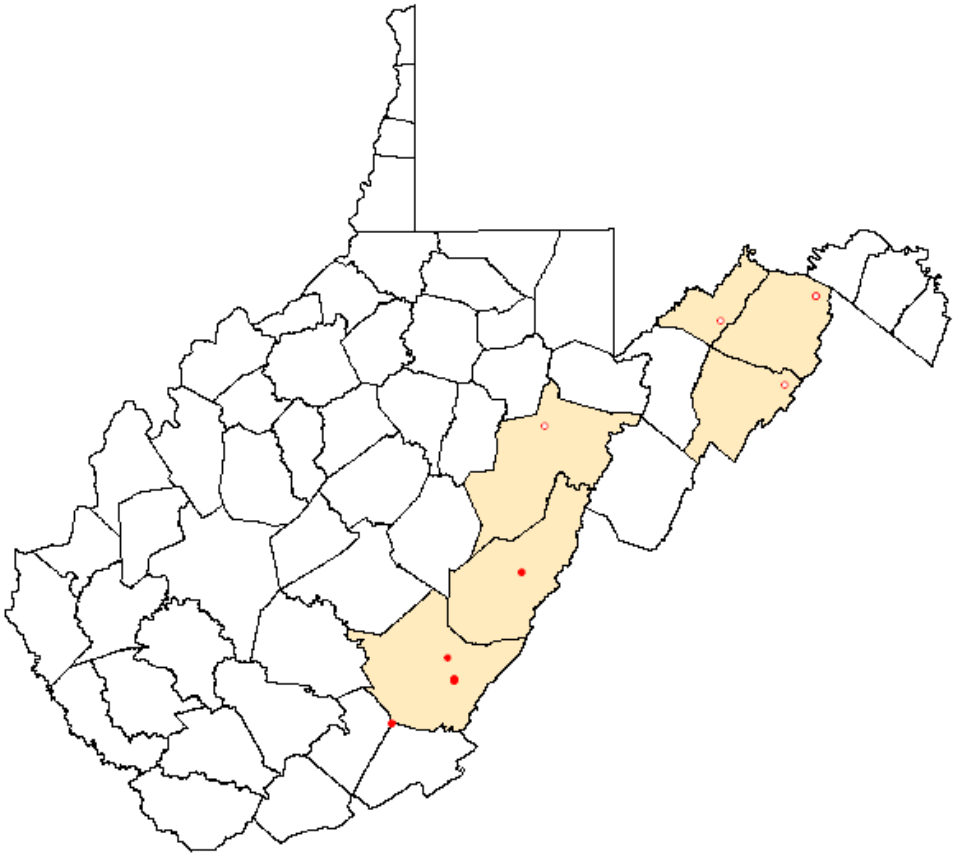
Gomphus fraternus adults have been documented from 24 June — 6 July with 4 valid records.

Suborder Anisoptera
Family Gomphidae

Gomphus lineatifrons
Splendid Clubtail

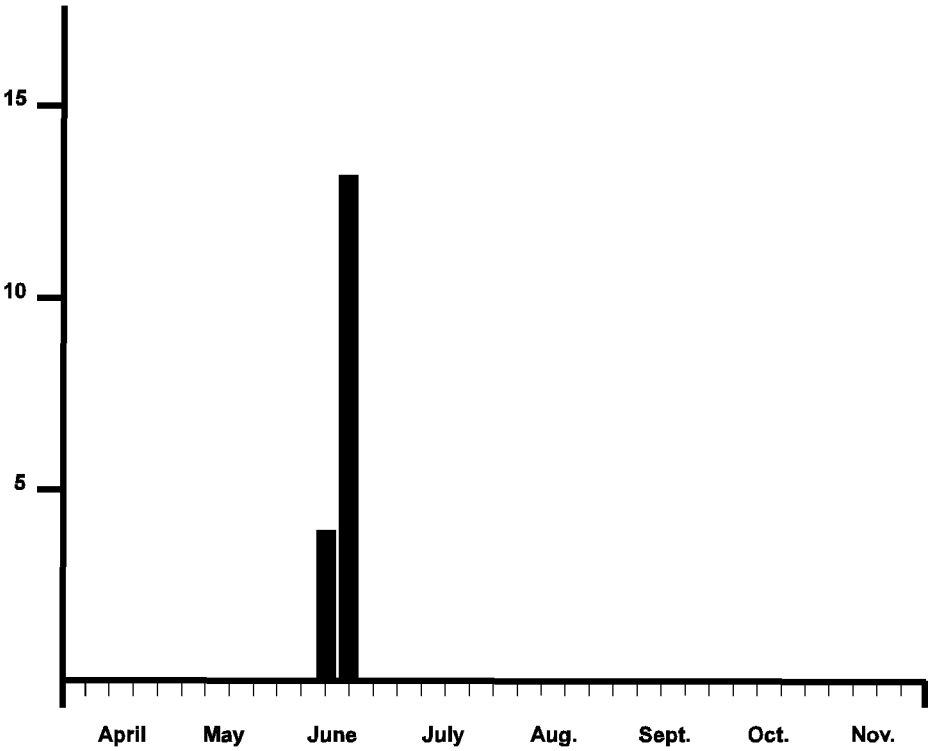
Gomphus lineatifrons male

Gomphus lineatifrons female



Gomphus lineatifrons distribution based on 18 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Although known historically from several counties, *Gomphus lineatifrons* has recently only been documented in Pocahontas and Greenbrier counties on the Greenbrier River. A clubtail of the southern Appalachians, this species prefers riffle areas of larger streams and rivers that are clean and clear.



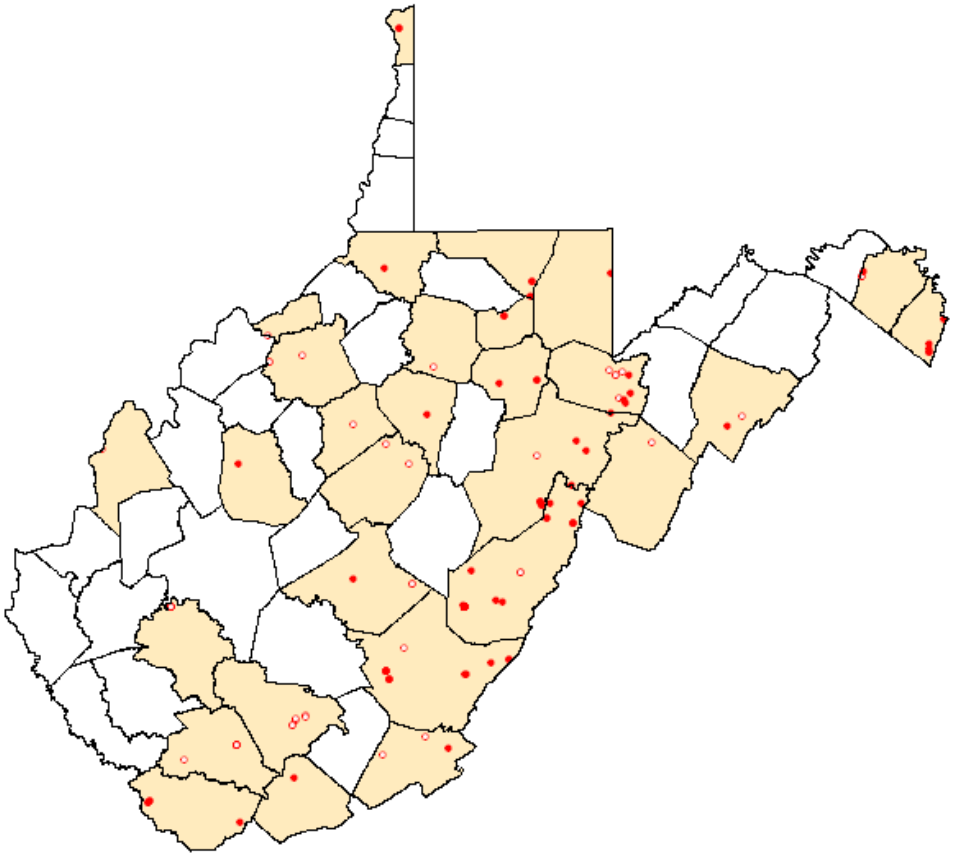
Gomphus lineatifrons adults have been documented from 10 June — 22 June with 17 valid records.

Suborder Anisoptera
Family Gomphidae

Gomphus lividus
Ashy Clubtail

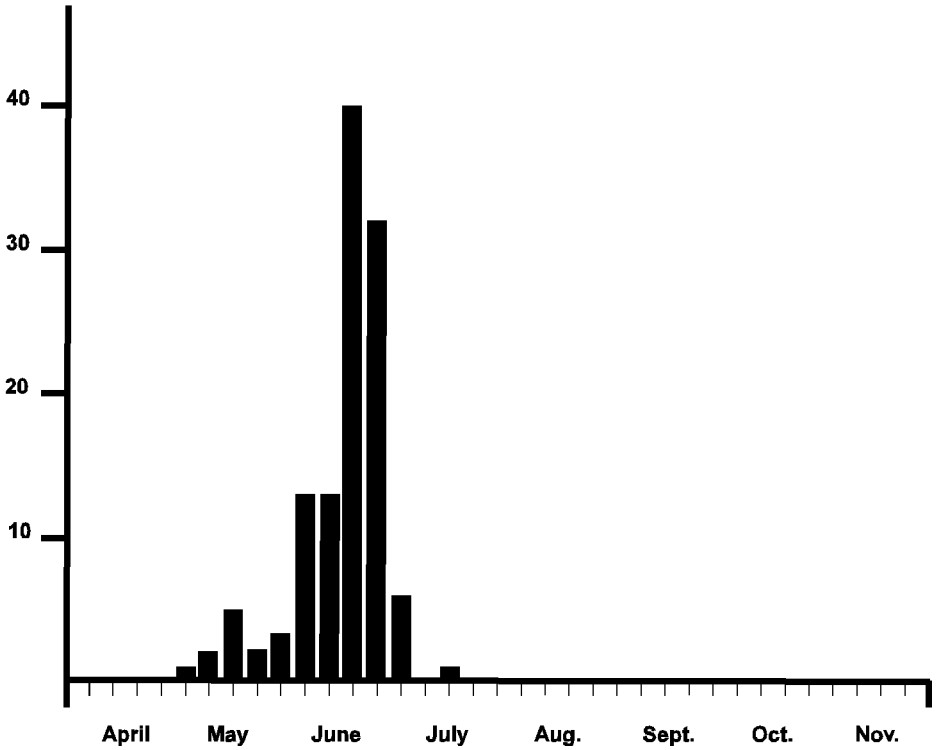
Gomphus lividus male

Gomphus lividus female



Gomphus lividus distribution based on 144 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Gomphus lividus is fairly commonly encountered throughout West Virginia at slow streams and rivers and in open areas nearby. The deeply undulating courtship flights of the male is easily seen in open areas.



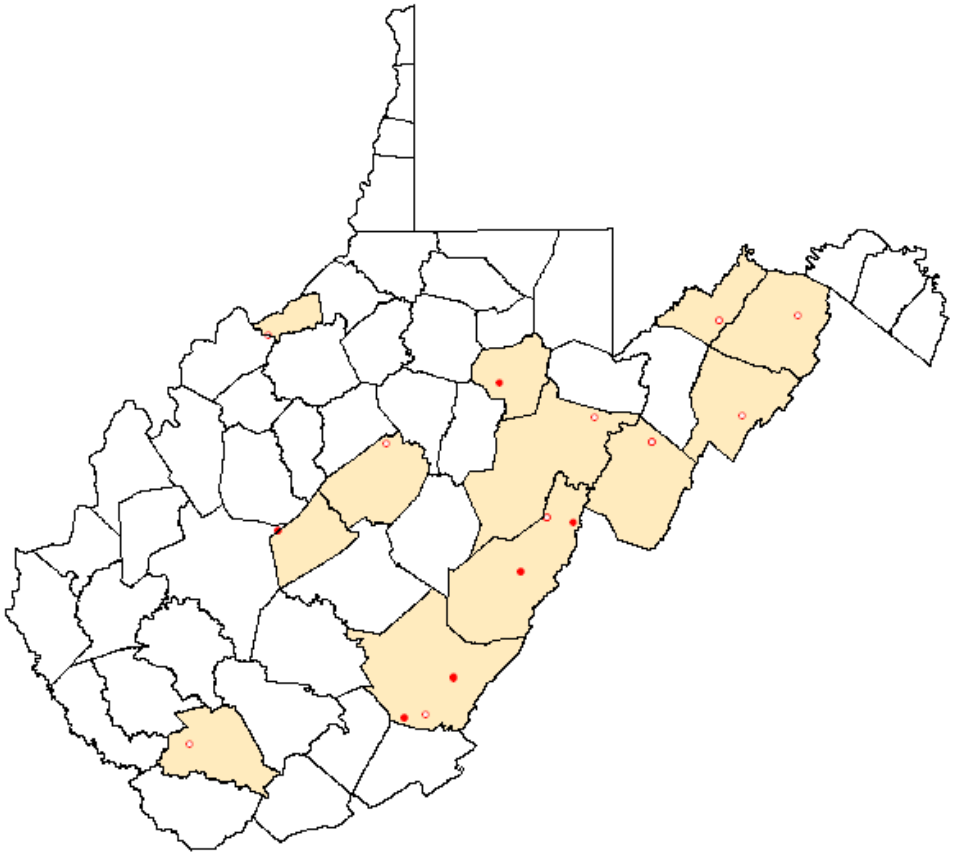
Gomphus lividus adults have been documented from 3 May — 13 July with 120 valid records.

Suborder Anisoptera
Family Gomphidae

Gomphus quadricolor
Rapids Clubtail

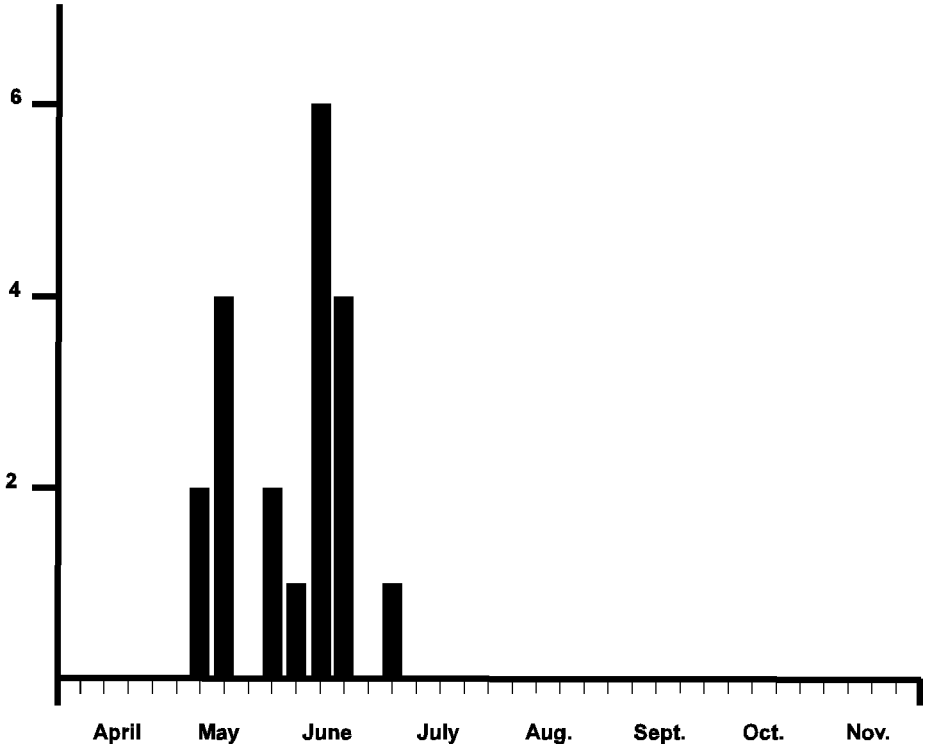
Gomphus quadricolor male

Gomphus quadricolor female



Gomphus quadricolor distribution based on 25 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

All recent records of *Gomphus quadricolor* in West Virginia have been from the mountains or foothills in Barbour, Pocahontas, and Greenbrier counties, suggesting a distributional withdrawal from lower elevations. Lower elevation watersheds may have experienced degraded water quality that is detrimental to this species. It is considered to be threatened, endangered, or a species of conservation concern in most states and provinces where it occurs.



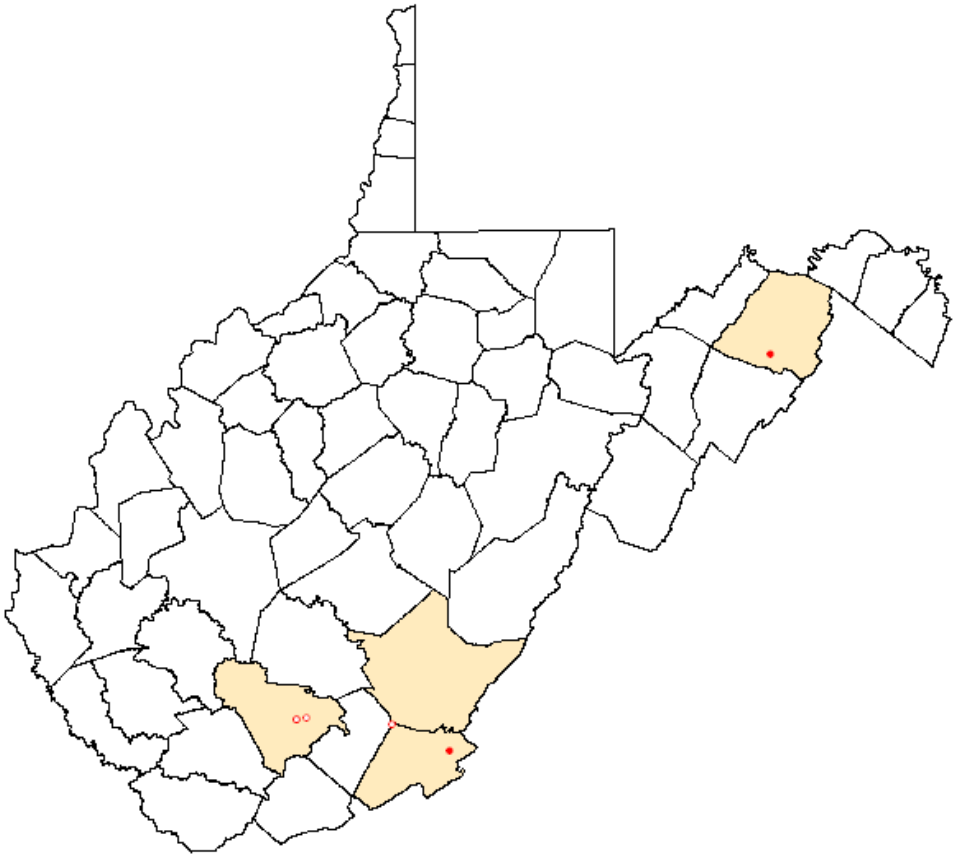
Gomphus quadricolor adults have been documented from 6 May — 3 July with 20 valid records.

Suborder Anisoptera
Family Gomphidae

Gomphus rogersi
Sable Clubtail

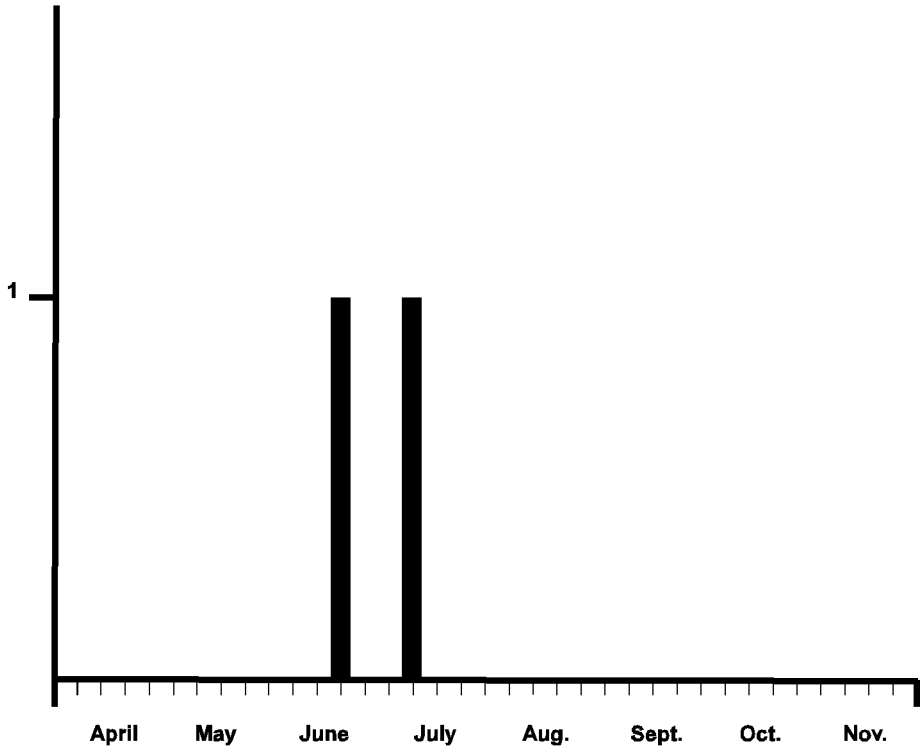
Gomphus rogersi male

Gomphus rogersi female



Gomphus rogersi distribution based on 6 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Gomphus rogersi is a secretive, dark, small clubtail that inhabits small, shaded mountain streams. Its distribution is limited almost entirely to the Appalachians. Because of the difficulty in detecting it, this species likely has a broader distribution in West Virginia than records indicate.



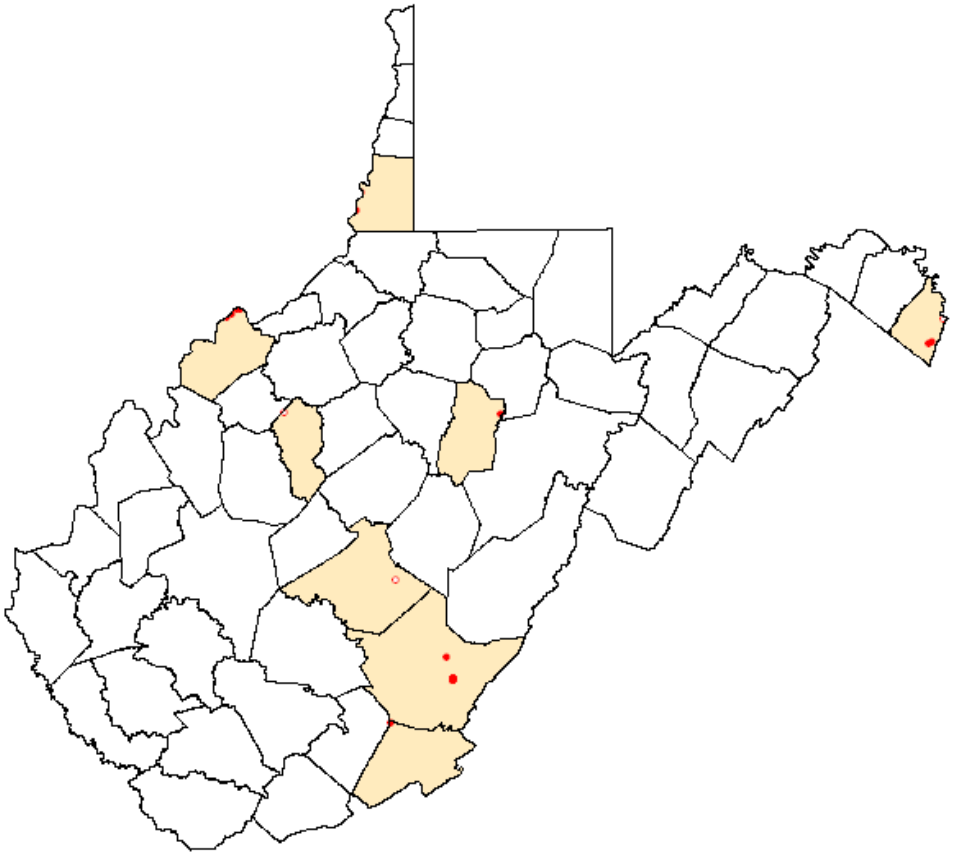
Gomphus rogersi adults have been documented from 22 June — 9 July with 2 valid records.

Suborder Anisoptera
Family Gomphidae

Gomphus vastus
Cobra Clubtail

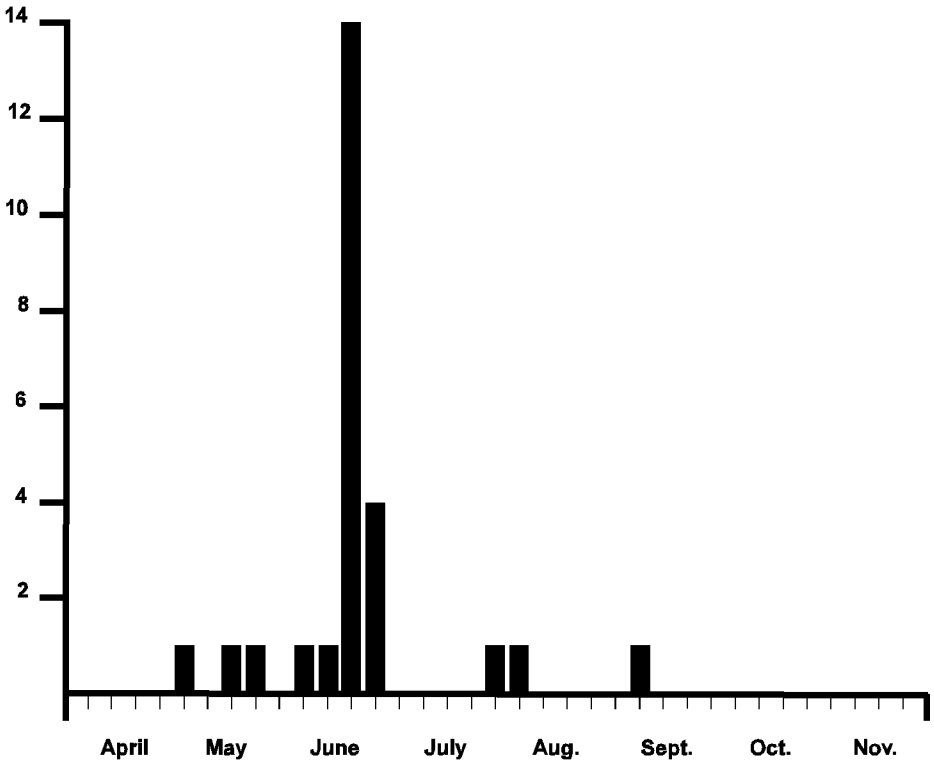
Gomphus vastus male

Gomphus vastus female



Gomphus vastus distribution based on 26 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

A clubtail of large rivers, *Gomphus vastus* has been documented from several of West Virginia's rivers, including the Potomac, Shenandoah, Greenbrier, and Ohio. It likely occurs on others, but challenges inherent to sampling on large rivers have limited its discovery.



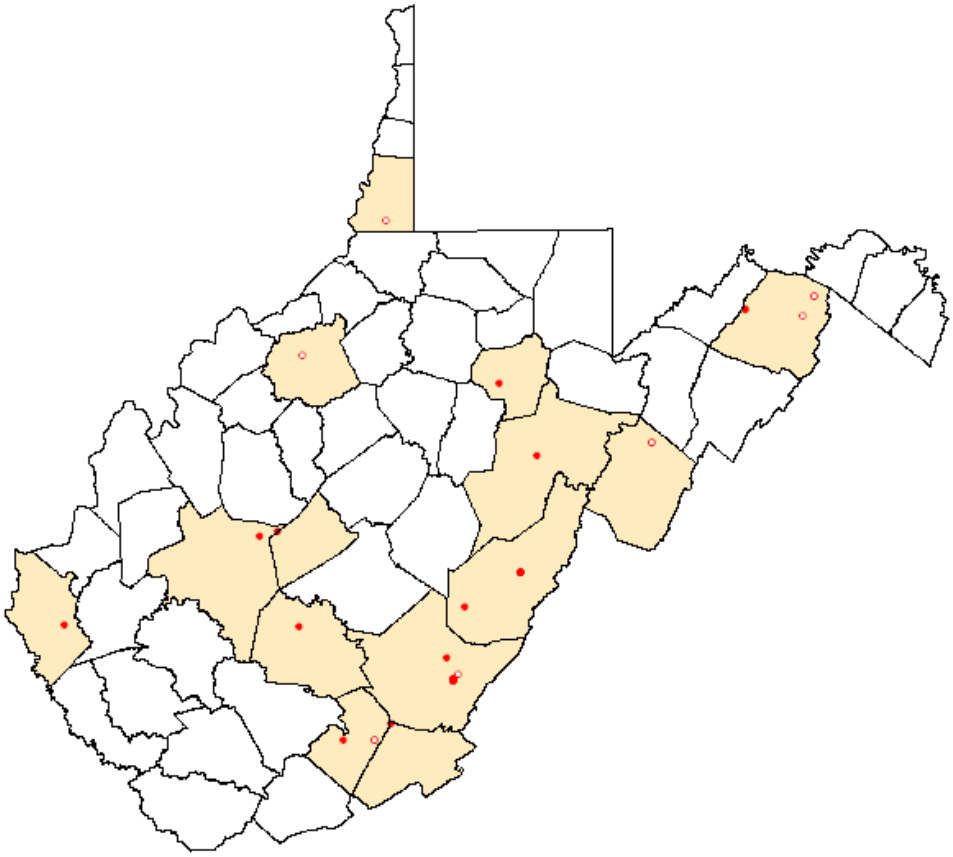
Gomphus vastus adults have been documented from 6 May — 9 September with 26 valid records.

Suborder Anisoptera
Family Gomphidae

Gomphus viridifrons
Green-faced Clubtail

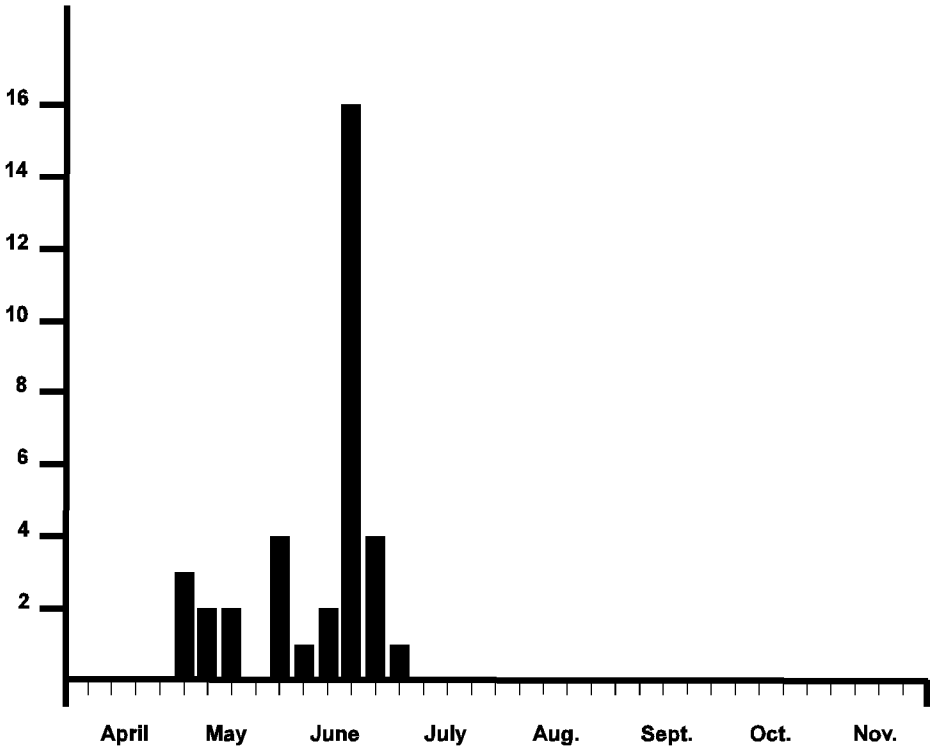
Gomphus viridifrons male

Gomphus viridifrons female



Gomphus viridifrons distribution based on 38 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Unlike other riverine clubtails, recent records for *Gomphus viridifrons* documented an increase in distribution from five counties to fourteen in West Virginia. Although typically found at clear rocky rivers and streams, several records have come from reservoirs or other impoundments.



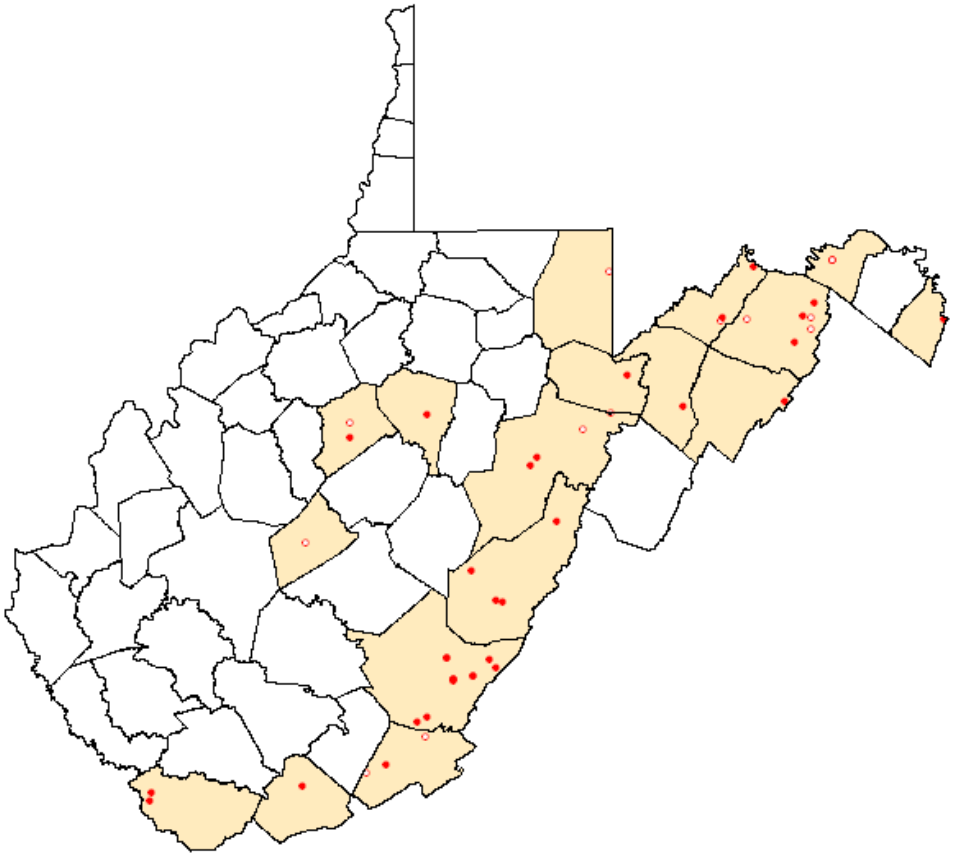
Gomphus viridifrons adults have been documented from 30 April — 30 June with 35 valid records.

Suborder Anisoptera
Family Gomphidae

Hagenius brevistylus
Dragonhunter

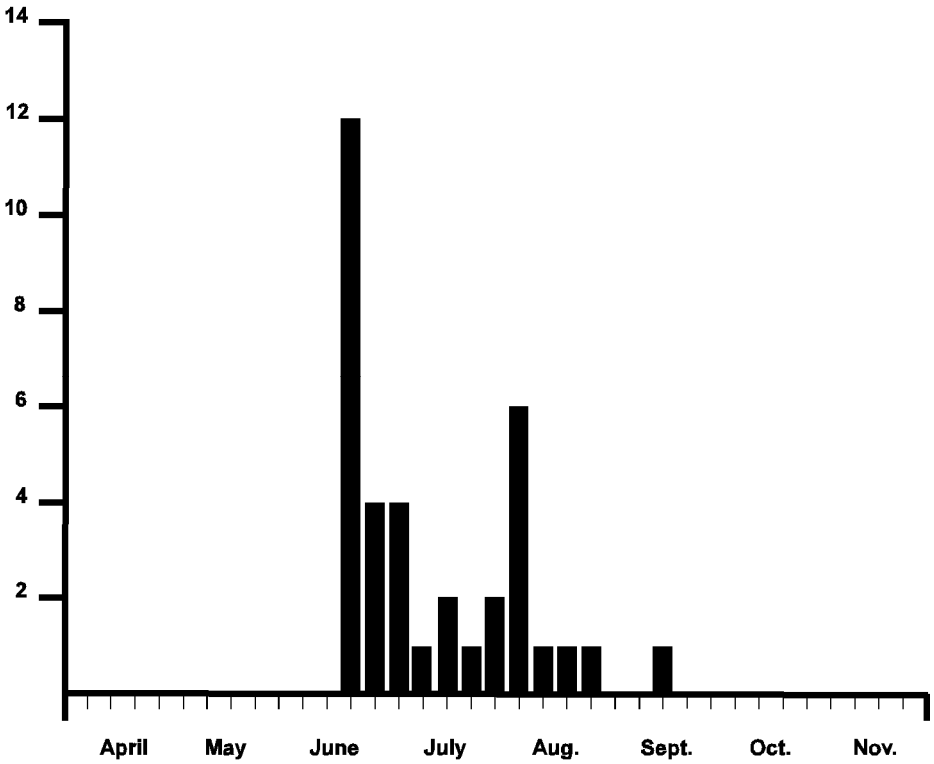
Hagenius brevistylus male

Hagenius brevistylus female



Hagenius brevistylus distribution based on 47 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Arguably one of the most dramatic of North American odonates, and the largest clubtail, *Hagenius brevistylus* has been documented from much of the eastern portion of West Virginia. It prefers clean, clear, moderately flowing forested streams and small rivers.



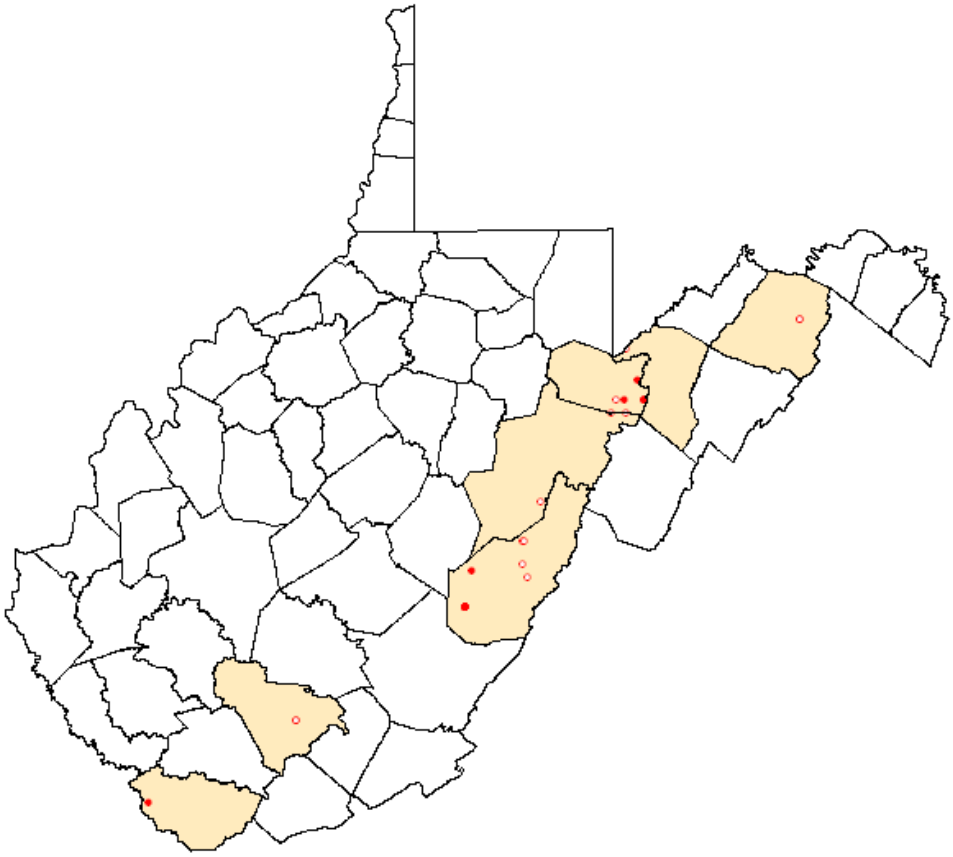
Hagenius brevistylus adults have been documented from 21 June — 17 September with 36 valid records.

Suborder Anisoptera
Family Gomphidae

Lanthus parvulus
Northern Pygmy Clubtail

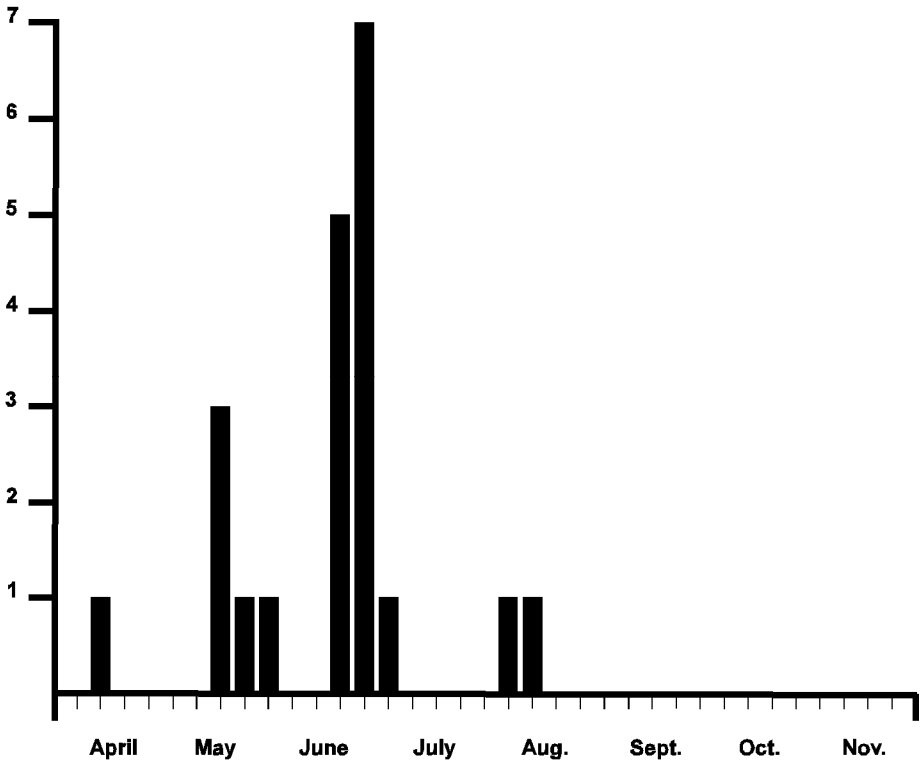
Lanthus parvulus male

Lanthus parvulus female



Lanthus parvulus distribution based on 29 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Preferring small, shady mountain streams and rarely flying for long periods, *Lanthus parvulus* is known from seven counties in West Virginia. It likely occurs in others with similar habitat, including Greenbrier and Preston. It reaches the southern limit of its range in West Virginia.



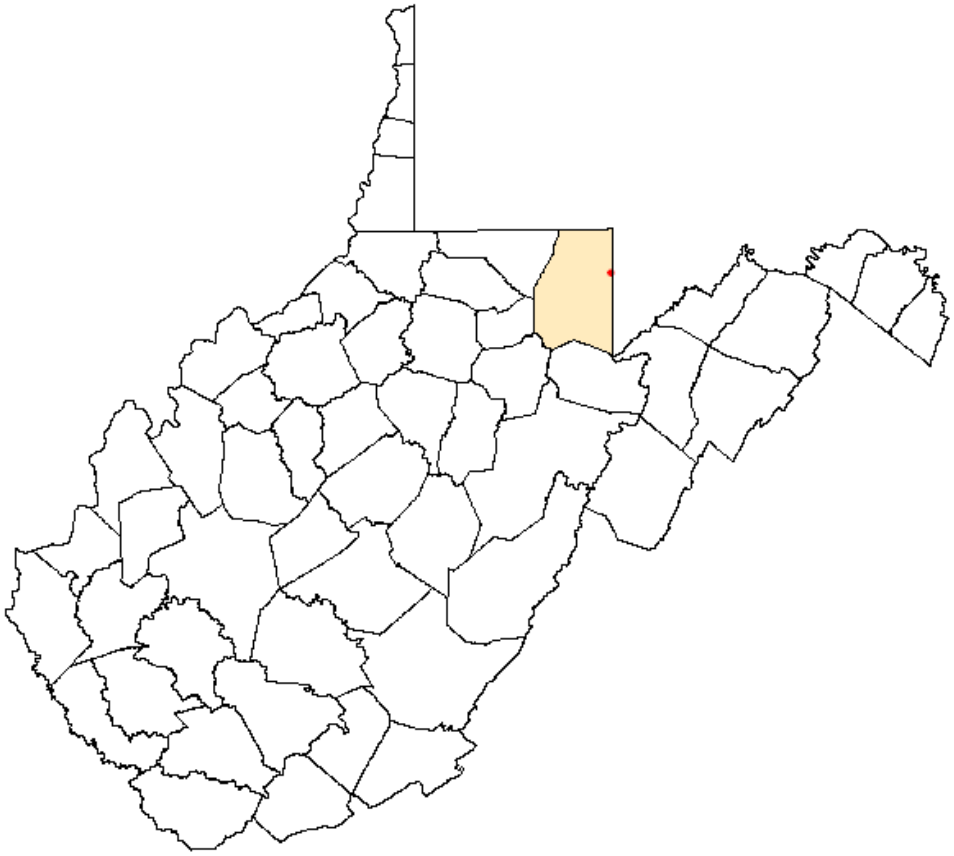
Lanthus parvulus adults have been documented from 10 April — 9 August with 21 valid records.

Suborder Anisoptera
Family Gomphidae

Lanthus vernalis
Southern Pygmy Clubtail

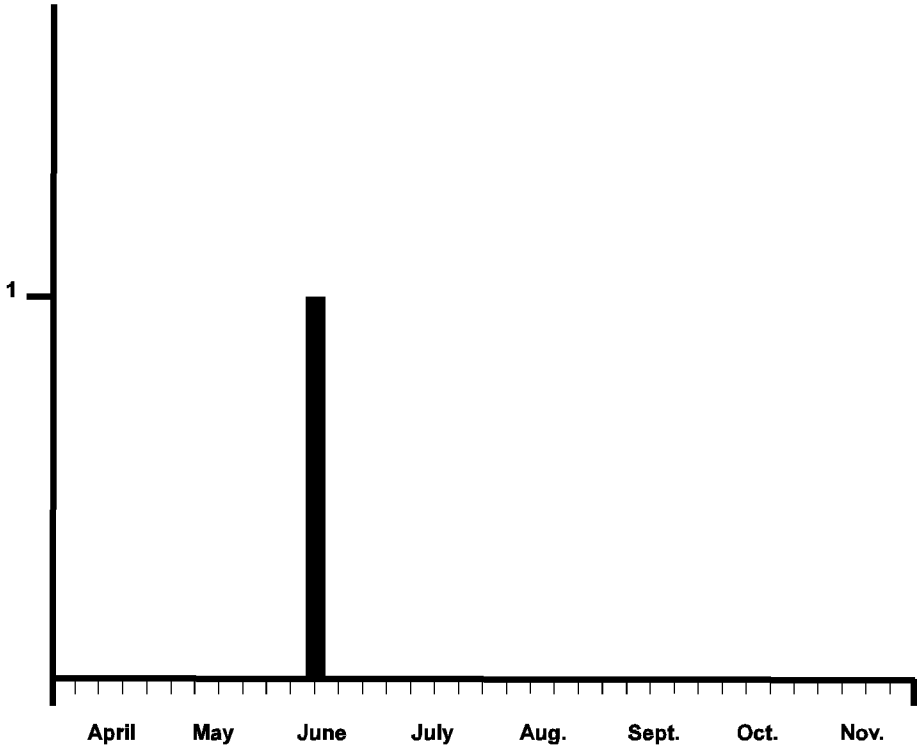
Lanthus vernalis male

Lanthus vernalis female



Lanthus vernalis distribution based on 29 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

The single record of *Lanthus vernalis* at Cranesville Swamp in Preston County remains puzzling as this small secretive clubtail should have been documented at other sites in the mountain counties over the years—especially areas like Cranberry Glades Botanical Area in Pocahontas County. Its habitat of very small shady streams may have been of little interest to collectors.



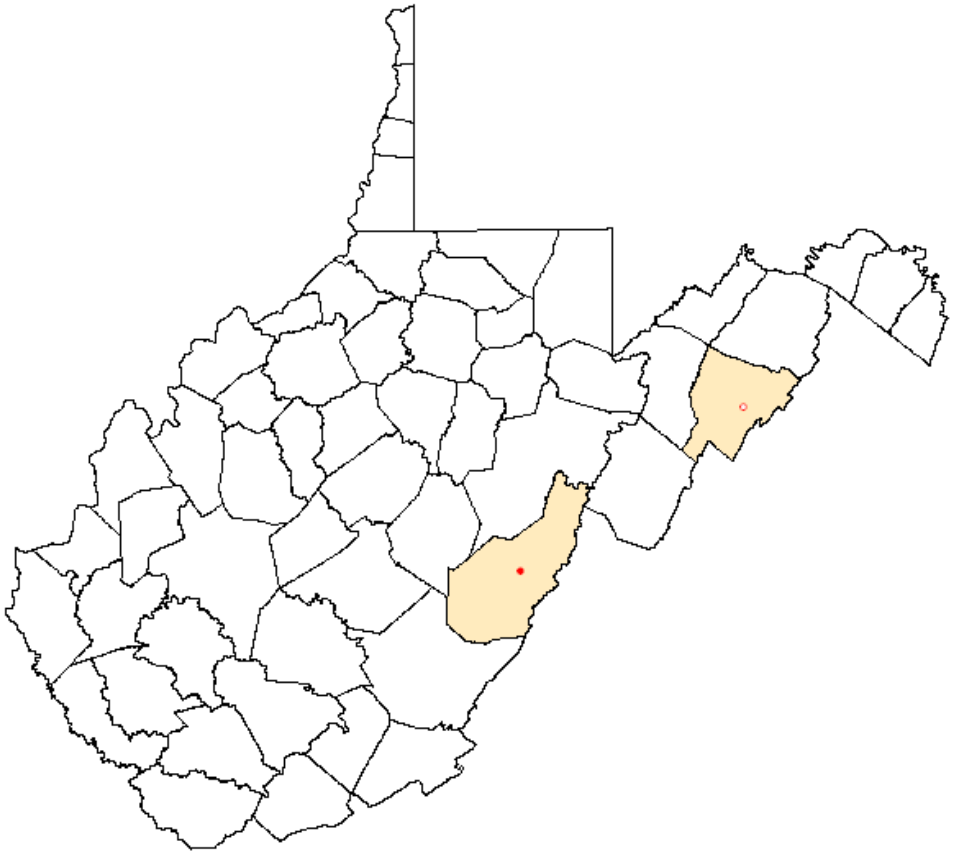
One *Lanthus vernalis* adult has been documented on 14 June.

Suborder Anisoptera
Family Gomphidae

Ophiogomphus carolus
Riffle Snaketail

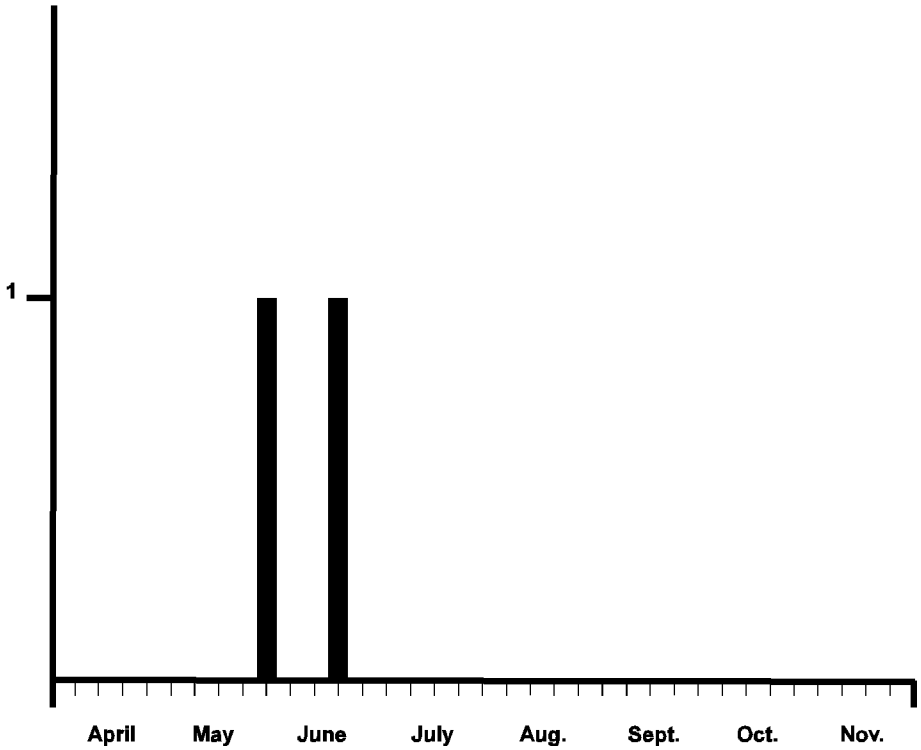
Ophiogomphus carolus male

Ophiogomphus carolus female



Ophiogomphus carolus distribution based on 2 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Ophiogomphus carolus is a northern species that reaches the southern limit of its range in West Virginia and neighboring VA. The recent record is from the species-rich Greenbrier River area in Pocahontas County. It prefers clear, clean, rocky streams.



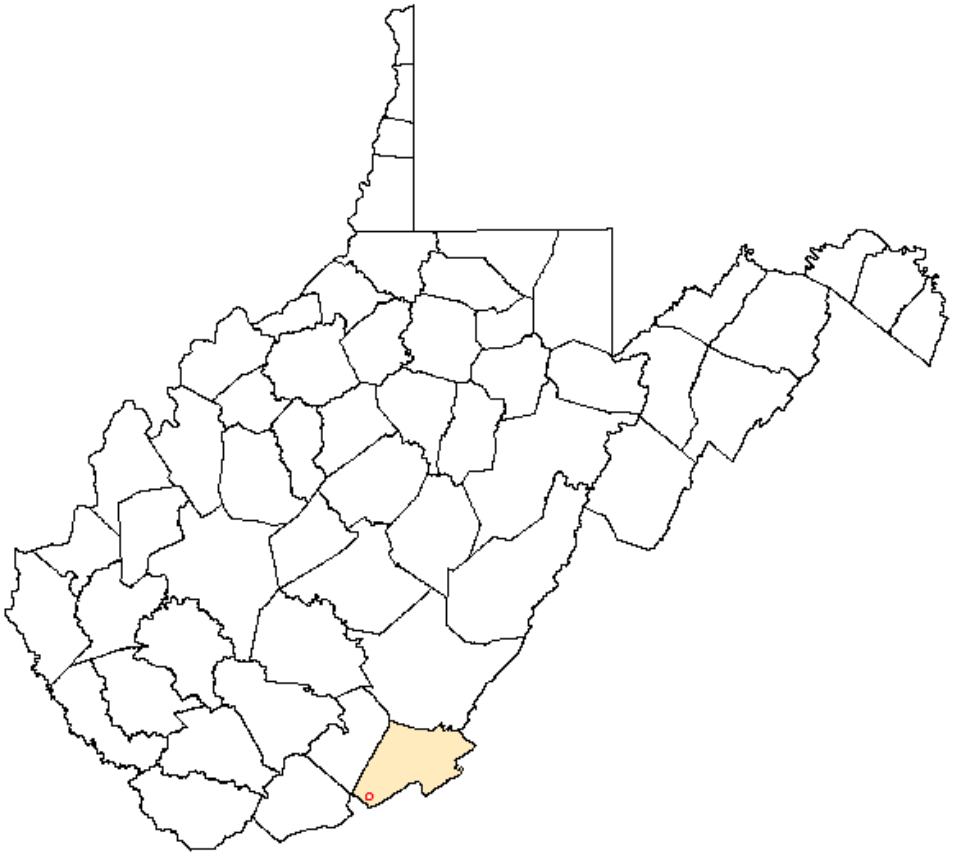
Ophiogomphus carolus adults have been documented from 31 May—21 June with 2 valid records.

Suborder Anisoptera
Family Gomphidae

Ophiogomphus incurvatus alleghaniensis
Appalachian Snaketail

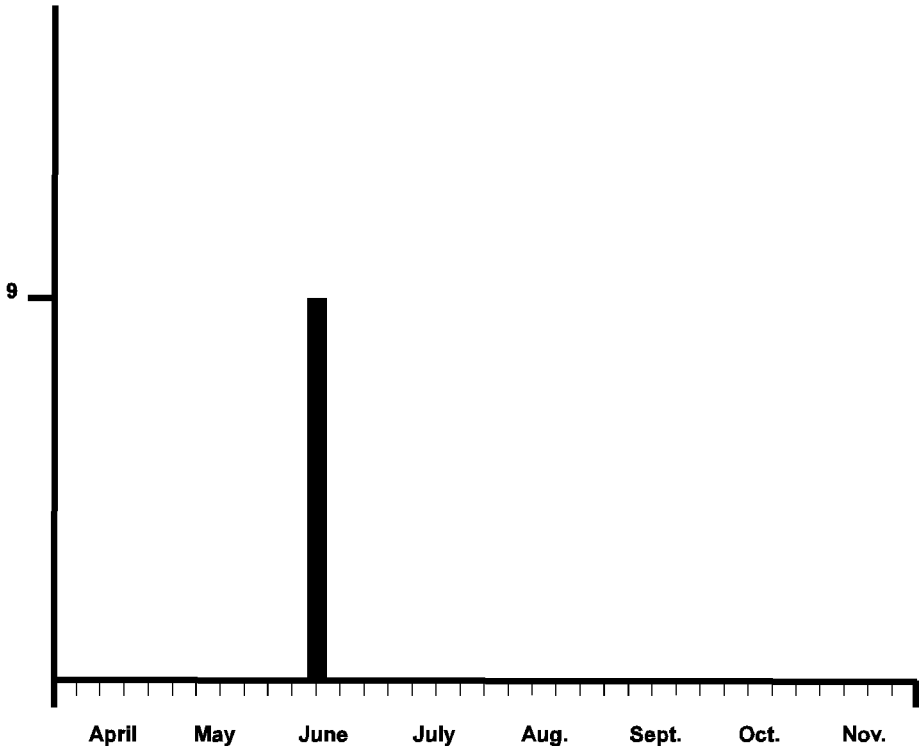
Ophiogomphus i. alleghaniensis male

Ophiogomphus i. alleghaniensis female



Ophiogomphus i. alleghaniensis distribution based on 19 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Ophiogomphus incurvatus alleghaniensis was documented from a single site on Rich Creek in Monroe County in 1980. Recent repeated visits to this site produced no larva or adults, but evidence of herbicide use in the pasture the creek runs through was observed. This evidence, and the lack of virtually any other stream invertebrates, indicate that this population is likely extirpated. There are no other sites known for it in West Virginia.



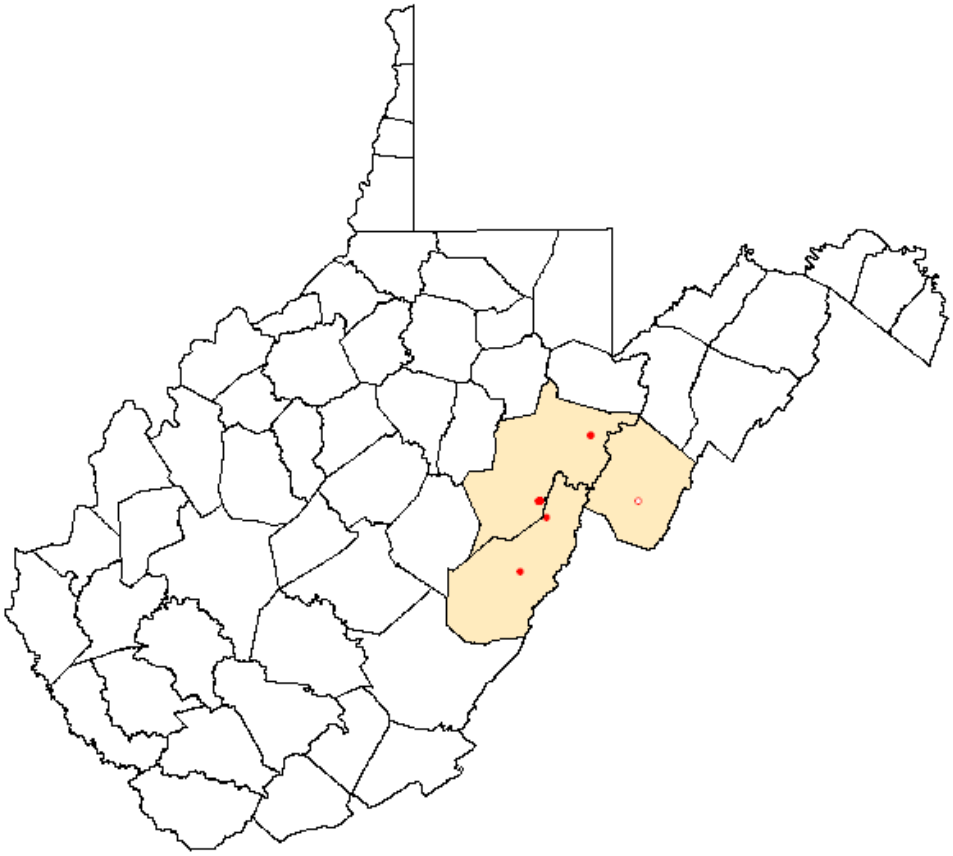
Ophiogomphus i. alleghaniensis adults have been documented from 12 June —14 June with 9 valid records.

Suborder Anisoptera
Family Gomphidae

Ophiogomphus mainensis fastigiatus
Maine Snaketail

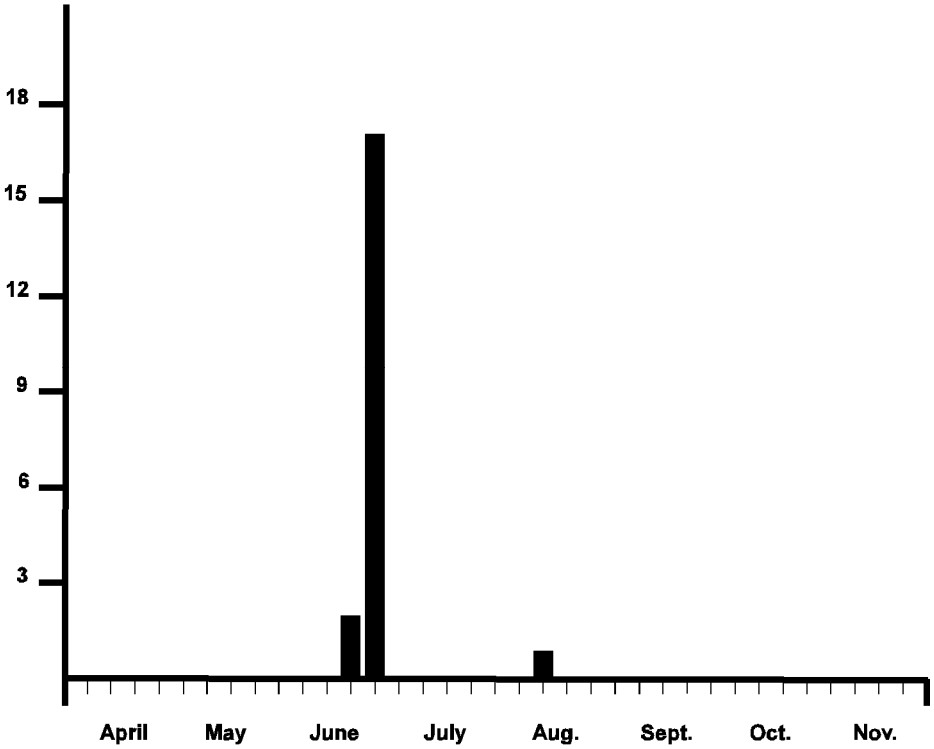
Ophiogomphus m. fastigiatus male

Ophiogomphus m. fastigiatus female



Ophiogomphus m. fastigiatus distribution based on 21 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Ophiogomphus mainensis fastigiatus is a northern clubtail whose southern distribution extends down the Appalachians to GA. It can be found in clear, cold, gravelly mountain streams in Randolph and Pocahontas counties.



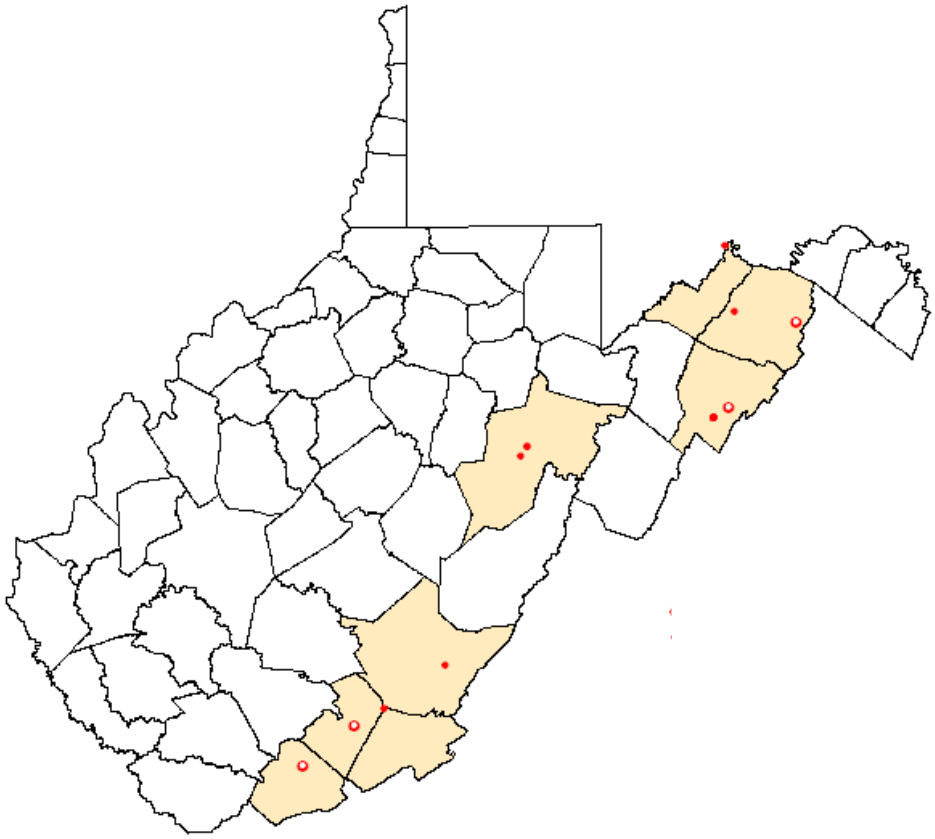
Ophiogomphus m. fastigiatus adults have been documented from 21 June —10 August with 20 valid records.

Suborder Anisoptera
Family Gomphidae

Ophiogomphus rupinsulensis
Rusty Snaketail

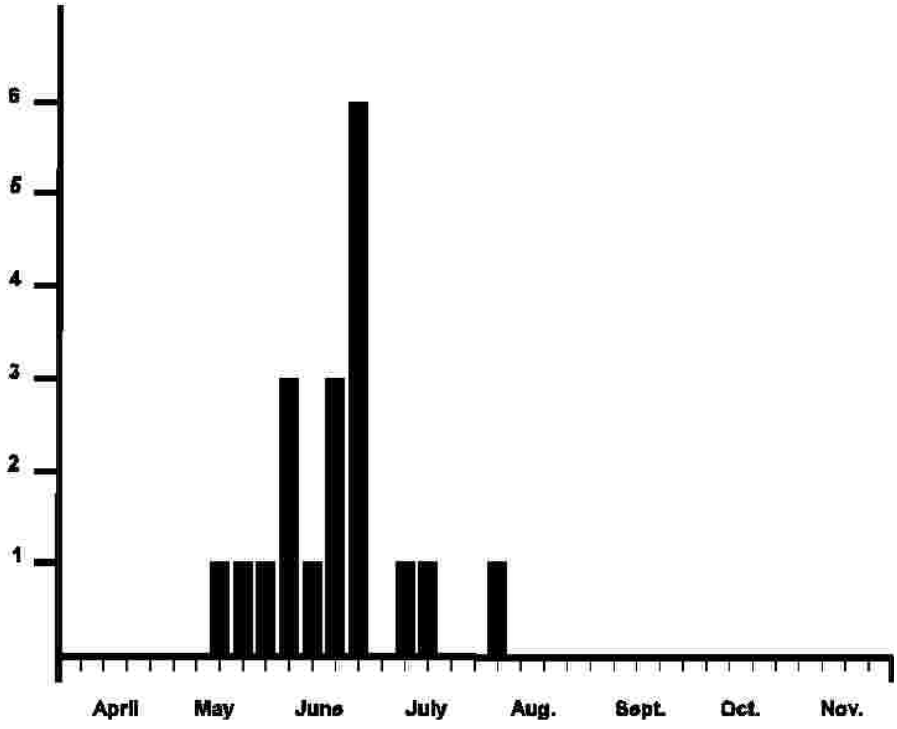
Ophiogomphus rupinsulensis
male

Ophiogomphus rupinsulensis
female



Ophiogomphus rupinsulensis distribution based on 19 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Ophiogomphus rupinsulensis has the largest distribution of the snaketails in West Virginia. It inhabits several rivers including the Tygart, Potomac, Lost, and Greenbrier with fifteen recent records.



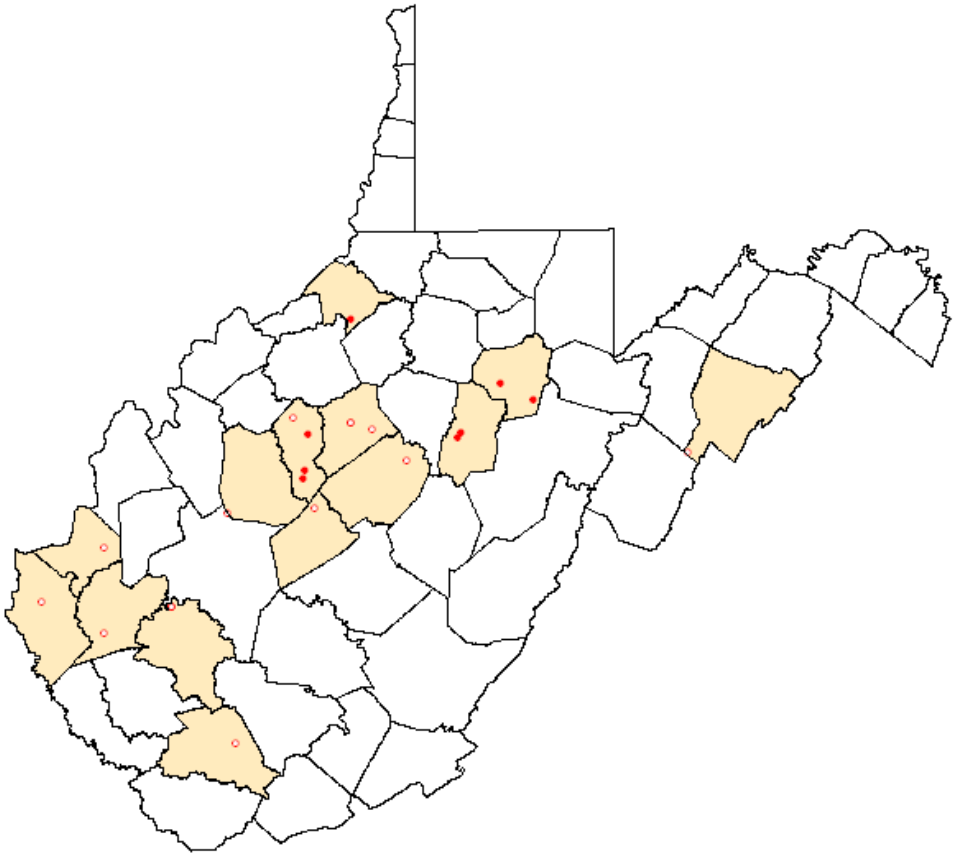
Ophiogomphus rupinsulensis adults have been documented from 5 May —5 August with 19 valid records.

Suborder Anisoptera
Family Gomphidae

Progomphus obscurus
Common Sanddragon

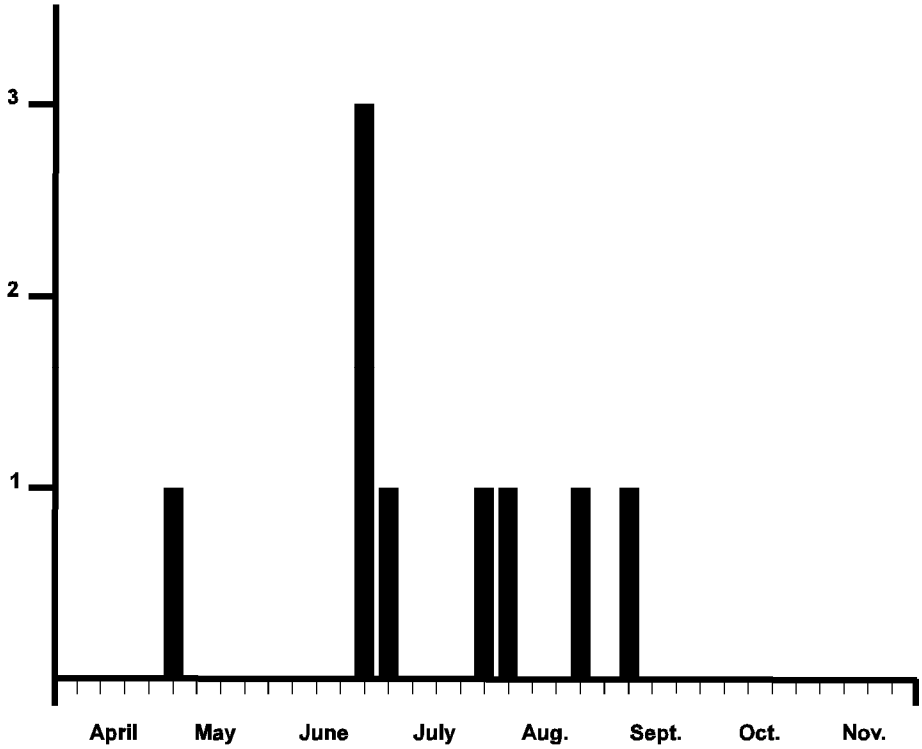
Progomphus obscurus male—sexes similar

Progomphus obscurus males



Progomphus obscurus distribution based on 23 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

The distribution of *Progomphus obscurus* in West Virginia is mostly west of the mountains. This distribution may reflect this species' habitat preference for slower flows and less rocky substrate in streams and rivers.



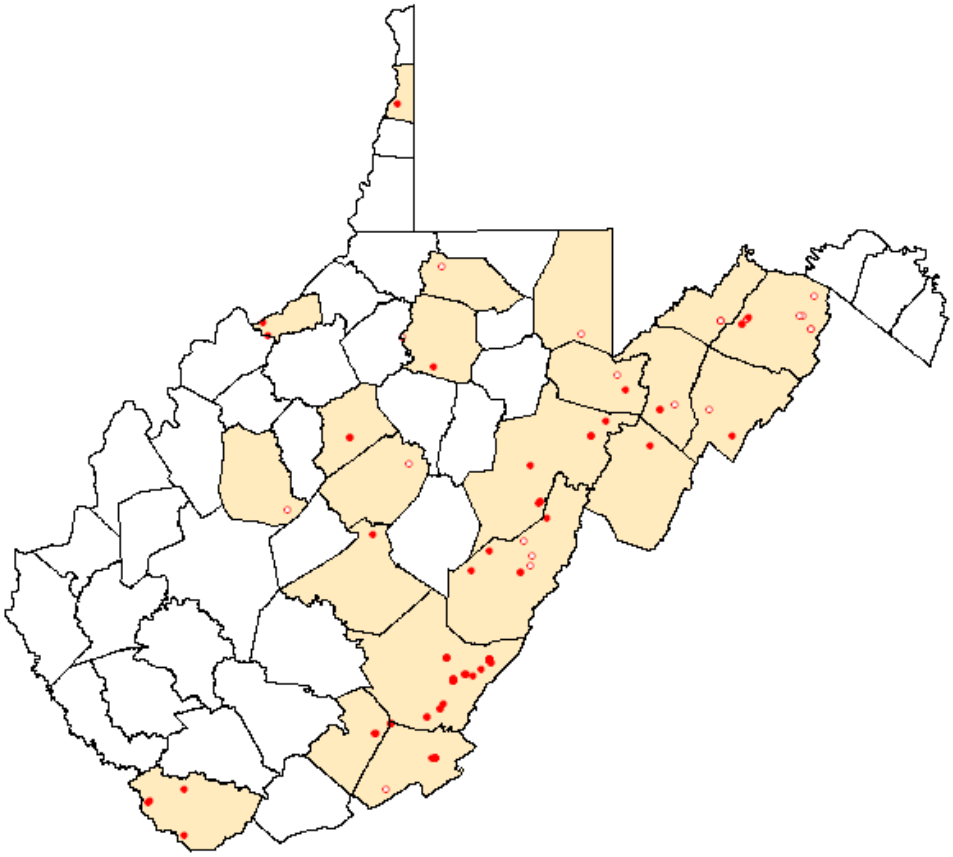
Progomphus obscurus adults have been documented from 1 May —11 September with 9 valid records.

Suborder Anisoptera
Family Gomphidae

Stylogomphus albistylus
Eastern Least Clubtail

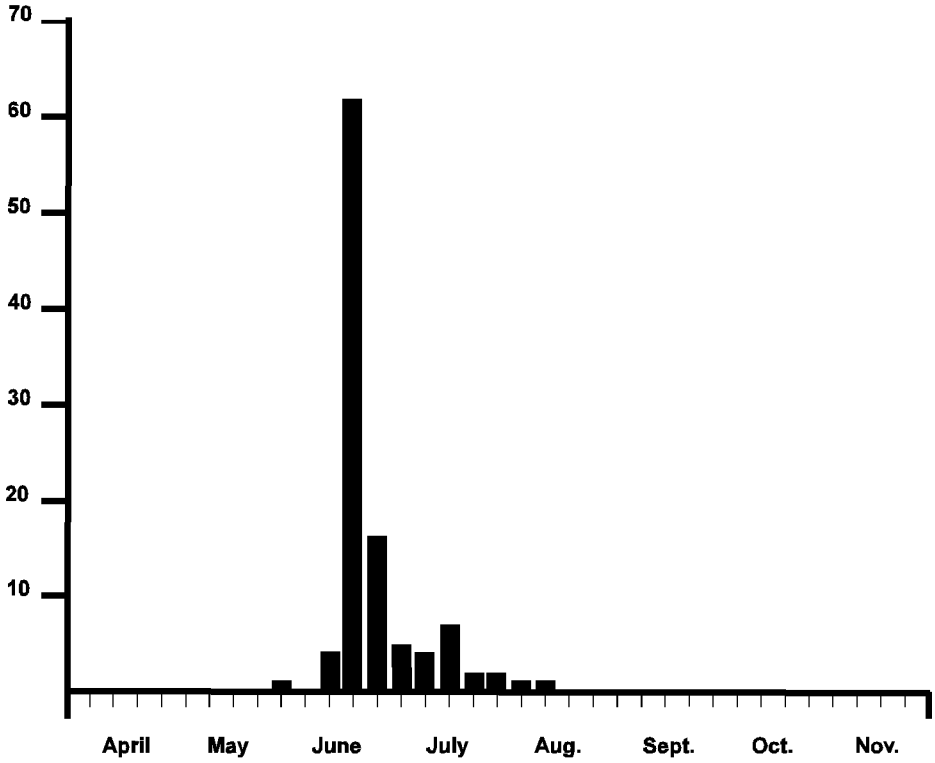
Stylogomphus albistylus male

*Stylogomphus albistylus f*emale



Stylogomphus albistylus distribution based on 111 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

This small dark clubtail of riffley streams and rivers has a wide distribution in West Virginia. The dark body and darting flight of *Stylogomphus albistylus* make it difficult to detect and capture. It likely has a wider distribution in the state than records indicate.



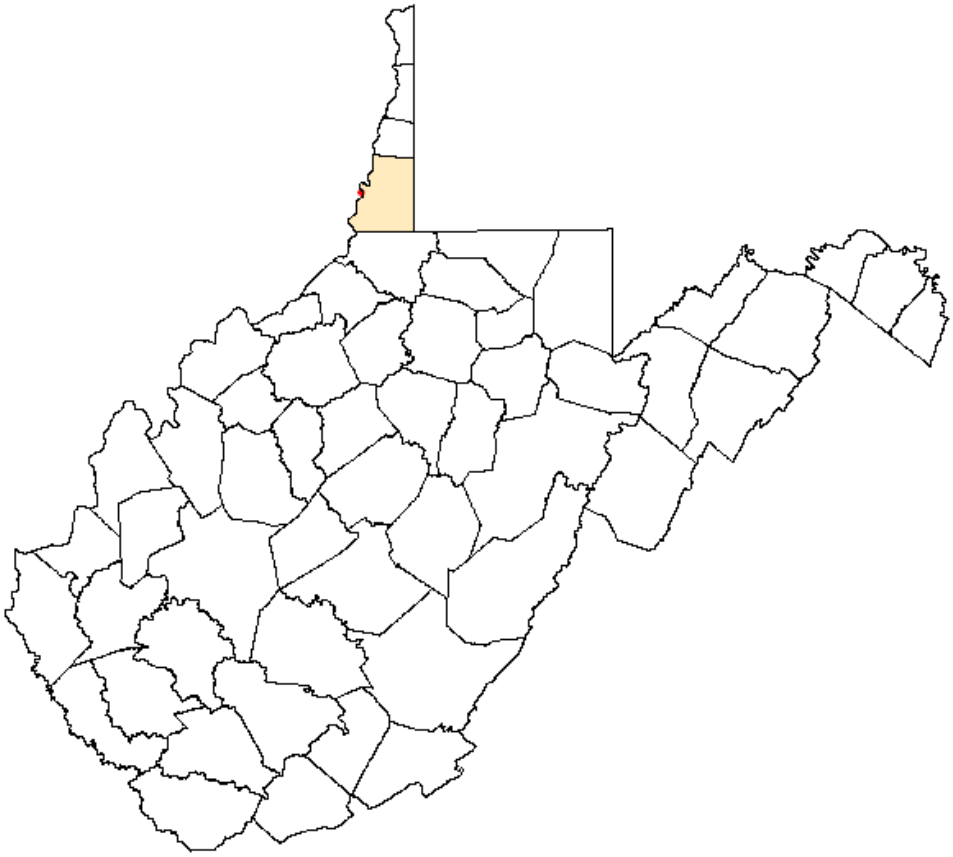
Stylogmphus albistylus adults have been documented from 26 May —8 August with 105 valid records.

Suborder Anisoptera
Family Gomphidae

Stylurus notatus
Elusive Clubtail

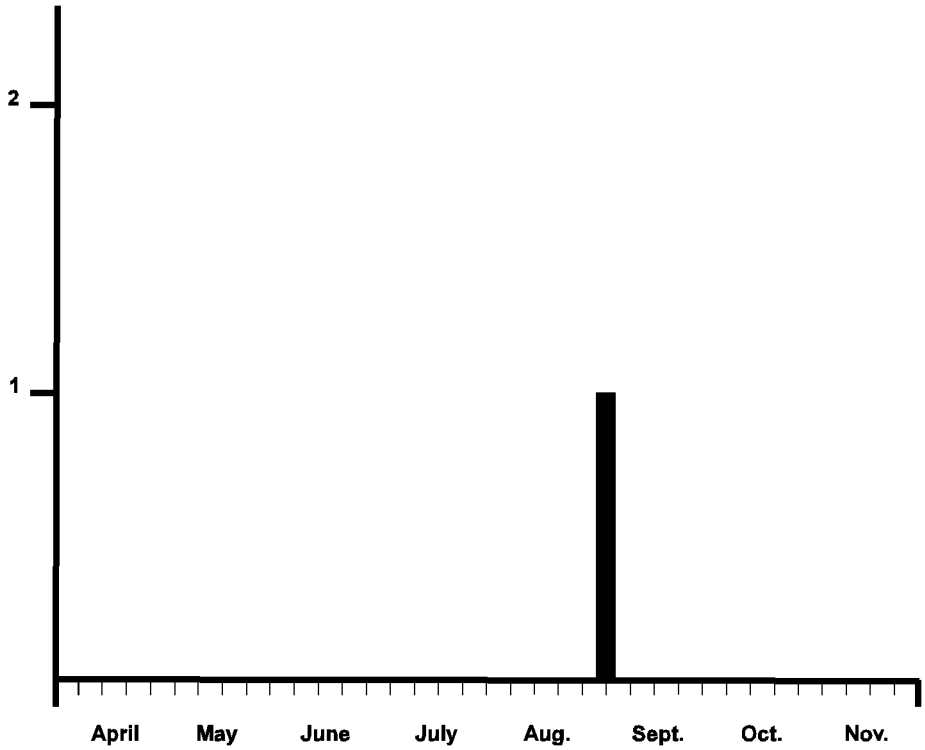
Stylurus notatus male

*Stylurus notatus f*emale



Stylurus notatus distribution based on 1 record. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

A single specimen of *Stylurus notatus* was documented in 2009 from Ohio River Islands NWR in Marshall County. This difficult to document species likely occurs elsewhere on the Ohio and on other West Virginia rivers including the Potomac, Greenbrier, Shenandoah, and Kanawha.



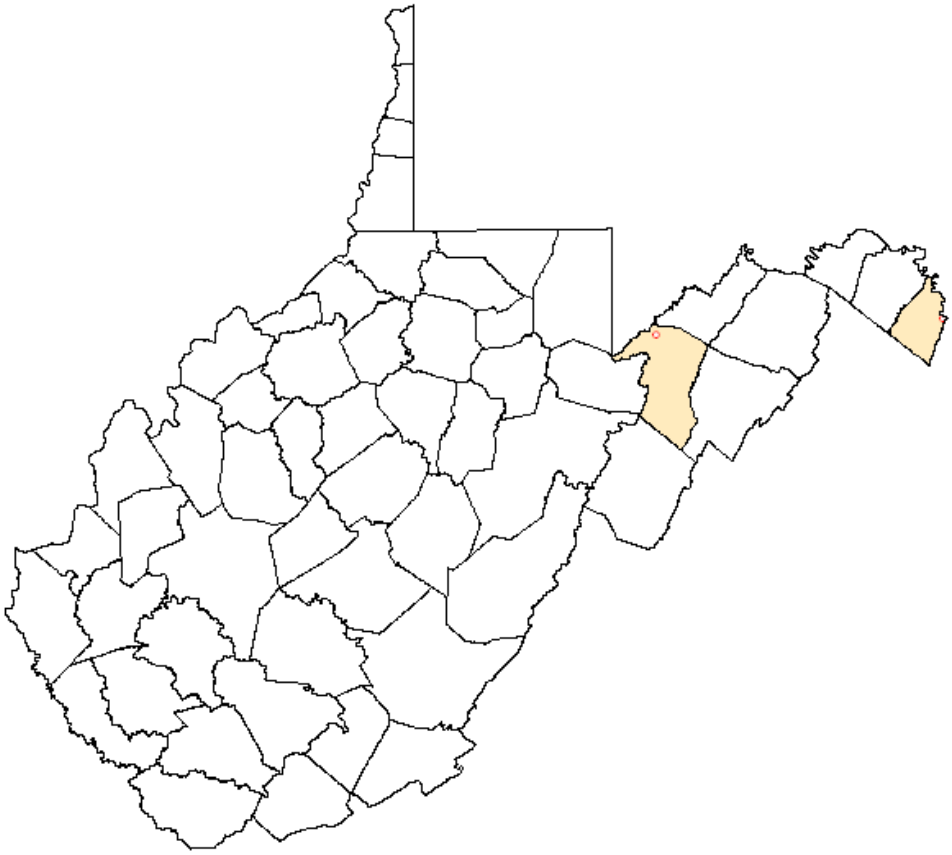
One *Stylurus notatus* adult has been documented on 4 September.

Suborder Anisoptera
Family Gomphidae

Stylurus plagiatus
Russet-tipped Clubtail

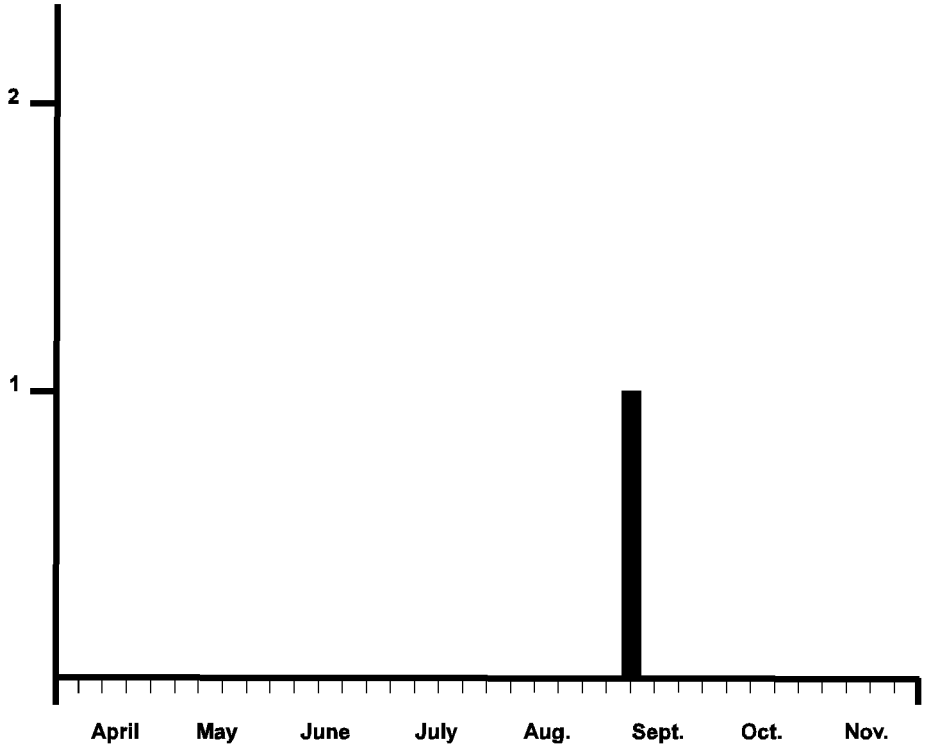
Stylurus plagiatus male

*Stylurus plagiatus f*emale



Stylurus plagiatus distribution based on 2 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Stylurus plagiatus is a species of large, slow rivers at low elevations. Recent records from the Potomac River in MD document its continued occurrence in that watershed, although it has not been recently found in West Virginia.



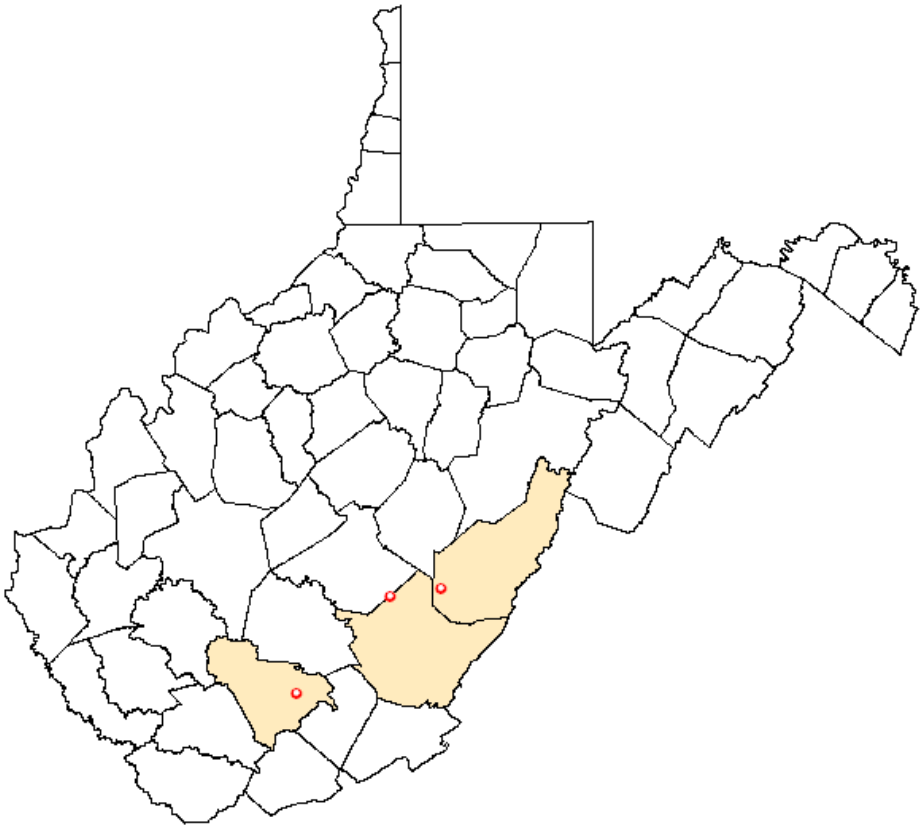
One *Stylurus plagiatus* adult has been documented on 9 September.

Suborder Anisoptera
Family Gomphidae

Stylurus scudderi
Zebra Clubtail

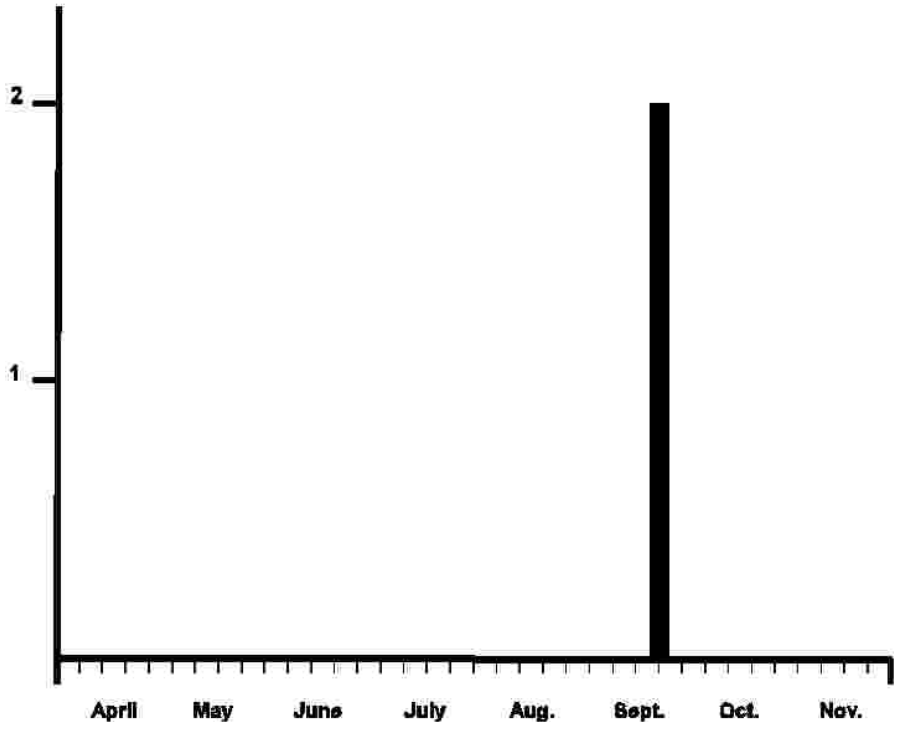
Stylurus scudderi male


*Stylurus scudderi f*emale



Stylurus scudderi distribution based on 3 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Stylurus scudderi is a northern clubtail whose southern distribution extends south down the Appalachians to GA. It is infrequently encountered throughout its range, and West Virginia has one larval and two adult records from the southeastern part of the state It prefers streams and rivers with low to moderate flow and sandy to muddy substrate.



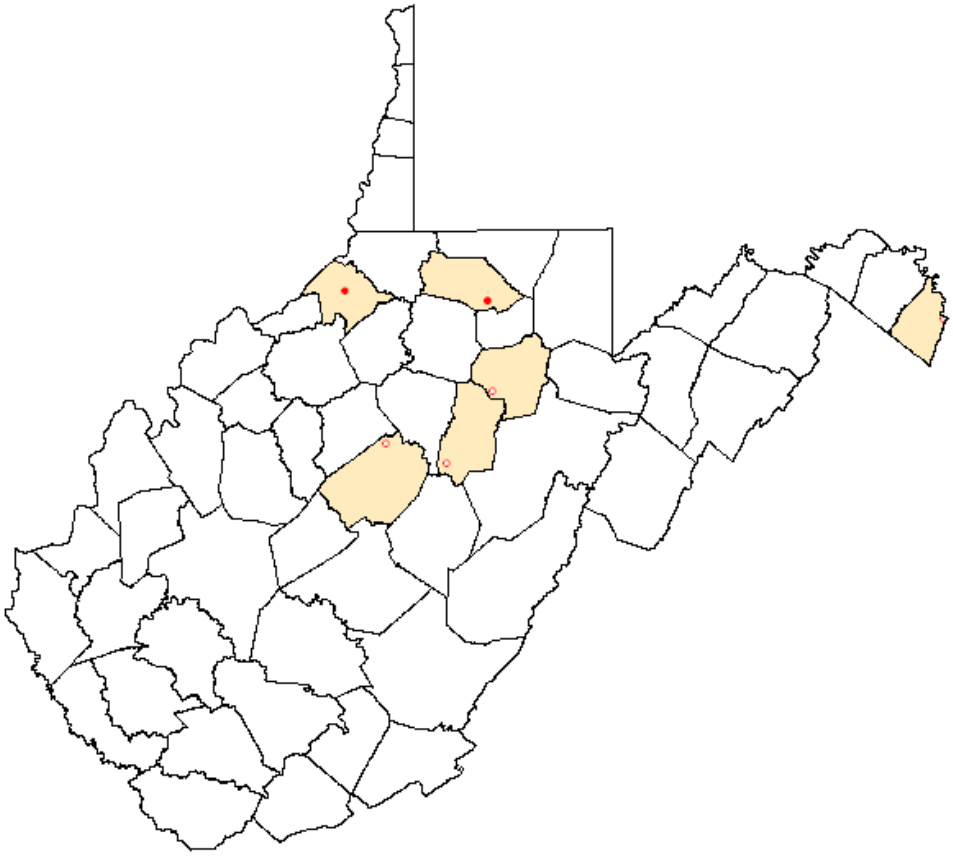
Stylurus scudderi adults have been documented from 26 September - 28 September with 2 valid records.

Suborder Anisoptera
Family Gomphidae

Stylurus spiniceps
Arrow Clubtail

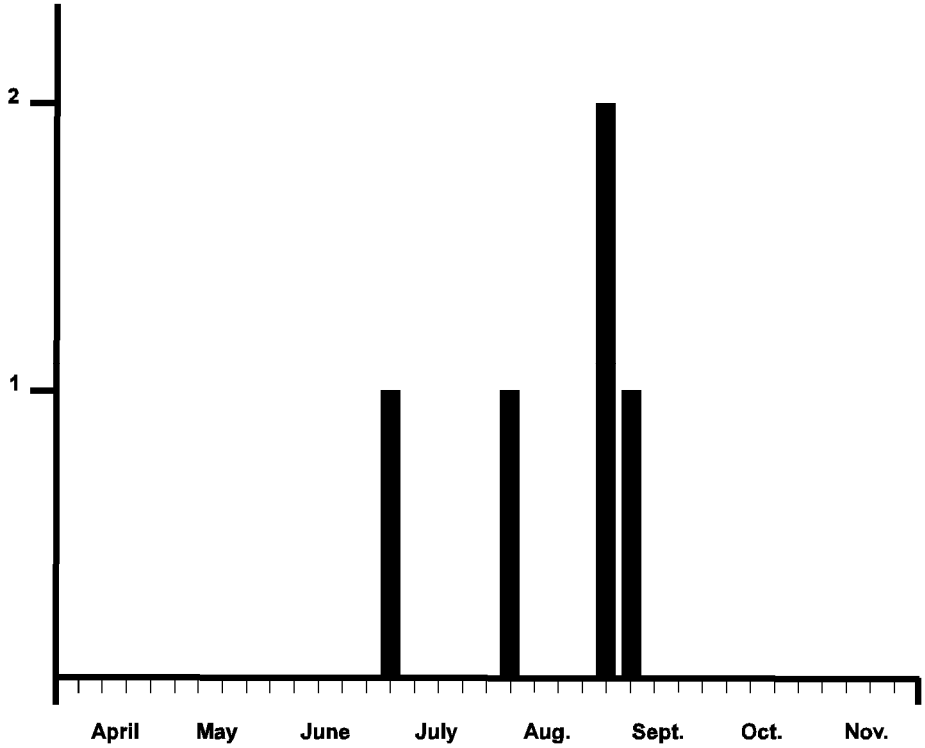
Stylurus spiniceps male

*Stylurus spiniceps f*emale



Stylurus spiniceps distribution based on 7 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Stylurus spiniceps occurs in a large range across much of the eastern U.S. As such, it likely occurs in a broader distribution in West Virginia than records indicate. Its preference for larger streams may have deterred collectors.



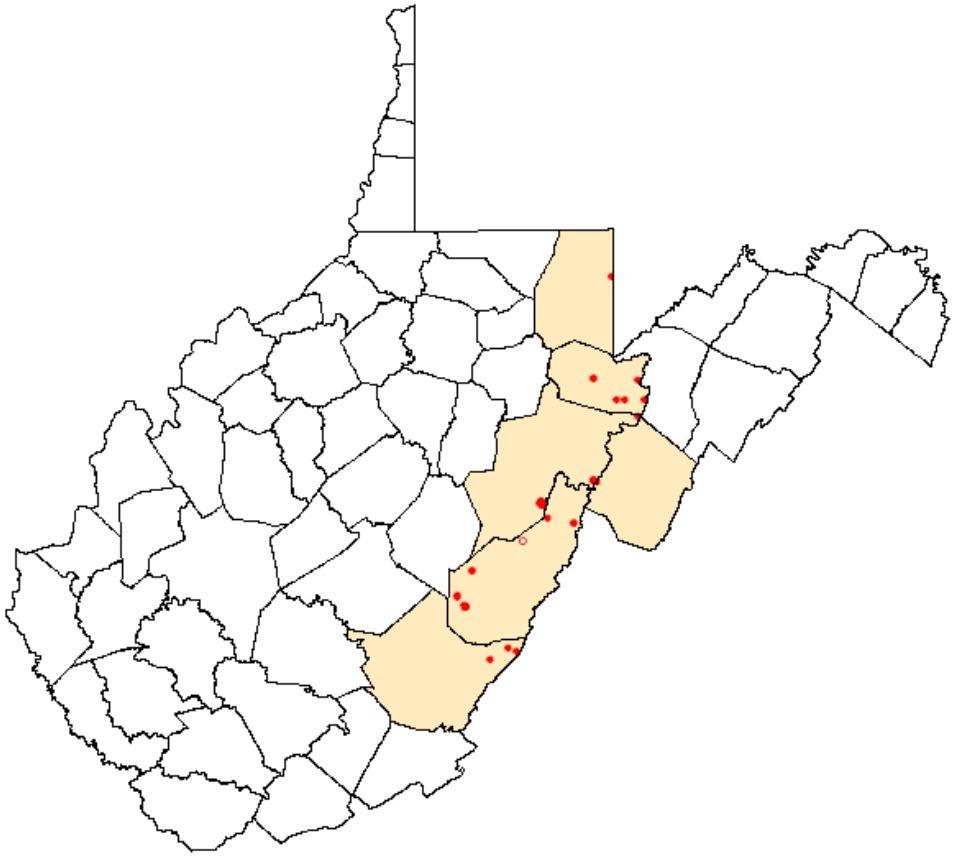
Stylurus spiniceps adults have been documented from 2 July— 10 September with 5 valid records.

Suborder Anisoptera
Family Cordulegastridae

Cordulegaster bilineata
Brown Spiketail

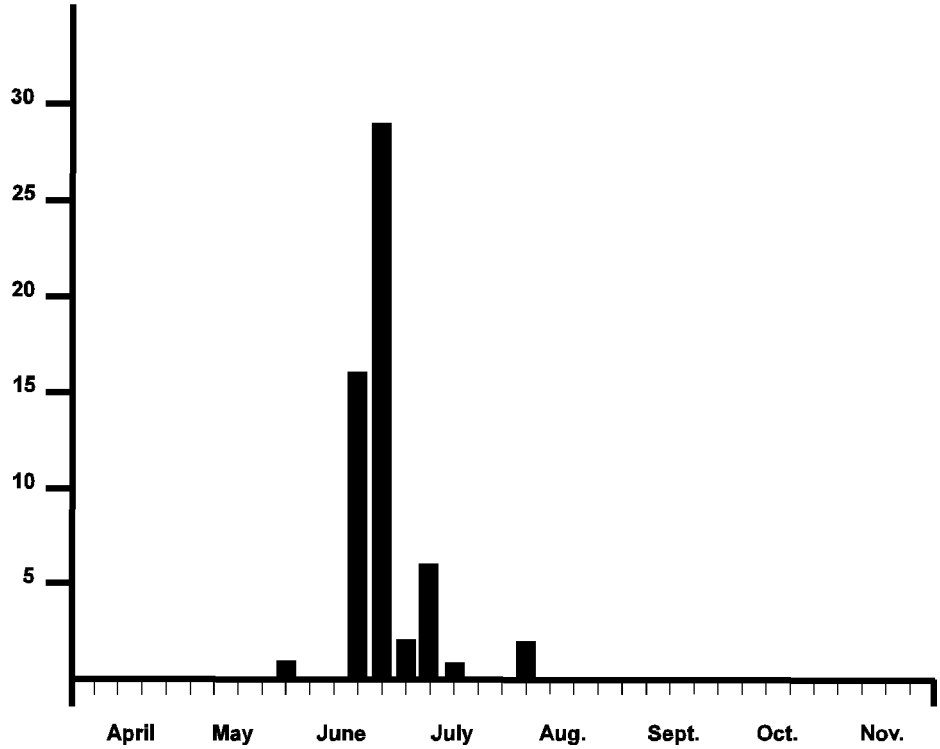
Cordulegaster bilineata male

*Cordulegaster bilineata f*emale



Cordulegaster bilineata distribution based on 57 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Cordulegaster bilineata is primarily a southern species that reaches its northern limit in the Appalachians in West Virginia. It also occurs in the Midwest. In West Virginia, it is found at high elevation (above 2500 ft) wetlands including marshy ponds and bogs.



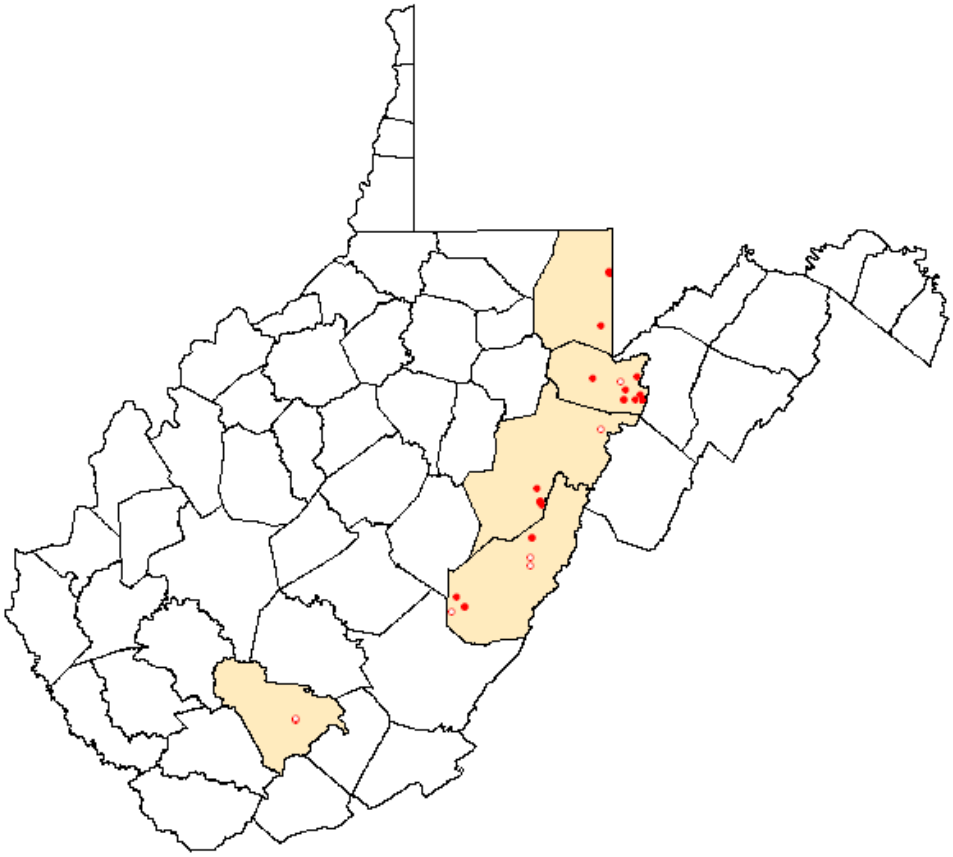
Cordulegaster bilineata adults have been documented from 27 May— 7 August with 57 valid records.

Suborder Anisoptera
Family Cordulegastridae

Cordulegaster diastatops
Delta-spotted Spiketail

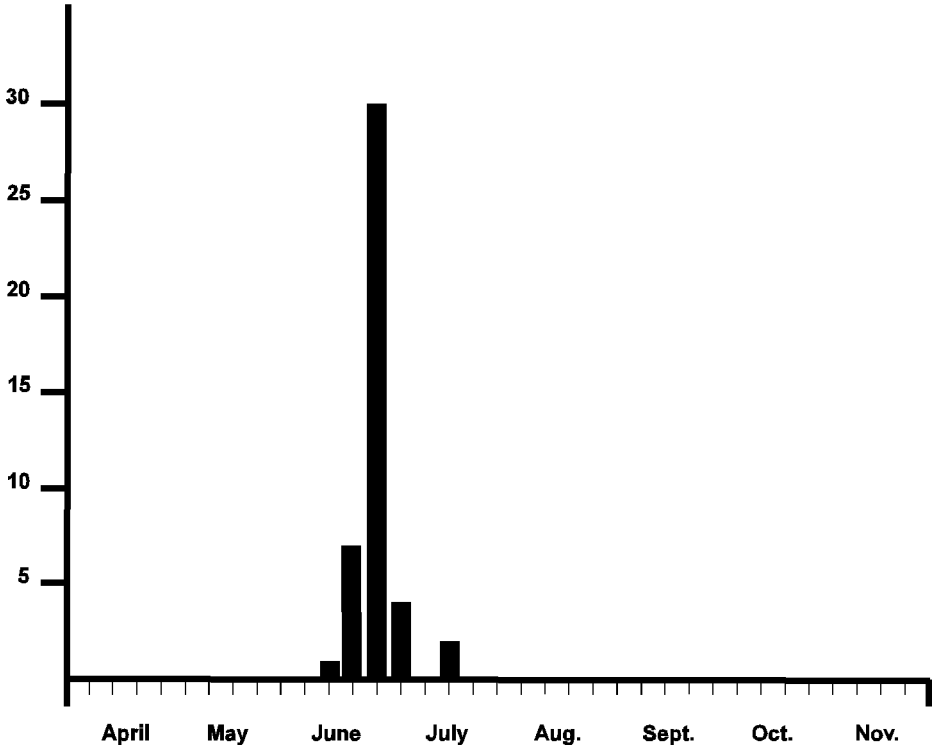
Cordulegaster diastatops male

*Cordulegaster diastatops f*emale



Cordulegaster diastatops distribution based on 54 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Cordulegaster diastops is a northern species that reaches its southern limit in West Virginia. It inhabits high elevation (above 2500 ft) wetlands including marshy ponds and bogs. Recent records have come from Preston, Tucker, Randolph and Pocahontas counties.



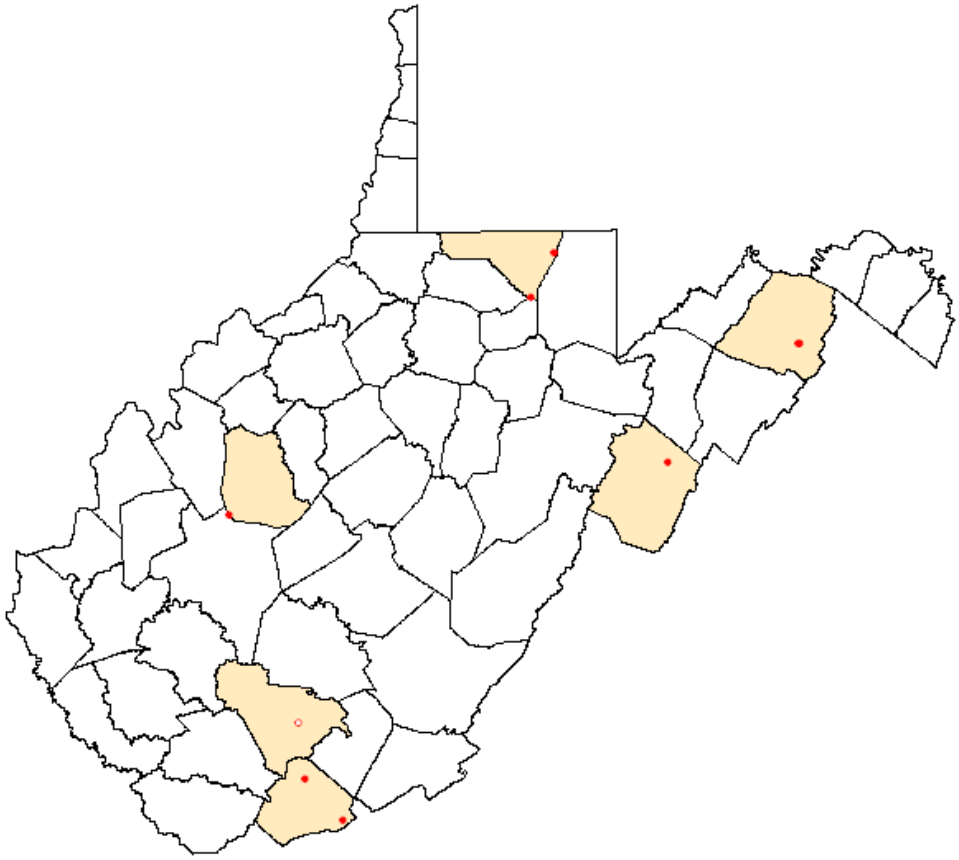
Cordulegaster diastatops adults have been documented from 9 June— 11 July with 44 valid records.

Suborder Anisoptera
Family Cordulegastridae

Cordulegaster erronea
Tiger Spiketail

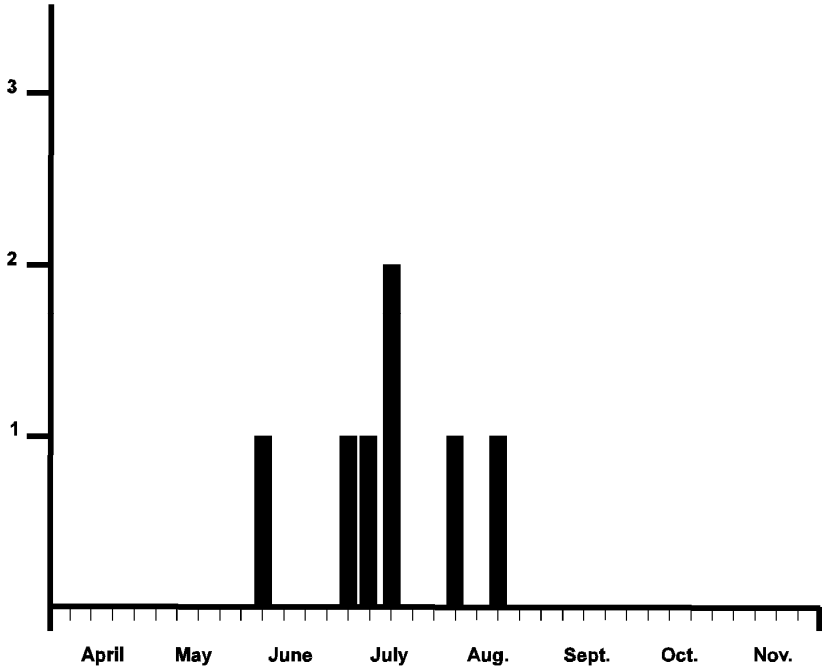
Cordulegaster erronea male

*Cordulegaster erronea f*emale



Cordulegaster erronea distribution based on 9 records. Open dots are

Cordulegaster erronea is likely more common in West Virginia than records indicate, but its habitat is often not surveyed. It inhabits very small spring fed streamlets in forests, often near openings, frequently near ridgetops. Seven recent records have expanded its known West Virginia distribution considerably.



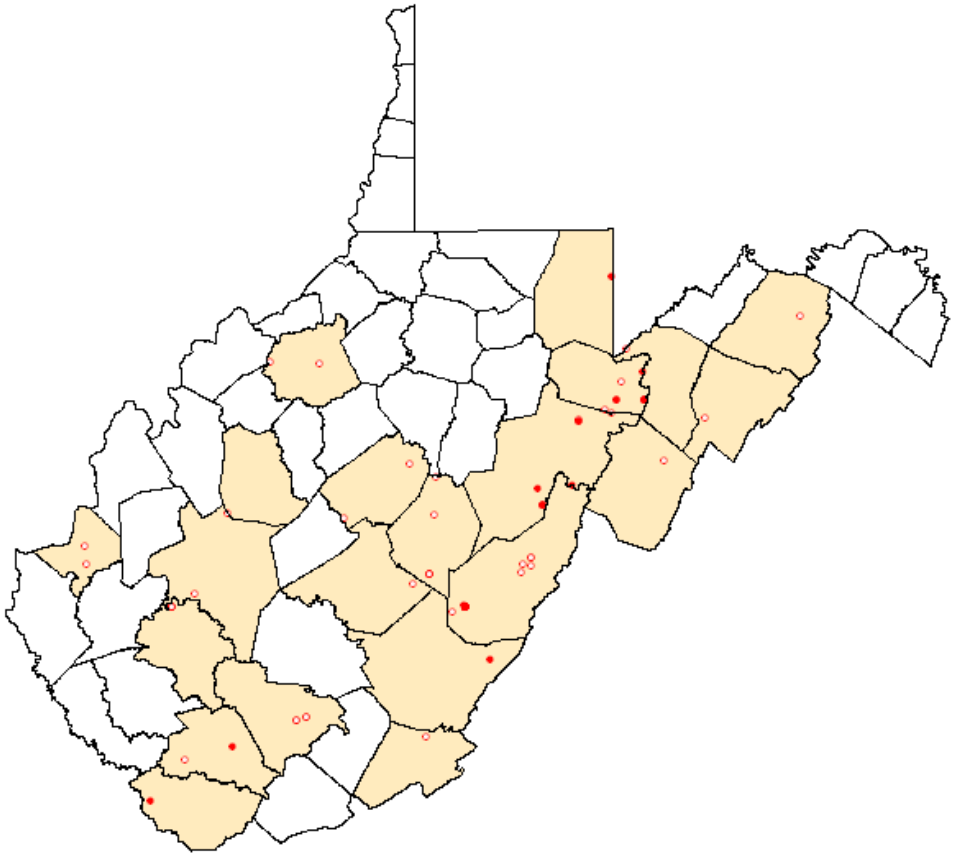
Cordulegaster erronea adults have been documented from 2 June— 23 August with 7 valid records.

Suborder Anisoptera
Family Cordulegastridae

Cordulegaster maculata
Twin-spotted Spiketail

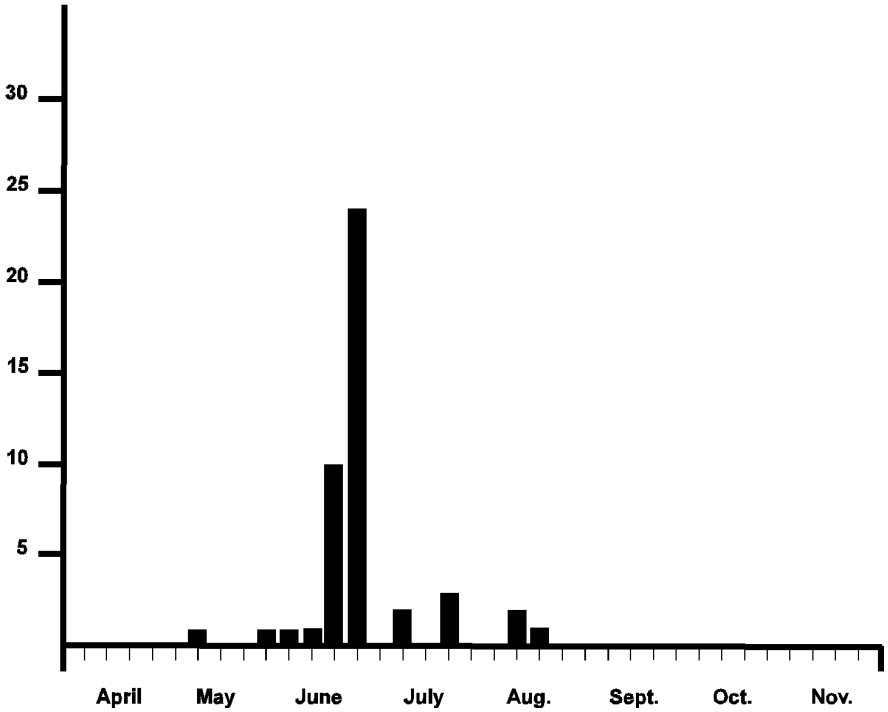
Cordulegaster maculata male

*Cordulegaster maculata f*emale



Cordulegaster maculata distribution based on 79 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Cordulegaster maculata is the most frequently encountered spiketail in West Virginia, and has the broadest distribution. It inhabits small to medium shallow streams in forested habitat.



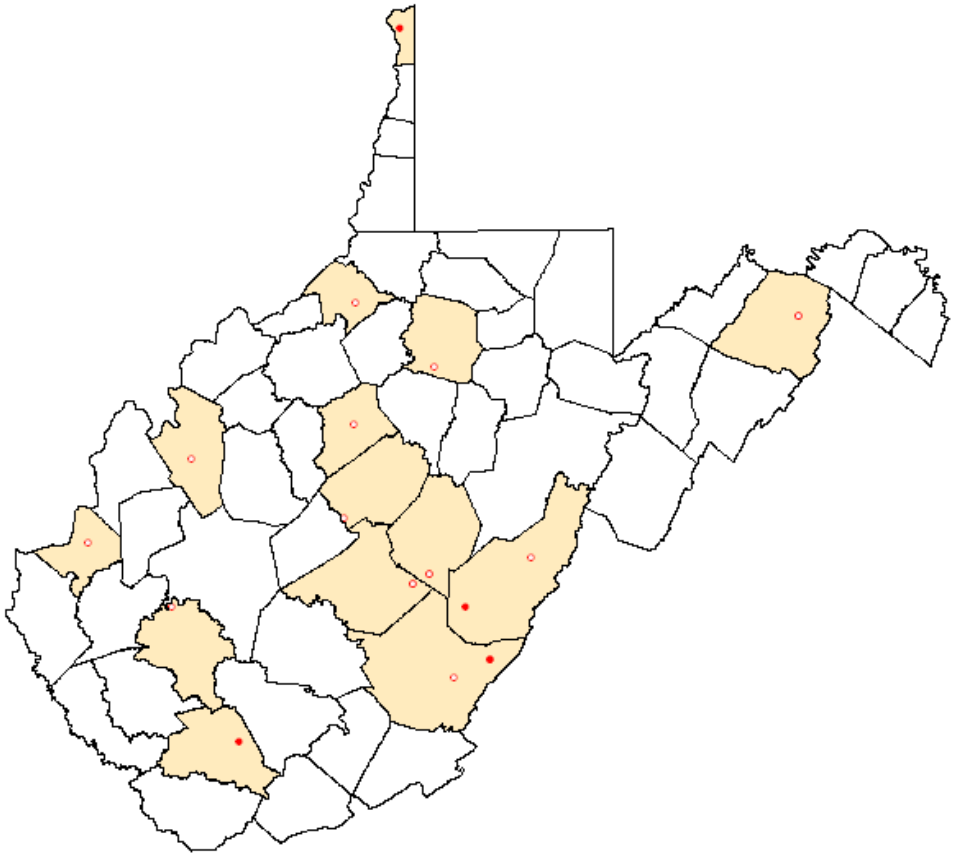
Cordulegaster maculata adults have been documented from 11 May— 17 August with 46 valid records.

Suborder Anisoptera
Family Cordulegastridae

Cordulegaster obliqua
Arrowhead Spiketail

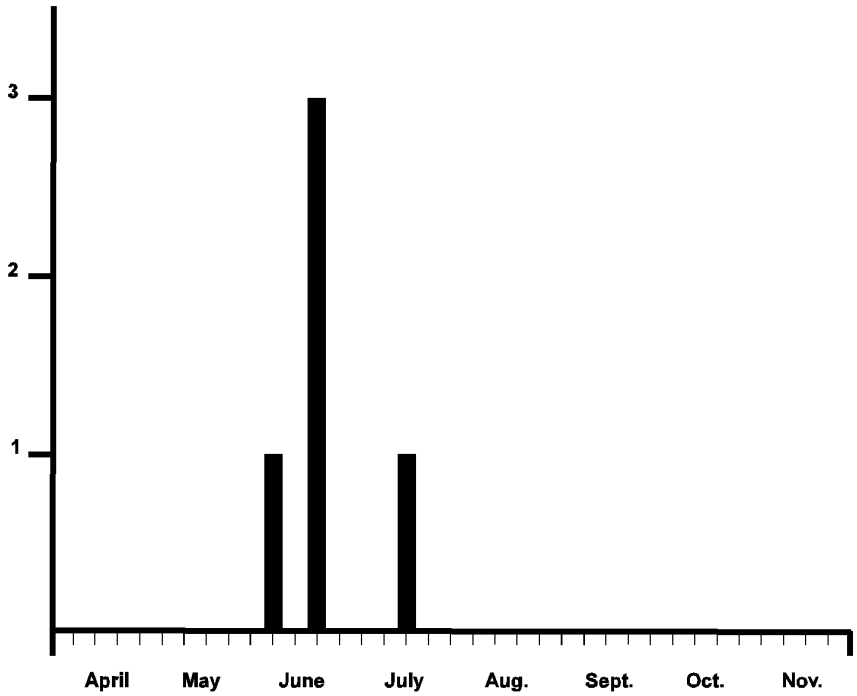
Cordulegaster obliqua male

*Cordulegaster obliqua f*emale



Cordulegaster obliqua distribution based on 19 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Records for *Cordulegaster obliqua* are scattered through West Virginia. It inhabits spring fed mucky woodland streamlets, and likely occurs statewide. Because collectors may be unaware of these small streamlets, these areas are often not surveyed, resulting in the low number of records.



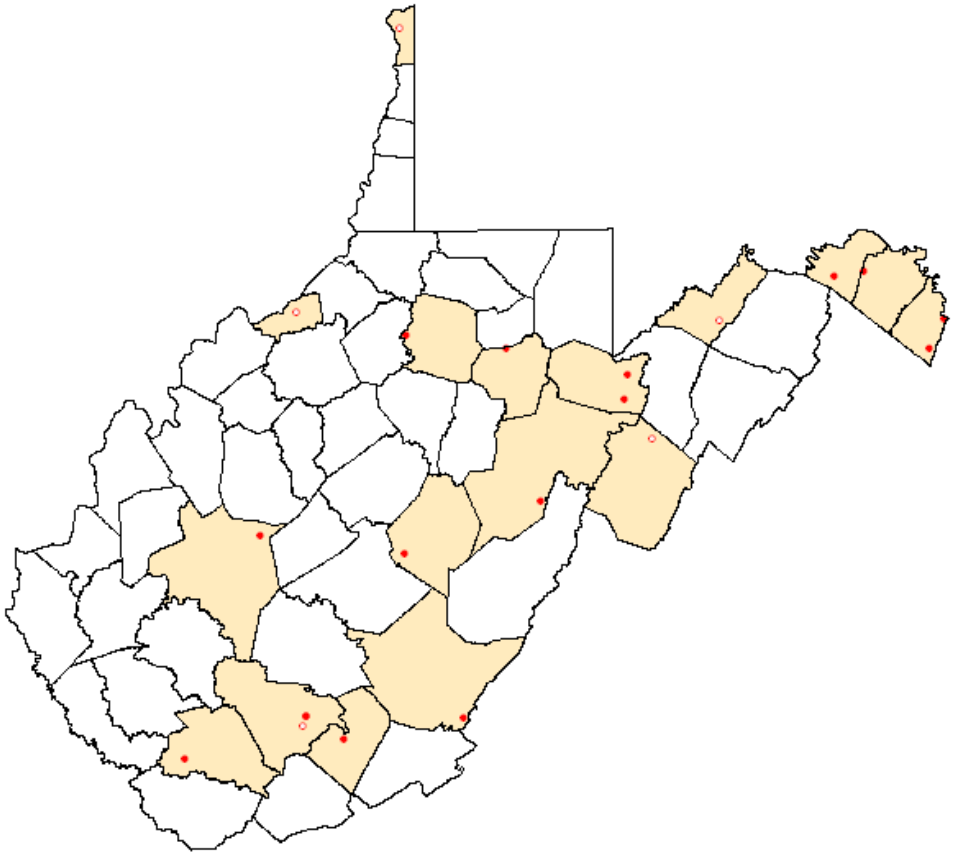
Cordulegaster obliqua adults have been documented from 7 June—18 July with 5valid records.

Suborder Anisoptera
Family Macromiidae

Didymops transversa
Stream Cruiser

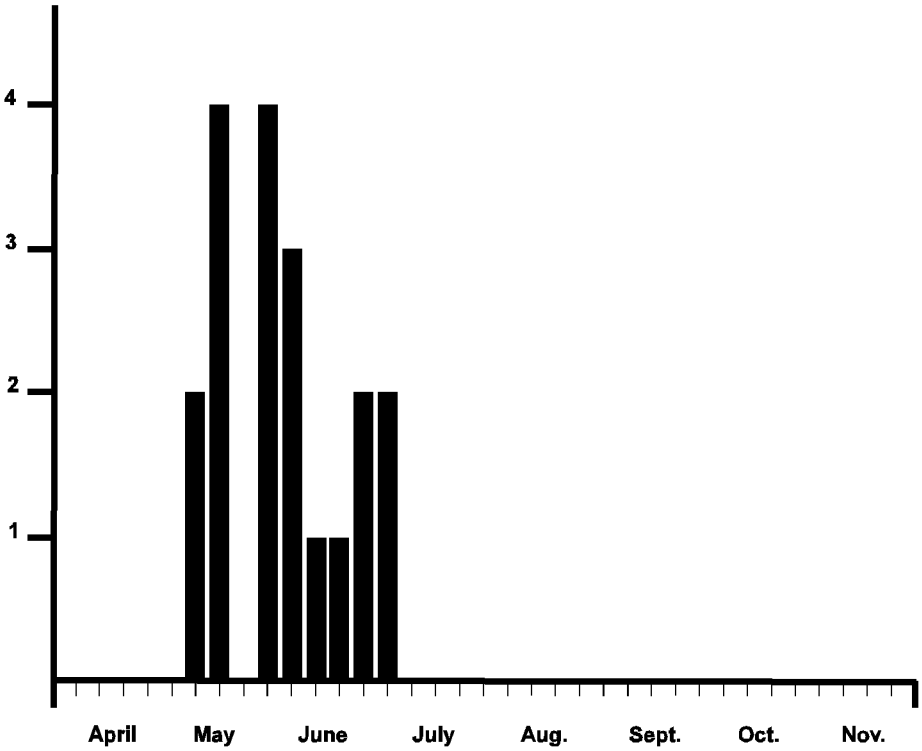
Didympos transversa male

*Didymops transversa f*emale



Didymops transversa distribution based on 21 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Didymops transversa is one of West Virginia's earliest flying odonates, with adult records from early May. It is widely distributed in the state, and likely occurs statewide. Males patrol long stretches of slow forested streams and lakes in search of females.

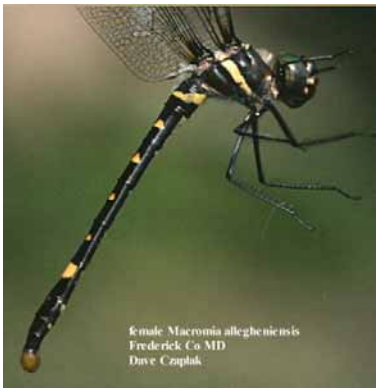


Didymops transversa adults have been documented from 10 May—8 July with 19 valid records.

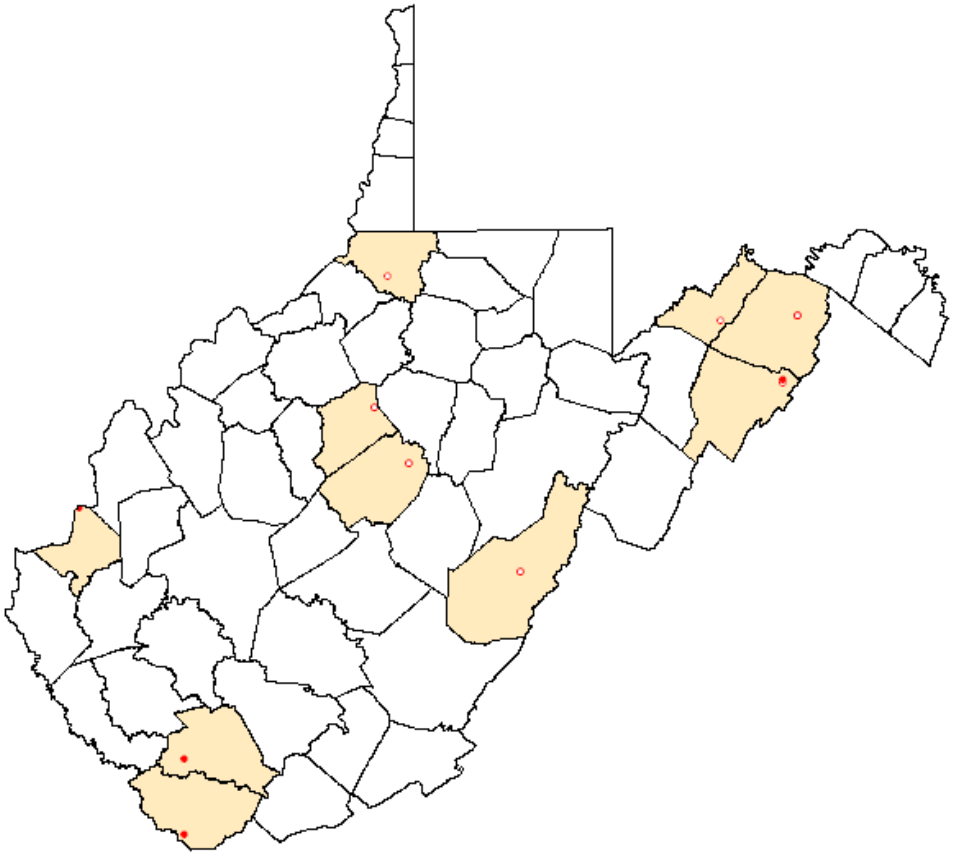
Suborder Anisoptera
Family Macromiidae

Macromia alleghaniensis
Allegheny River Cruiser

Macromia alleghaniensis male

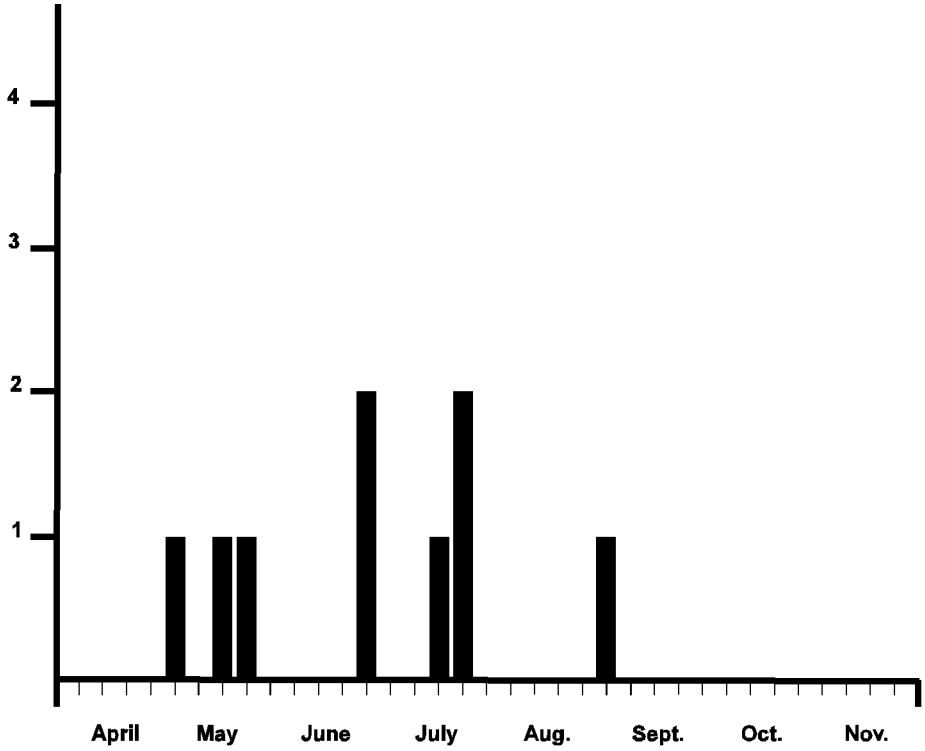


*Macromia alleghaniensis f*emale



Macromia alleghaniensis distribution based on 16 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Macromia alleghaniensis is a large strikingly patterned odonate of streams that approaches its northern range limit in West Virginia. This species must be in hand for positive identification and is challenging to net. Because of this limitation, it may have a wider distribution in the state than records indicate.



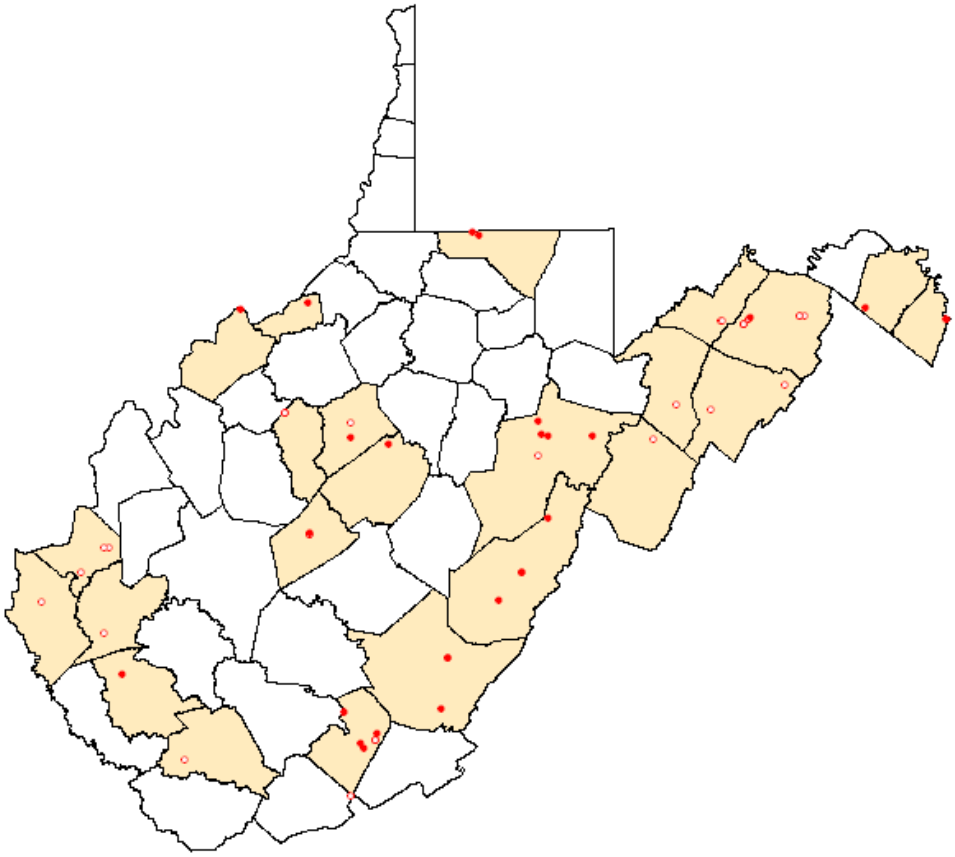
Macromia alleghaniensis adults have been documented from 3 May—3 September with 9 valid records.

Suborder Anisoptera
Family Macromiidae

Macromia illinoiensis illinoiensis

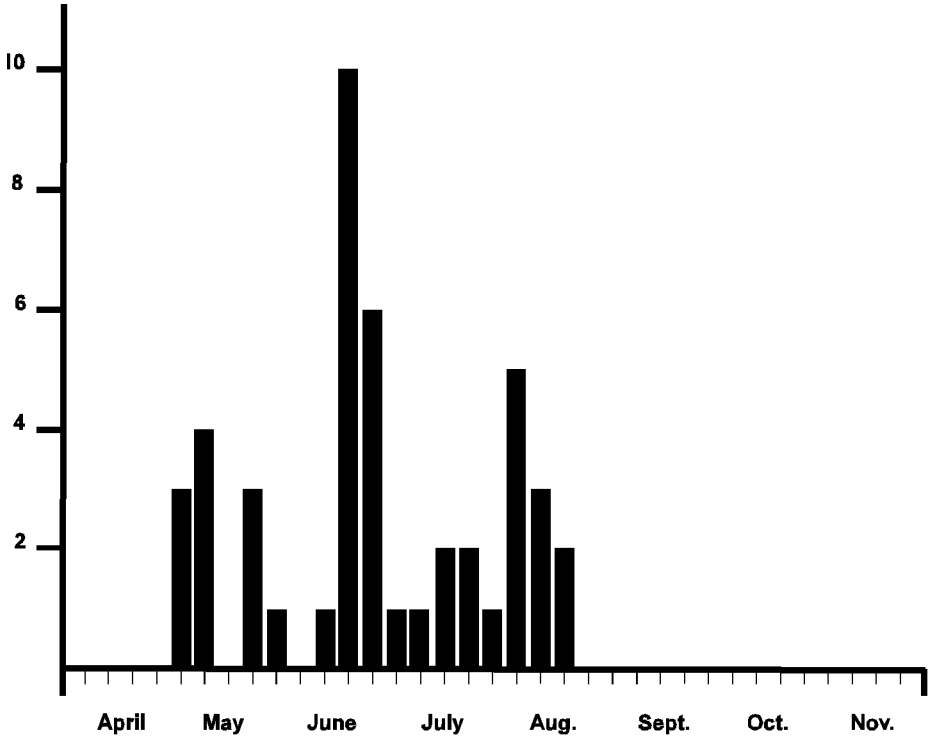
Macromia i. illinoiensis male

*Macromia i. illinoiensis f*emale



Macromia i. illinoiensis distribution based on 56 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Macromia i. illinoiensis is West Virginia's most commonly encountered cruiser on streams. It flies long patrols over pool and riffle areas. This species must be in hand for positive identification and is challenging to net. Because of this limitation, it may have a wider distribution in the state than records indicate.



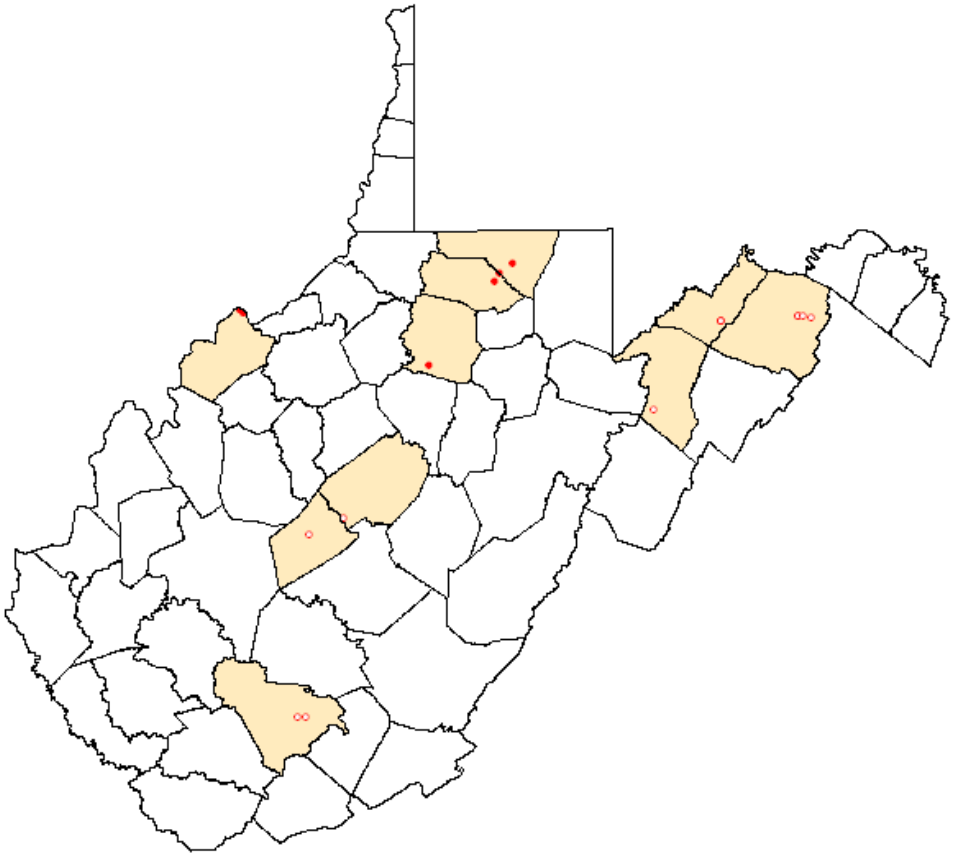
Macromia i. illinoiensis adults have been documented from 3 May—20 August with 45 valid records.

Suborder Anisoptera
Family Macromiidae

Macromia taeniolata
Royal River Cruiser

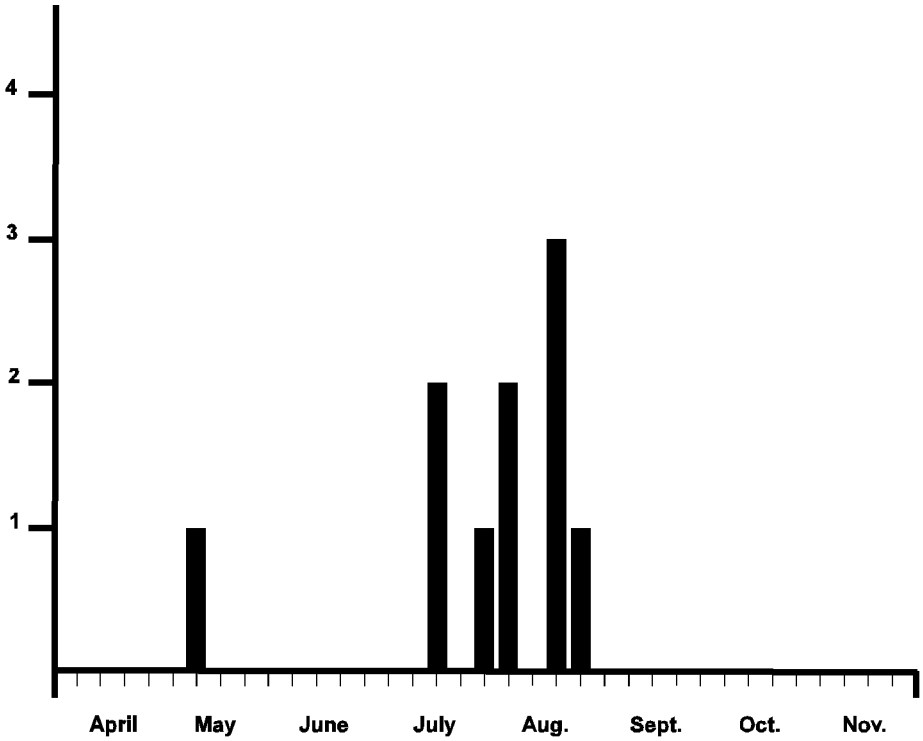
Macromia taeniolata male

*Macromia taeniolata f*emale



Macromia taeniolata distribution based on 21 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Macromia taeniolata is found on West Virginia's rivers and rarely on streams. It has been documented from the Ohio, Potomac, Monongahela, North, and Cacapon rivers. Because of the difficulty in surveying for this species and the requirement for in hand identification, it likely has a broader distribution in West Virginia than records indicate.



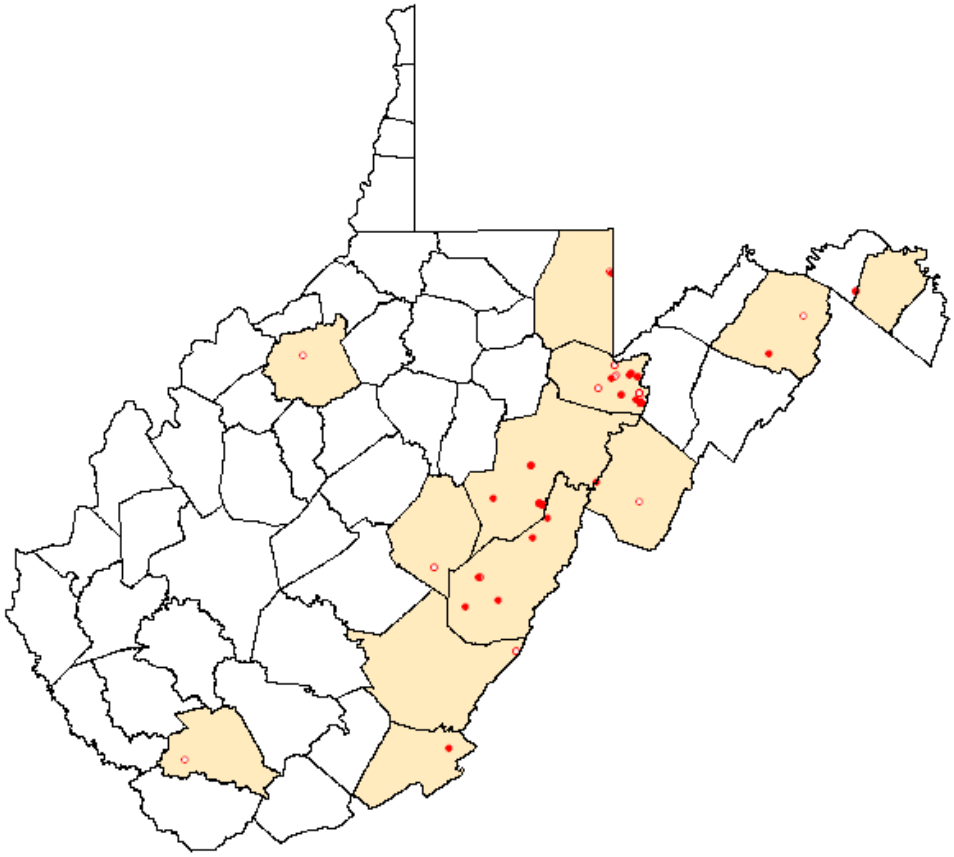
Macromia taeniolata adults have been documented from 11 May—24 August with 10 valid records.

Suborder Anisoptera
Family Corduliidae

Cordulia shurtleffi
American Emerald

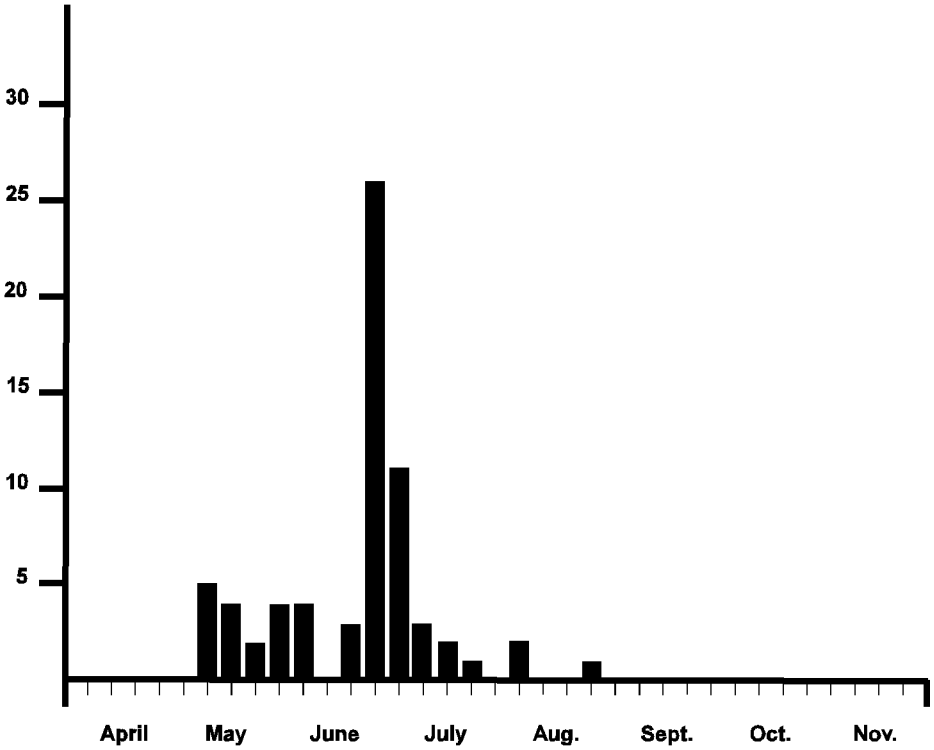
Cordulia shurtleffi male

Cordulia shurtleffi female



Cordulia shurtleffi distribution based on 73 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

A northern species, *Cordulia shurtleffi* approaches its southern limit in West Virginia. It is common at high elevation (above 2500 ft) ponds, marshy pools, bogs, and marshes in the mountain counties.



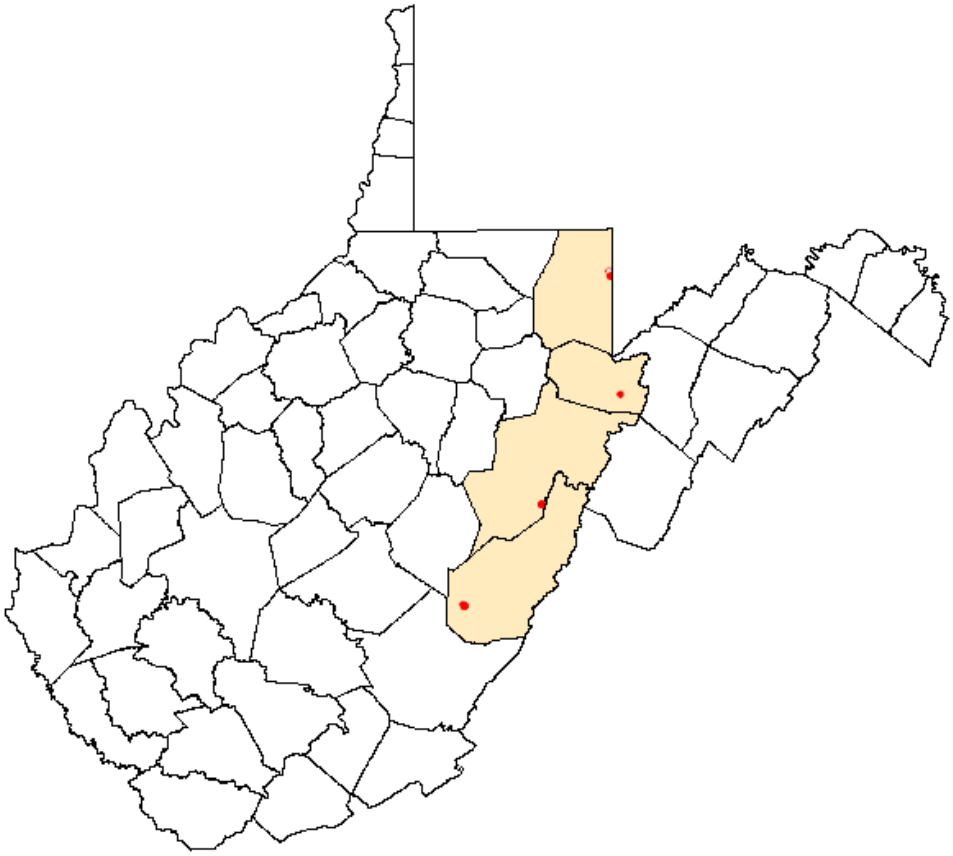
Cordulia shurtleffi adults have been documented from 5 May—25 August with 68 valid records.

Suborder Anisoptera
Family Corduliidae

Epitheca canis
Beaverpond Baskettail

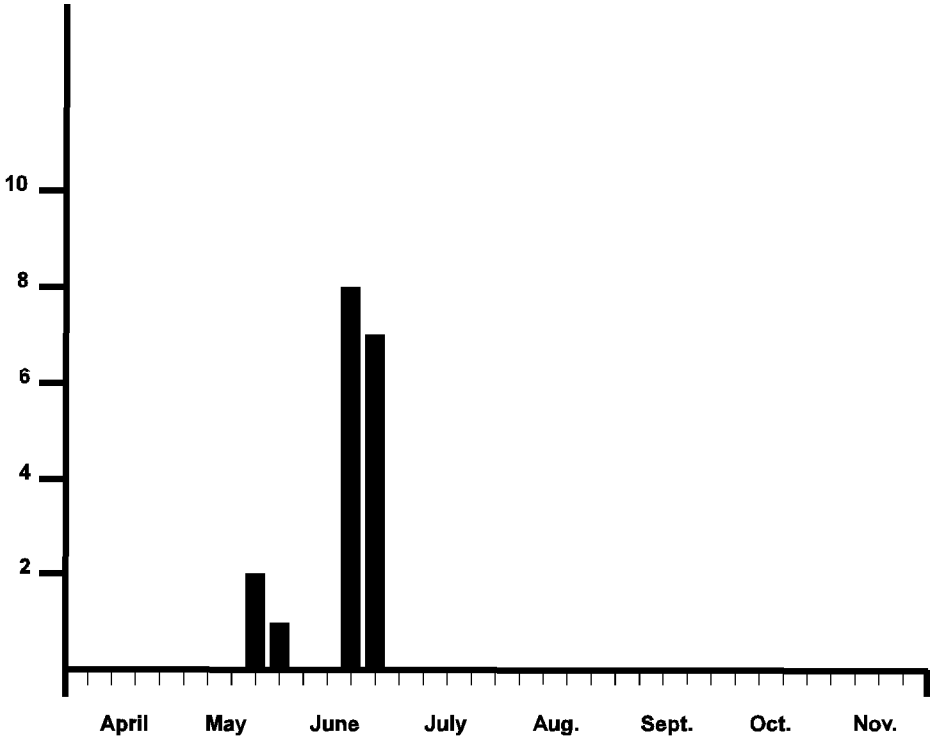
Epitheca canis male

Epitheca canis male



Epitheca canis distribution based on 19 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Epitheca canis is found infrequently at high elevation (above 2500 ft) ponds and wetlands in West Virginia. When present, however, it may be locally abundant. It is a northern species that reaches its southern range limit in the state.



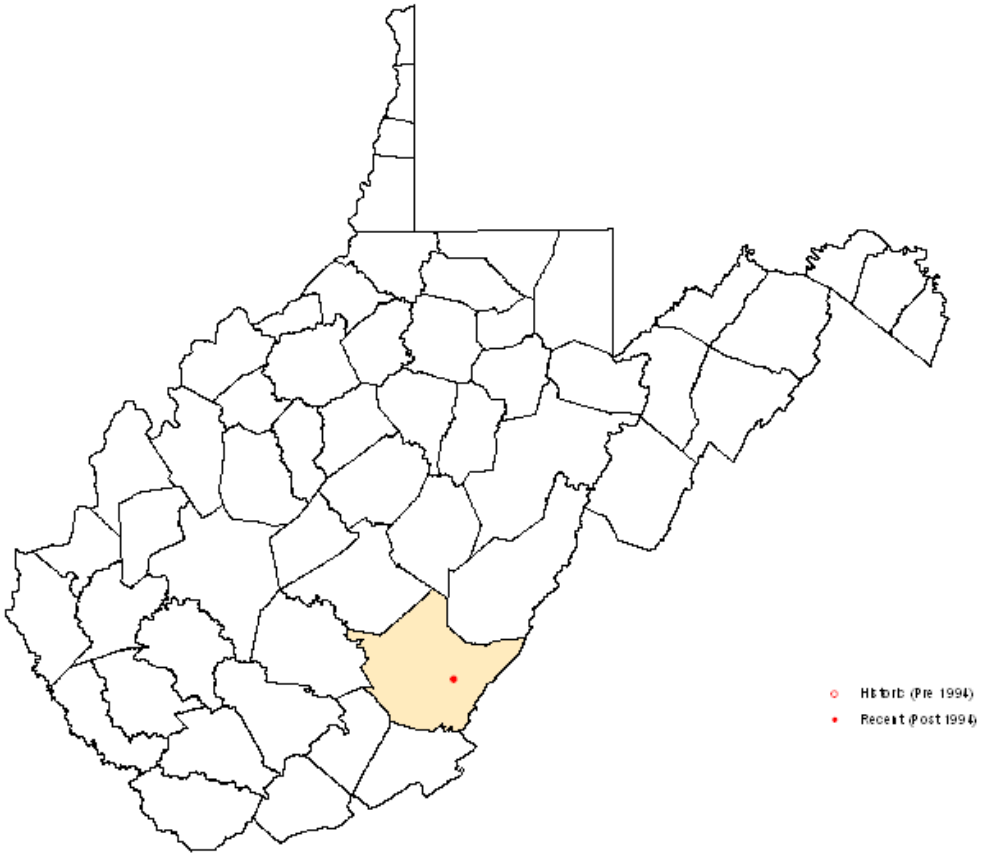
Epitheca canis adults have been documented from 23 May—24 June with 18 valid records.

Suborder Anisoptera
Family Corduliidae

Epitheca costalis
Slender Baskettail

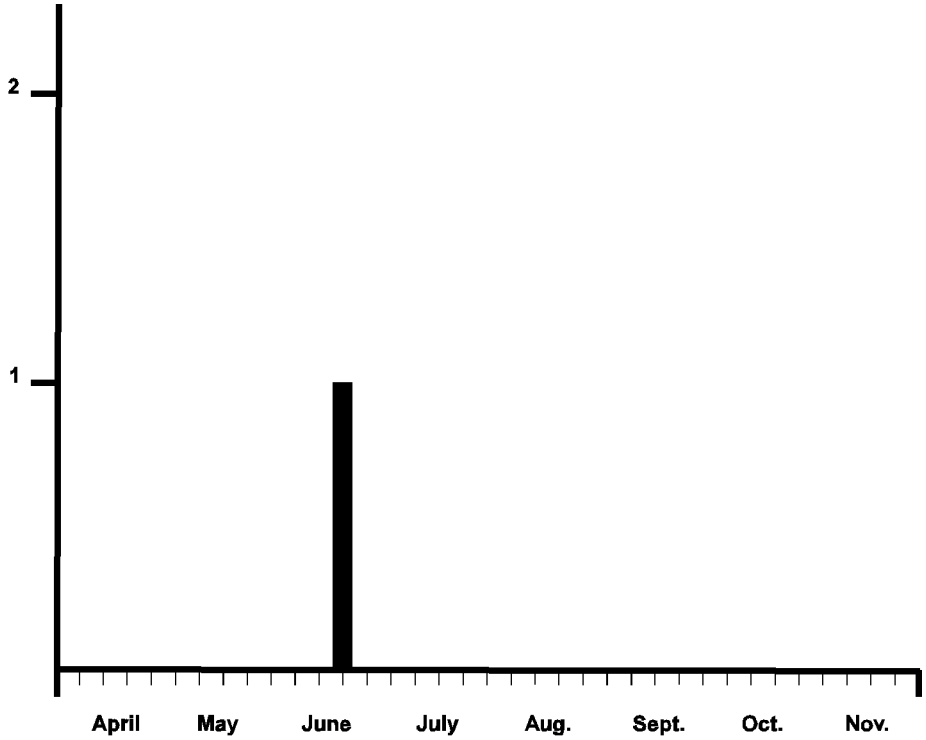
Epitheca costalis male

Epitheca costalis female



Epitheca costalis distribution based on 1 record. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Epitheca costalis is a pond species of the coastal plain and Mississippi River drainage. It tends to avoid mountainous areas and is lacking from the Appalachian region except for this one record from Greenbrier County. It is likely a vagrant into the state.



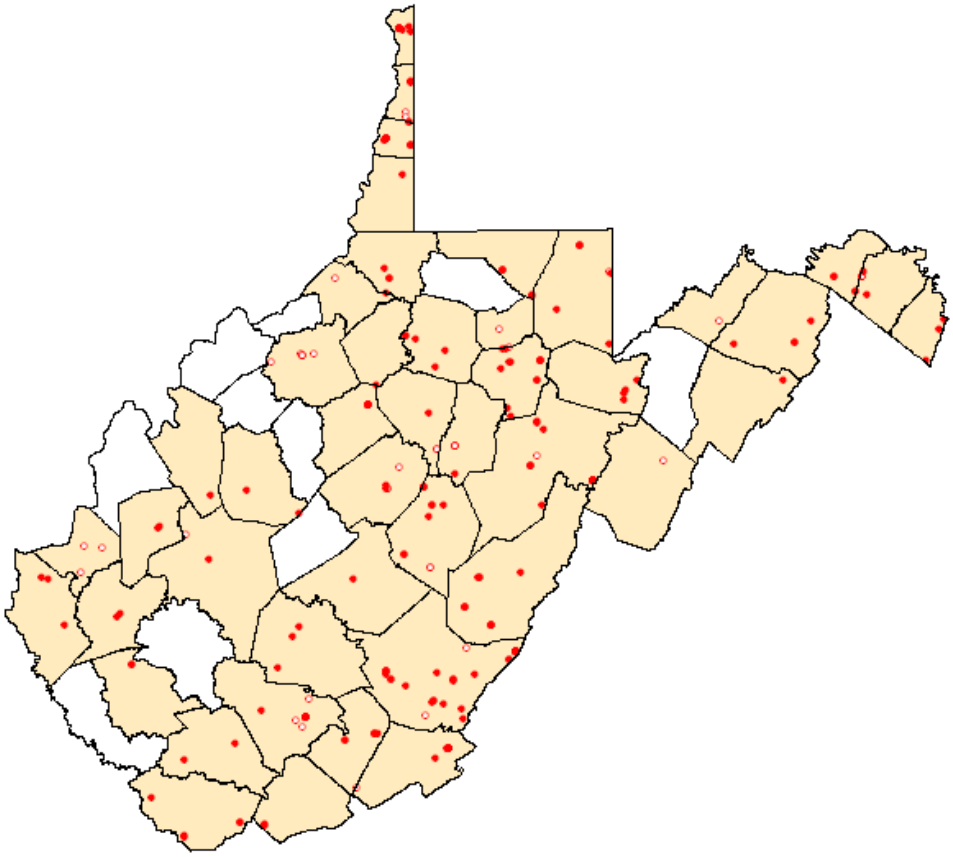
One *Epitheca costalis* adult has been documented on 21 June.

Suborder Anisoptera
Family Corduliidae

Epitheca cynosura
Common Baskettail

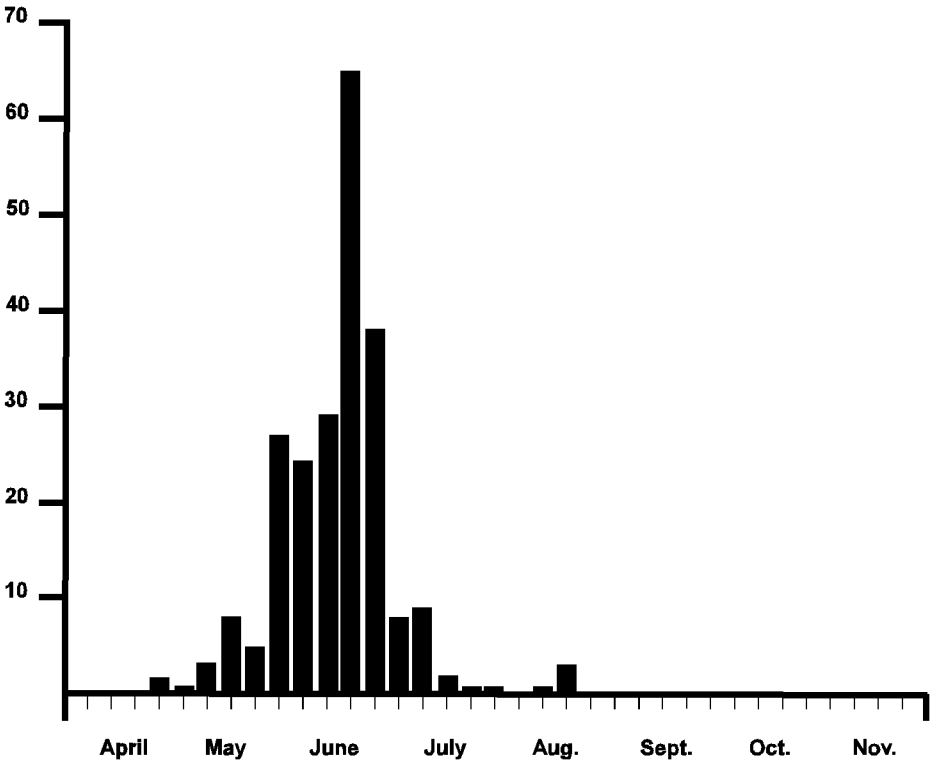
Epitheca cynosura male

Epitheca cynosura female



Epitheca cynosura distribution based on 249 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Epitheca cynosura is a ubiquitous species on ponds and slow streams throughout West Virginia in the spring. Like most emeralds, males stay on the wing for extended periods patrolling breeding habitat in search of females and defending territory.



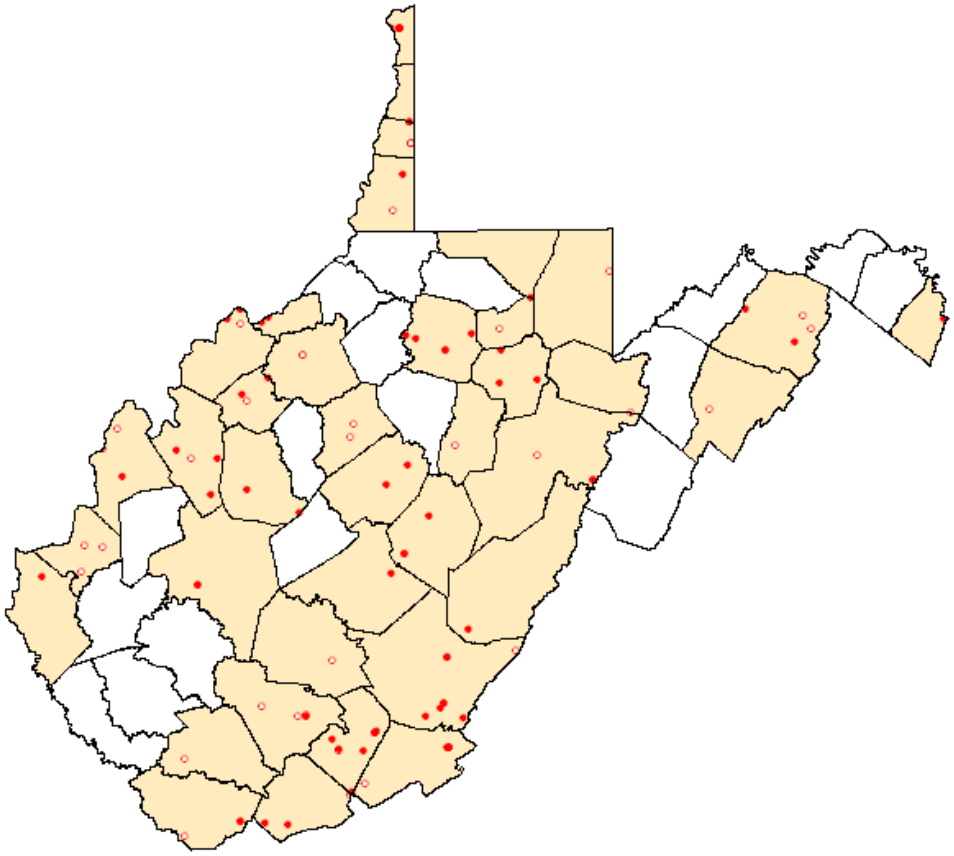
Epitheca cynosura adults have been documented from 24 April—20 August with 227 valid records.

Suborder Anisoptera
Family Corduliidae

Epitheca princeps
Prince Baskettail

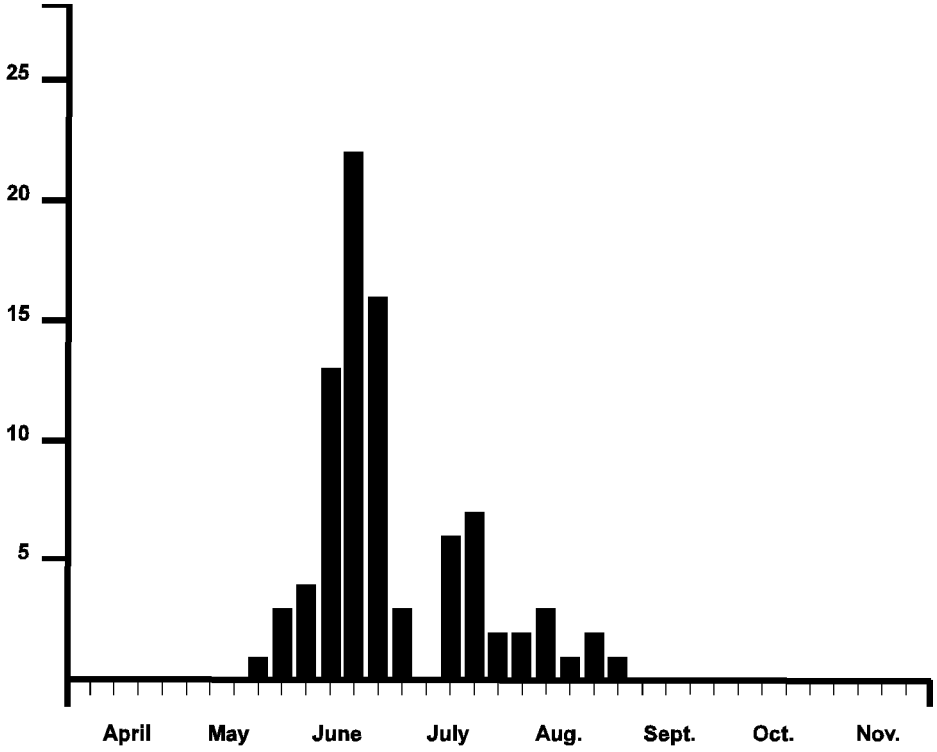
Epitheca princeps male

Epitheca princeps female



Epitheca princeps distribution based on 108 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Epitheca princeps probably occurs statewide. Flying tirelessly over ponds and slow streams and rivers, its large size, patterned wings, and typically green eyes make for an easy identification without capturing it.



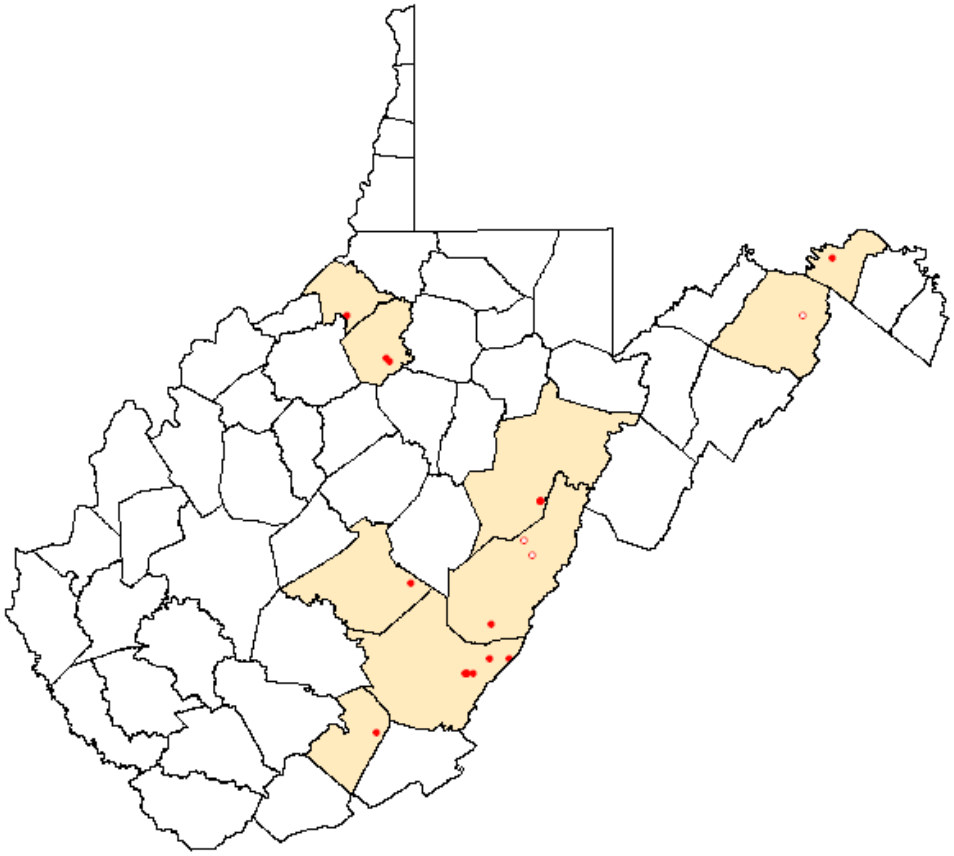
Epitheca princeps adults have been documented from 20 May —2 September with 86 valid records.

Suborder Anisoptera
Family Corduliidae

Helocordulia uhleri
Uhler's Sundragon

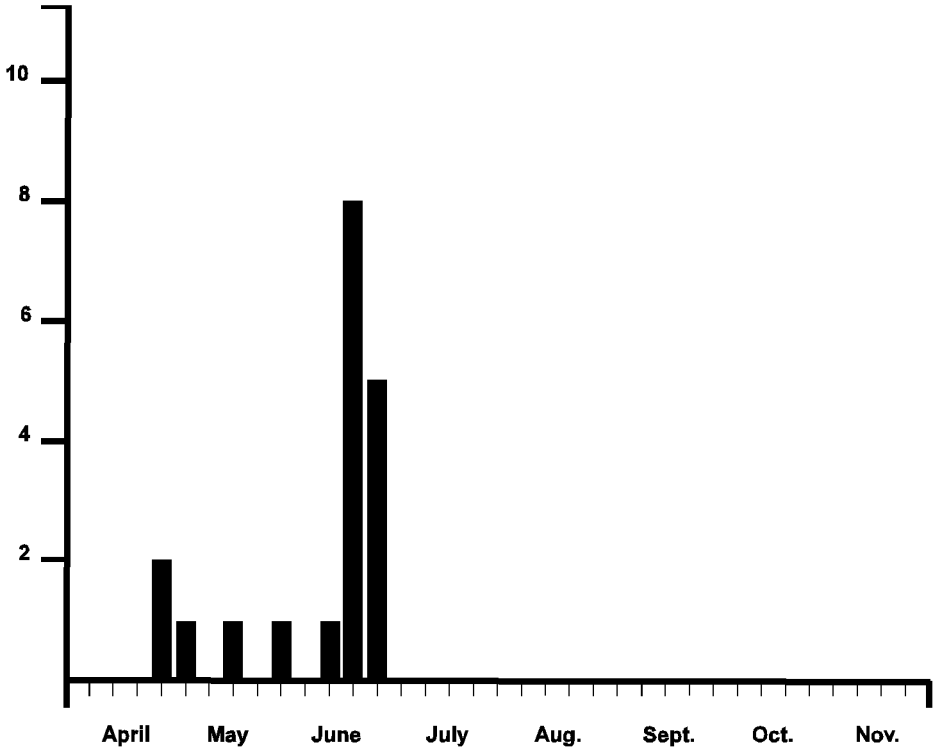
Helocordulia uhleri male

Helocordulia uhleri female



Helocordulia uhleri distribution based on 21 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

A little emerald of early spring, *Helocordulia uhleri* is found flying patrols in sunny patches of fast flowing clear streams. Because collectors may miss its early flight period, this species likely has a more extensive distribution in West Virginia than records indicate.



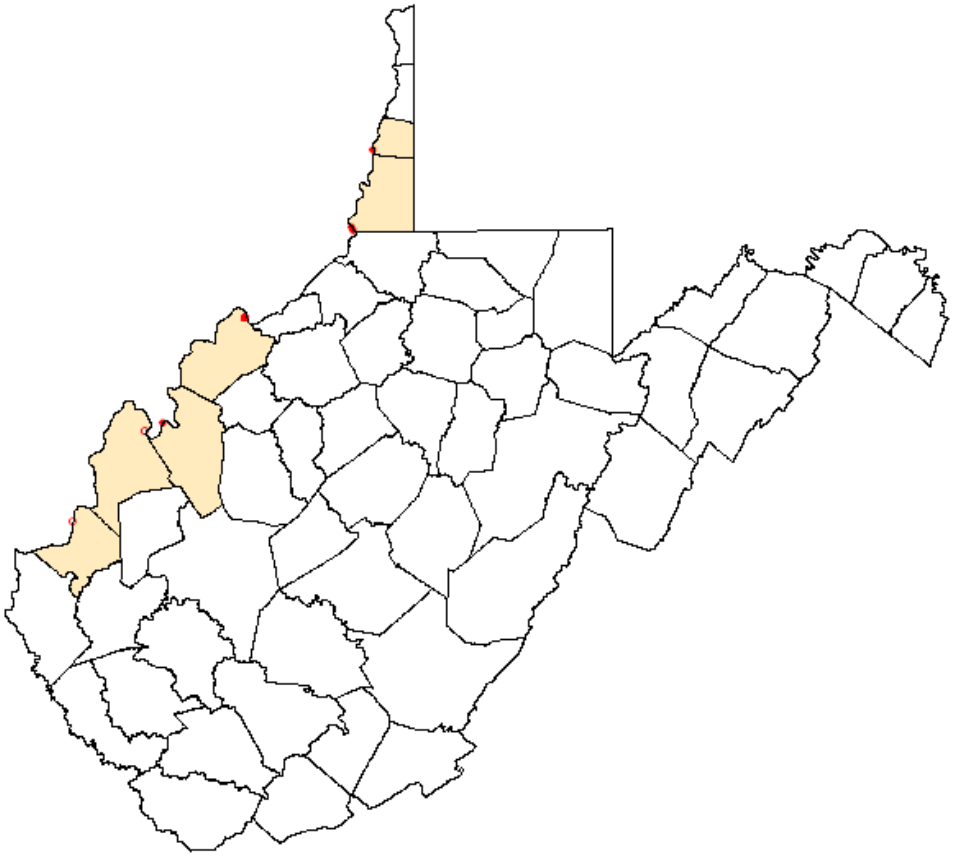
Helocordulia uhleri adults have been documented from 24 April — 24 June with 19 valid records.

Suborder Anisoptera
Family Corduliidae

Neurocordulia molesta
Smoky Shadowdragon

Neurocordulia molesta male

Neurocordulia molesta female



Neurocordulia molesta distribution based on 29 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Neurocordulia molesta is documented from larval specimens from the Ohio River. Because it is a night flying species, and inactive during the day, the collection of adults is extremely challenging or a matter of luck. It is unknown if this species could be found on other rivers such as the Kanawha or New, although the Ohio currently appears to be the eastern edge of its range.

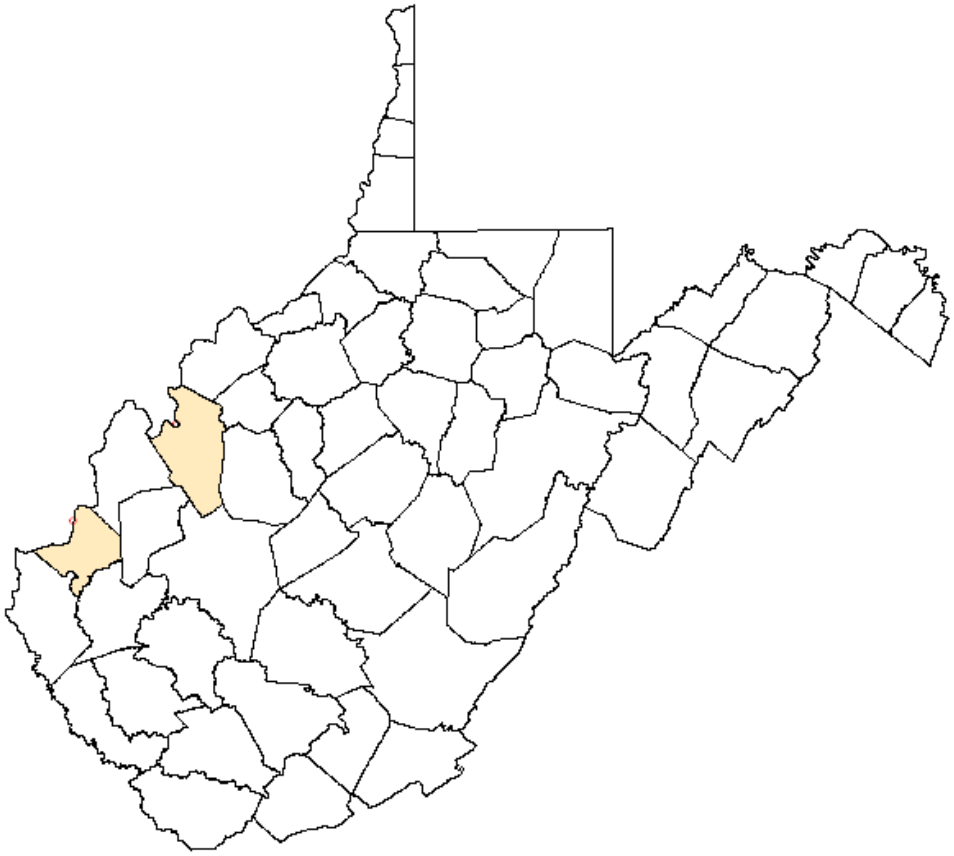
No *Neurocordulia molesta* adults have been documented in West Virginia.

Suborder Anisoptera
Family Corduliidae

Neurocordulia obsoleta
Umber Shadowdragon

Neurocordulia obsoleta male

Neurocordulia obsoleta male



Neurocordulia obsoleta distribution based on 21 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Neurocordulia obsoleta is documented in West Virginia from only two Ohio River larval specimens. A night flying species, adults are very challenging to collect. Records in adjacent states (OH, KY, VA, PA) indicate that this species may occur more widely in West Virginia than our data indicate, although it appears to be primarily a coastal plain species.

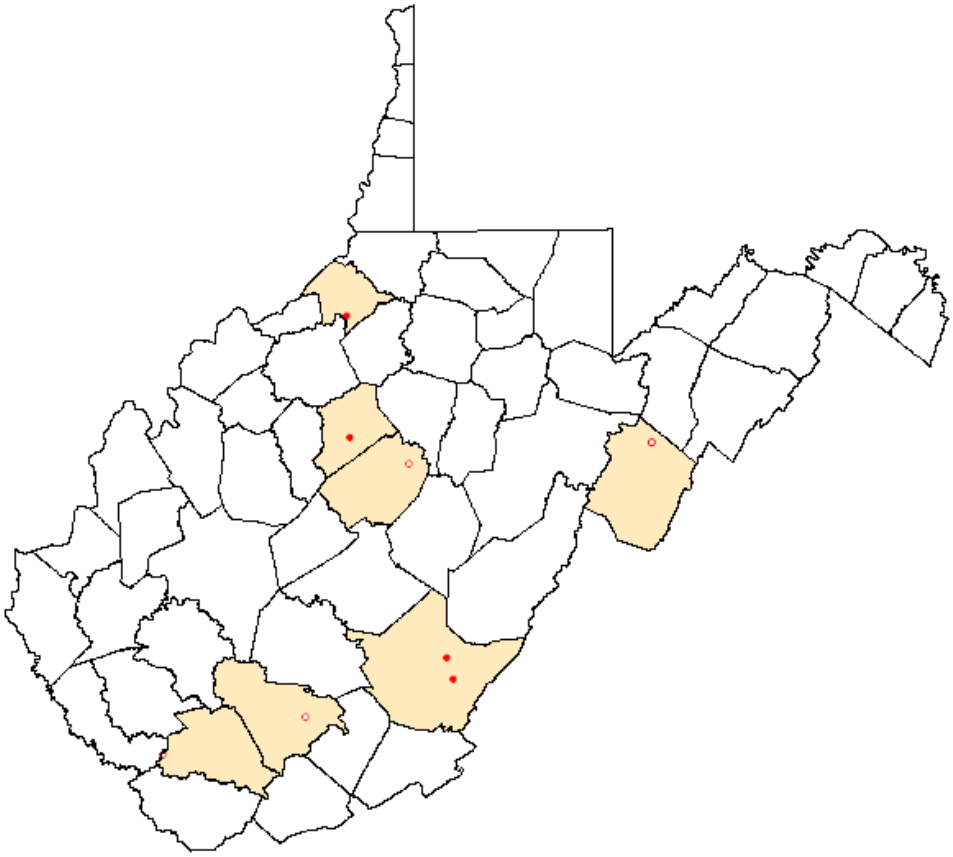
No *Neurocordulia obsoleta* adults have been documented in West Virginia.

Suborder Anisoptera
Family Corduliidae

Neurocordulia yamaskanensis
Stygian Shadowdragon

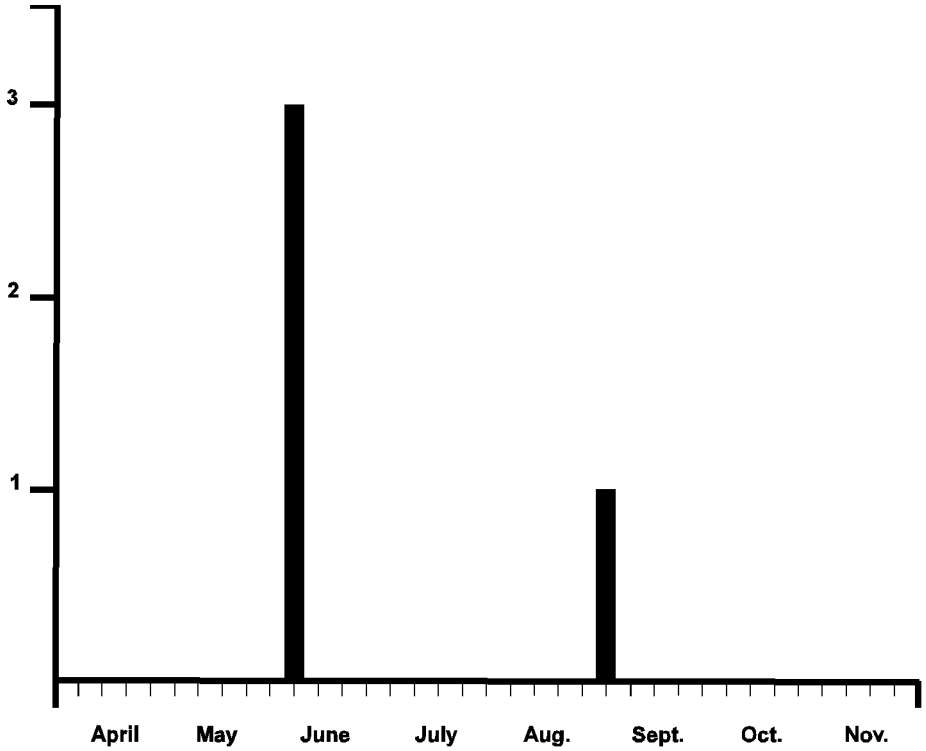
Neurocordulia yamaskanensis
male

Neurocordulia yamaskanensis
female



Neurocordulia yamaskanensis distribution based on 10 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Neurocordulia yamaskanensis is likely the most common shadowdragon in West Virginia. It occurs on both rivers and slow flowing streams. Like other shadowdragons, however, it flies only at night and remains a challenge to collect as an adult.

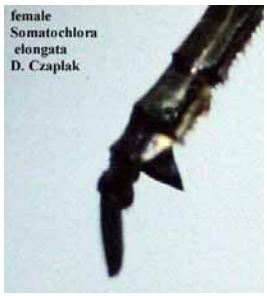


Neurocordulia yamaskanensis adults have been documented from 29 May — 4 September with 4 valid records.

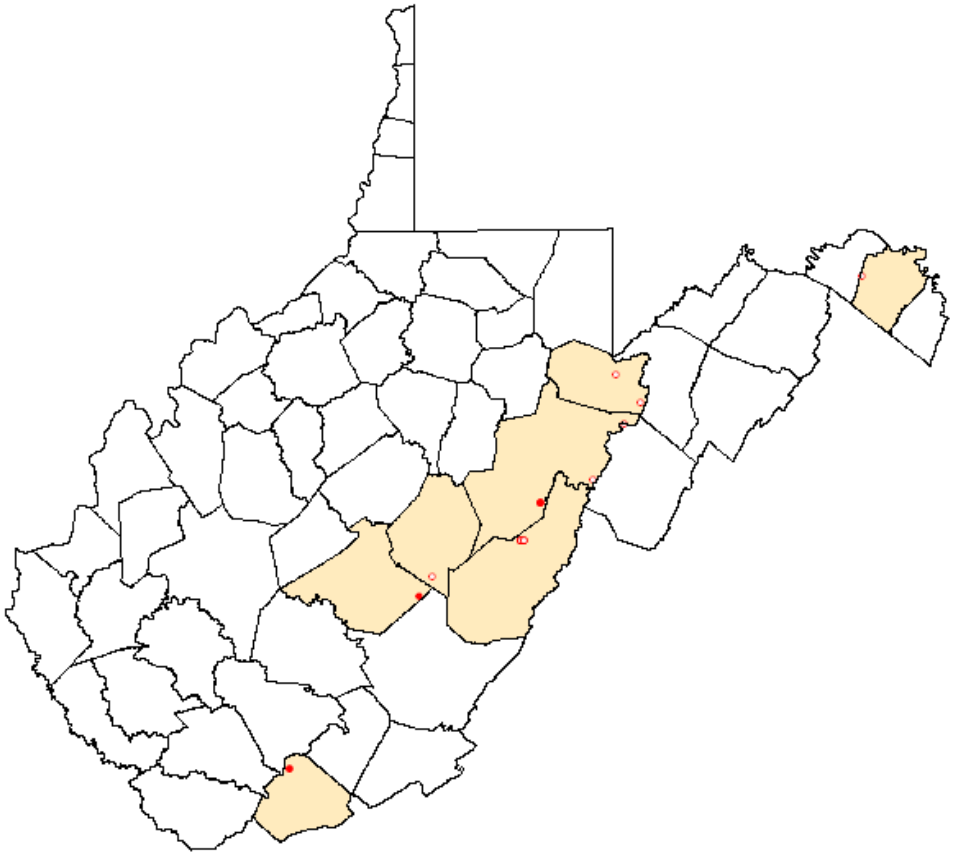
Suborder Anisoptera
Family Corduliidae

Somatochlora elongata
Ski-tipped Emerald

Somatochlora elongata male

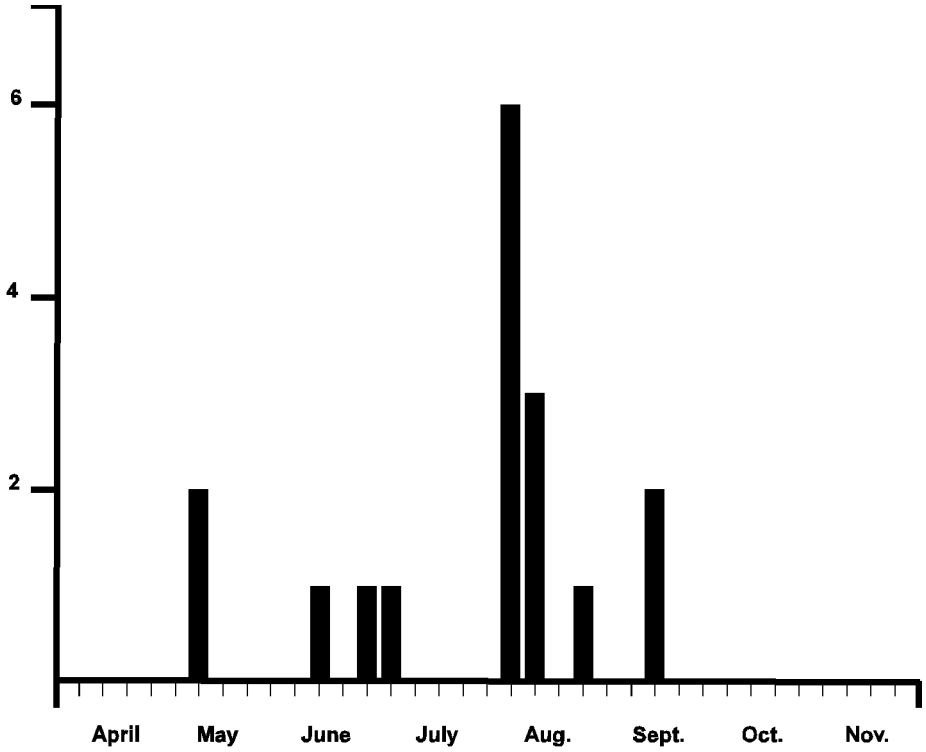


Somatochlora elongata female terminal appendages



Somatochlora elongata distribution based on 21 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Somatochlora elongata is a northern species whose range extends south in the Appalachians to SC. In West Virginia it is restricted to high elevation (above 2500 ft) ponds, marshes, and bogs.



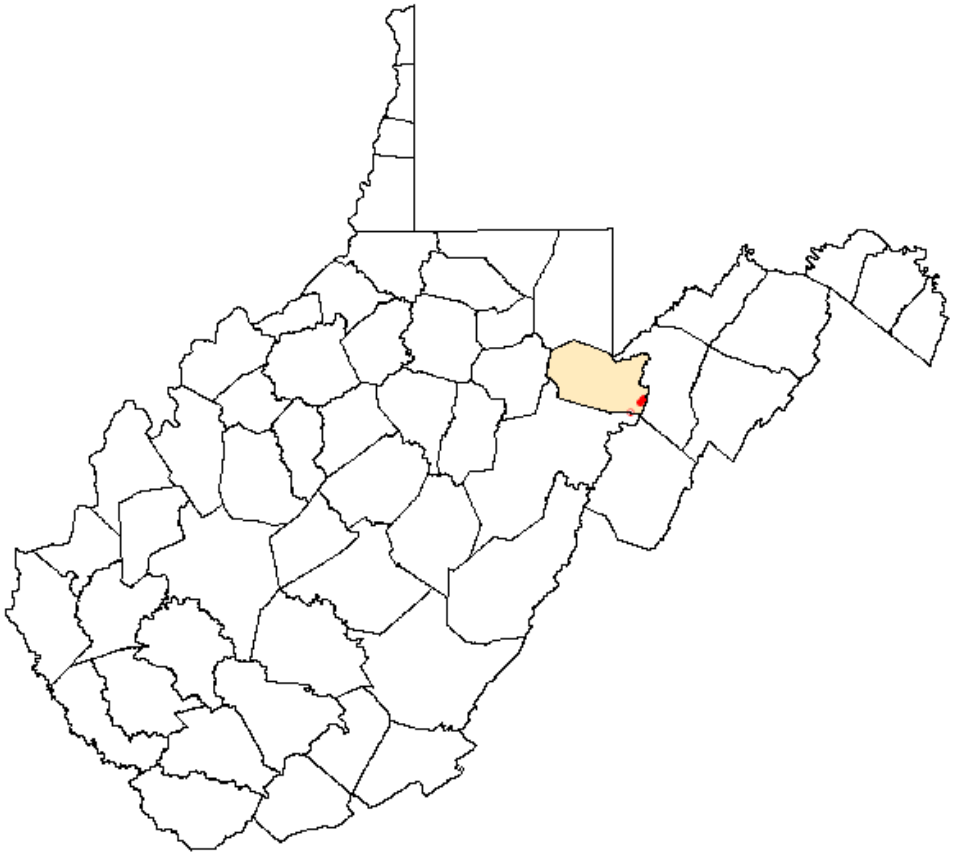
Somatochlora elongata adults have been documented from 6 May — 14 September with 17 valid records.

Suborder Anisoptera
Family Corduliidae

Somatochlora forcipata
Forcipate Emerald

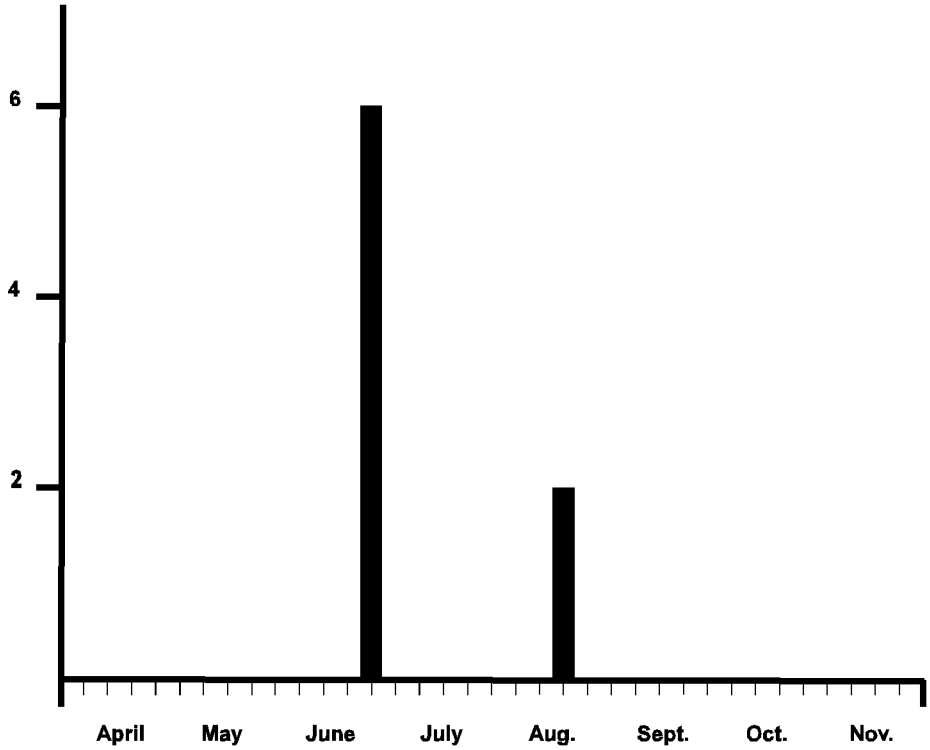
Somatochlora forcipata male

Somatochlora forcipata female



Somatochlora forcipata distribution based on 7 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Somatochlora forcipata is a northern species whose southern limit occurs in West Virginia. The southern-most population of this species apparently occurs at bogs on Dolly Sods in Tucker County.



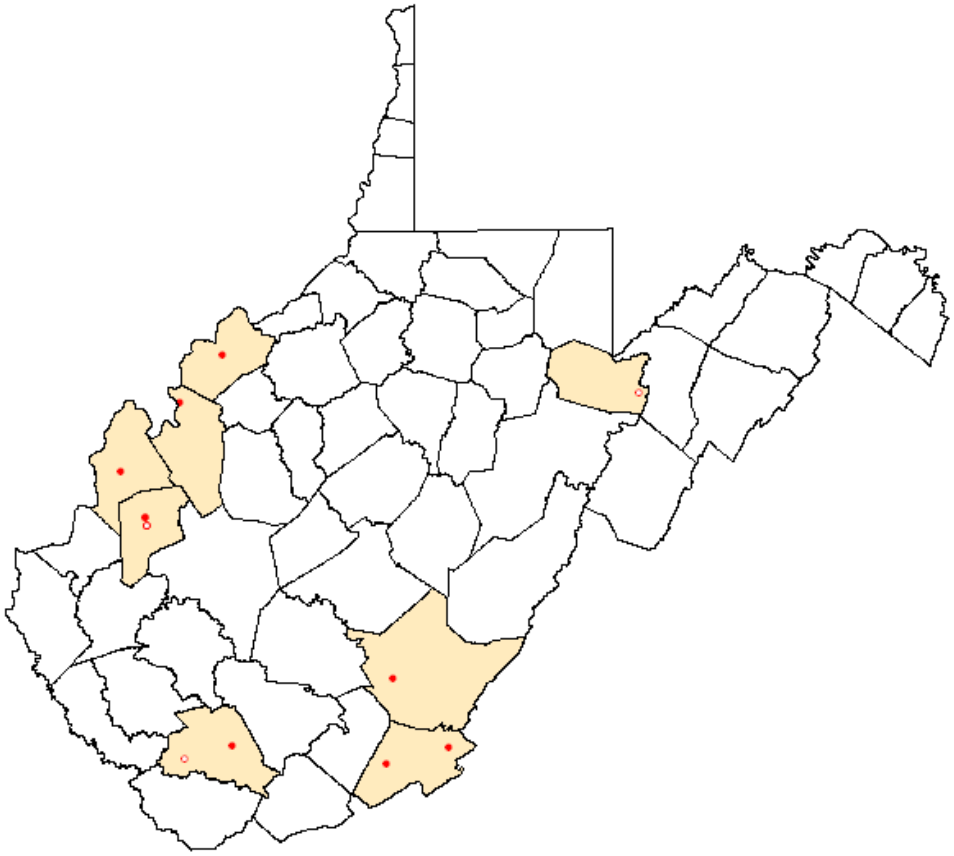
Somatochlora forcipata adults have been documented from 6 May — 14 September with 10 (7) valid records. REDO

Suborder Anisoptera
Family Corduliidae

Somatochlora linearis
Mocha Emerald

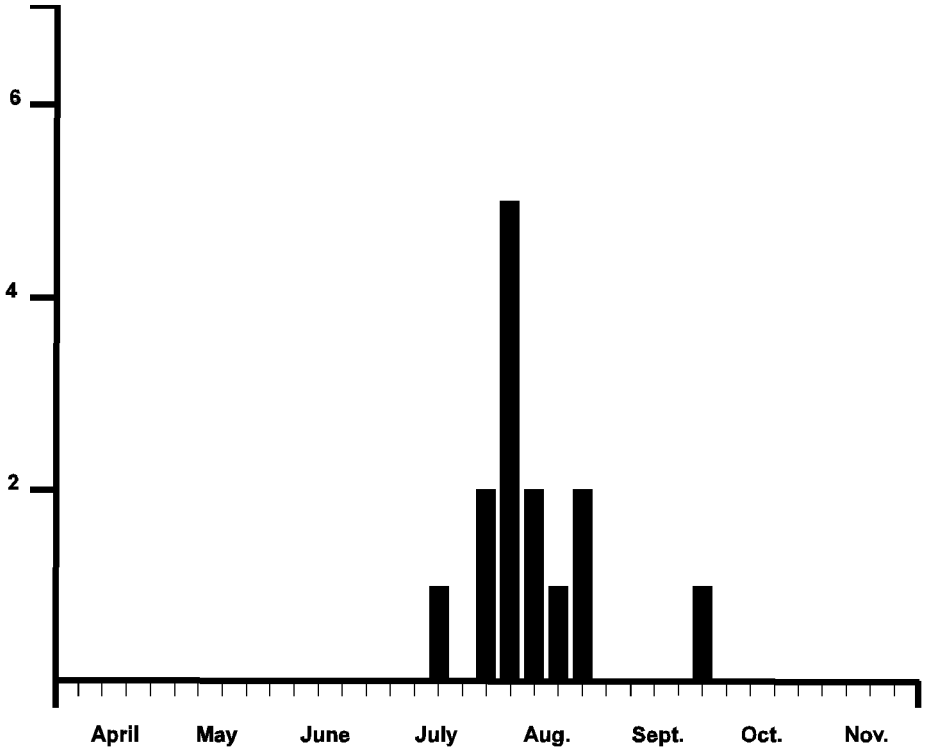
Somatochlora linearis male

Somatochlora linearis female



Somatochlora linearis distribution based on 15 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

A widespread eastern species, *Somatochlora linearis* likely has a wider distribution in West Virginia than records indicate. It prefers wooded or brushy hollows and valleys with small, often almost dried up streams. Recent surveys increased the number of counties it has been documented in from three to eight.



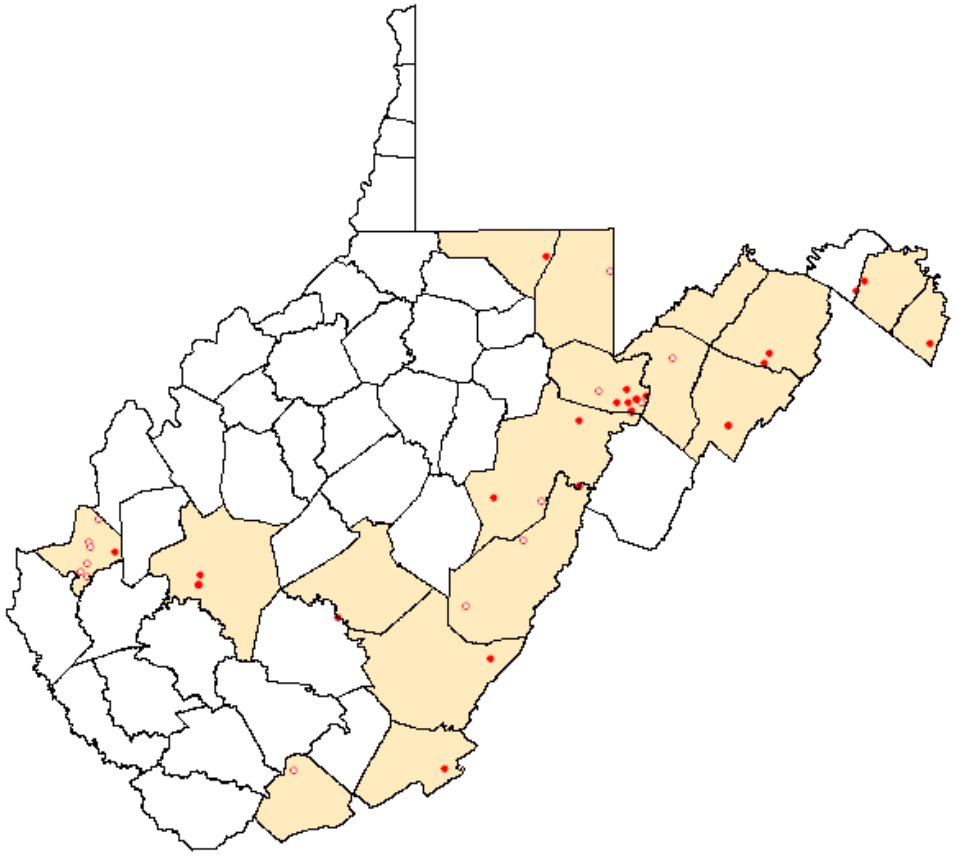
Somatochlora linearis adults have been documented from 18 July — 1 October with 14 valid records.

Suborder Anisoptera
Family Corduliidae

Somatochlora tenebrosa
Clamp-tipped Emerald

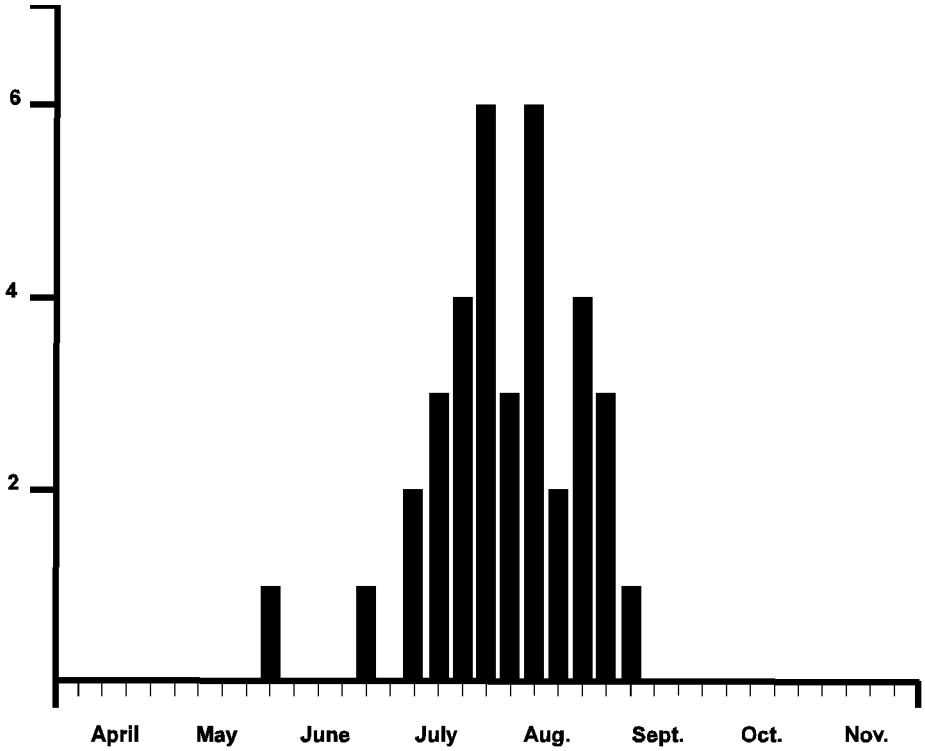
Somatochlora tenebrosa male

Somatochlora tenebrosa female terminal appendages



Somatochlora tenebrosa distribution based on 44 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Somatochlora tenebrosa is a widespread eastern species. In West Virginia, it is found patrolling small forest streams, and foraging along roads, trails, and in sunny clearings. It likely has a more extensive distribution in the state than records indicate.



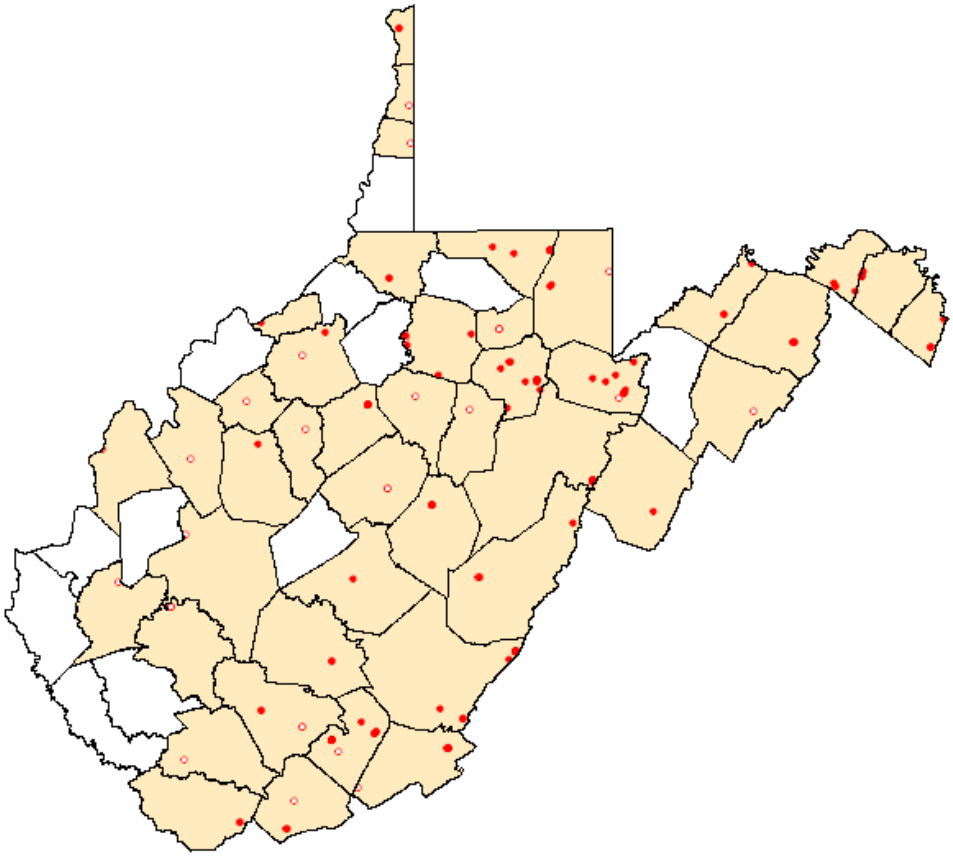
Somatochlora tenebrosa adults have been documented from 22 May—10 September with 36 valid records.

Suborder Anisoptera
Family Libellulidae

Celithemis elisa
Calico Pennant

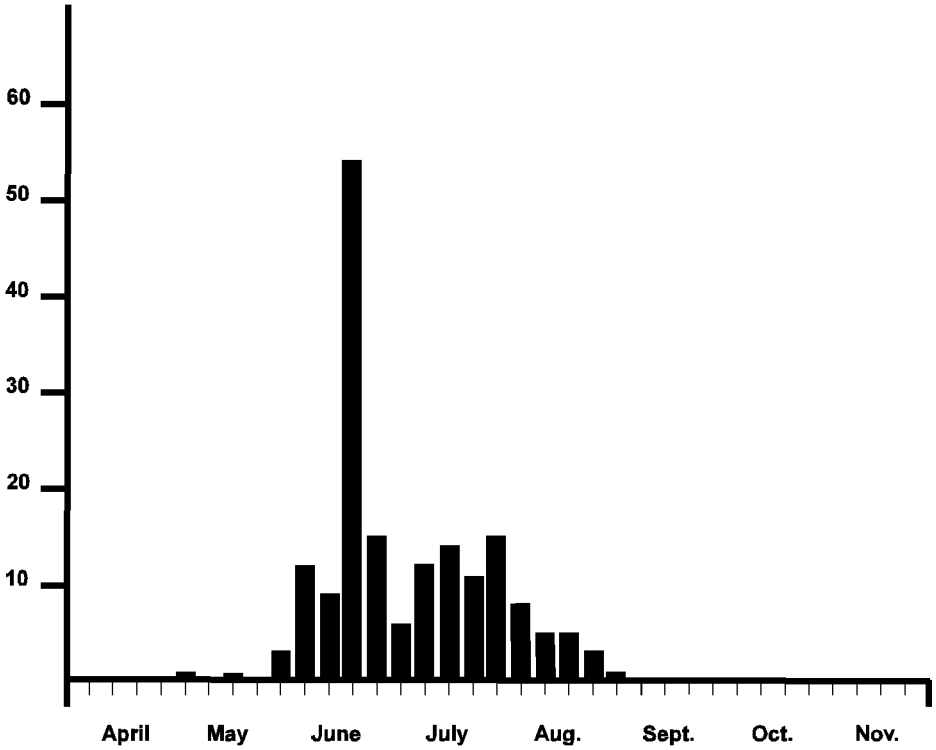
Celithemis elisa male

Cleithemis elisa female



Celithemis elisa distribution based on 185 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Celithemis elisa is a widespread species that is likely found throughout West Virginia at ponds and other still water. It prefers perching at the tip of grass stems and other vegetation at pond edges.



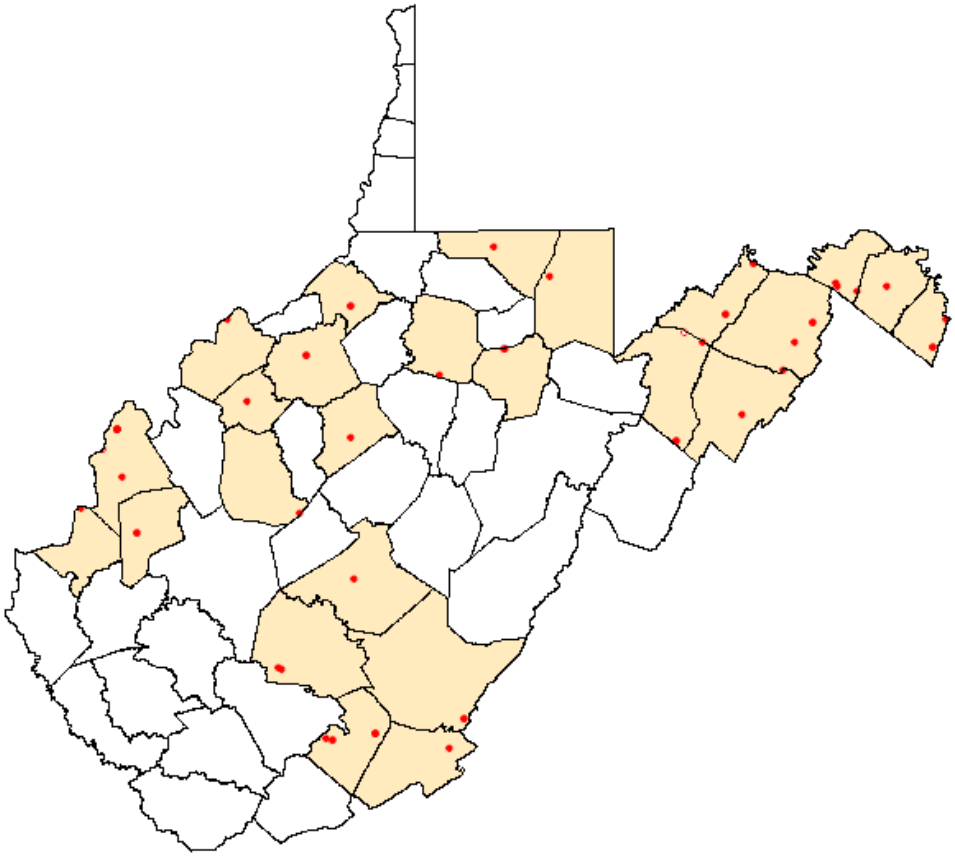
Celithemis elisa adults have been documented from 2 May—1 September with 175 valid records.

Suborder Anisoptera
Family Libellulidae

Celithemis eponina
Halloween Pennant

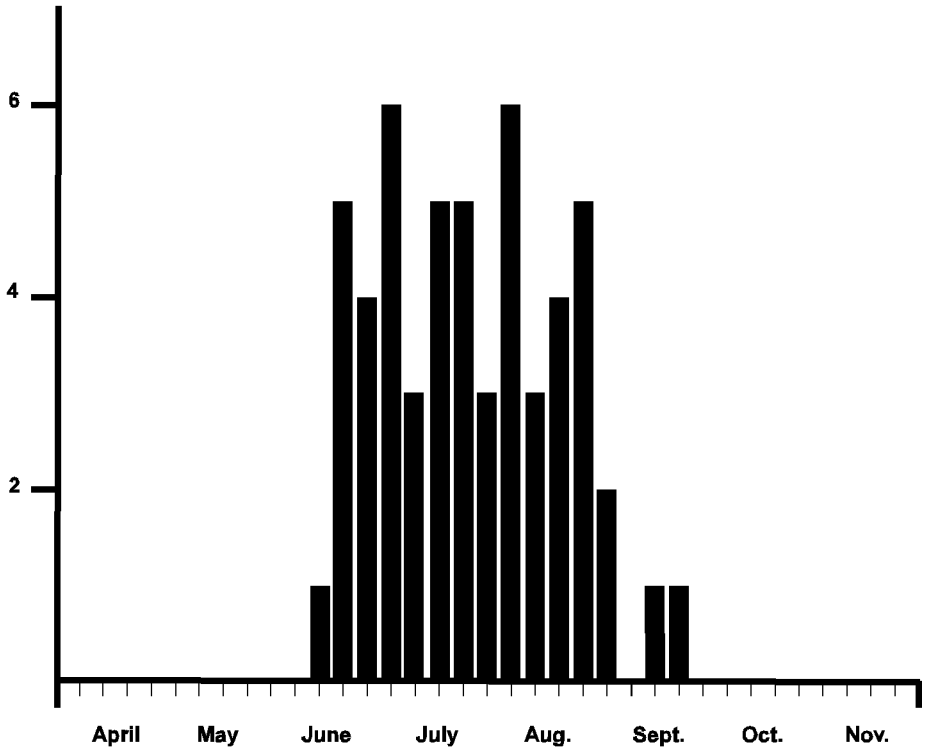
Celithemis eponina male

Cleithemis eponina female



Celithemis eponina distribution based on 56 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Celithemis eponina is widespread in West Virginia, and is found at ponds and marshes around the state. It appears to prefer well established ponds with some emergent vegetation.



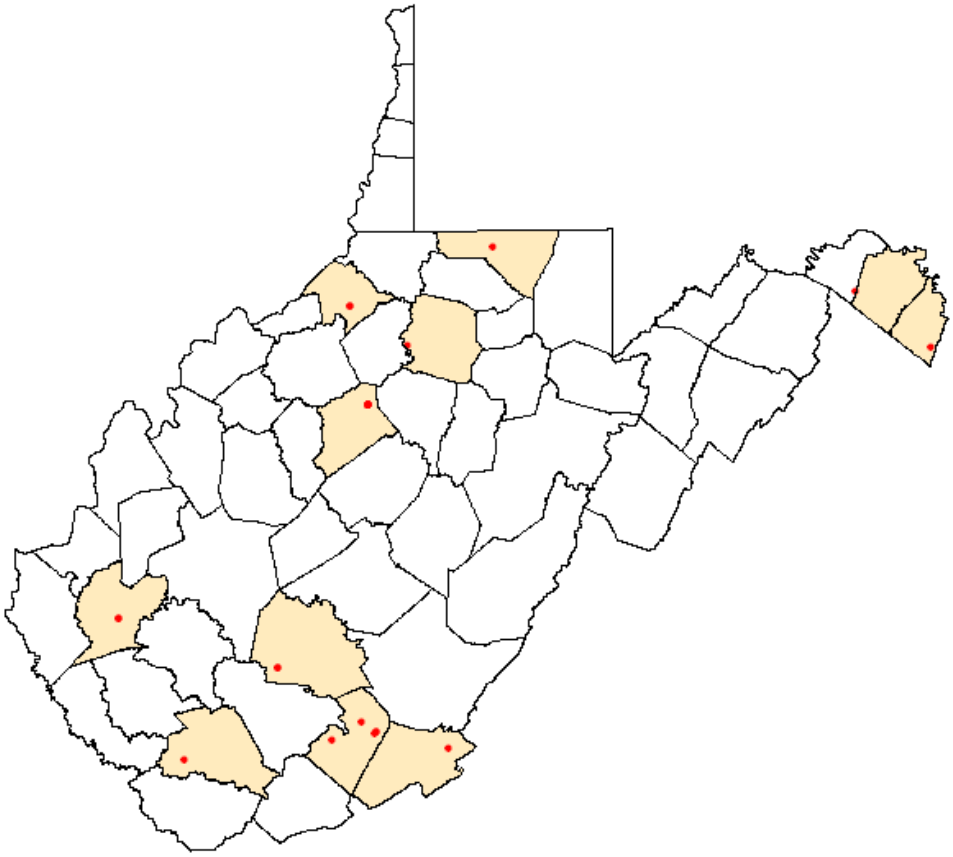
Celithemis eponina adults have been documented from 17 June — 24 September with 54 valid records.

Suborder Anisoptera
Family Libellulidae

Celithemis fasciata
Banded Pennant

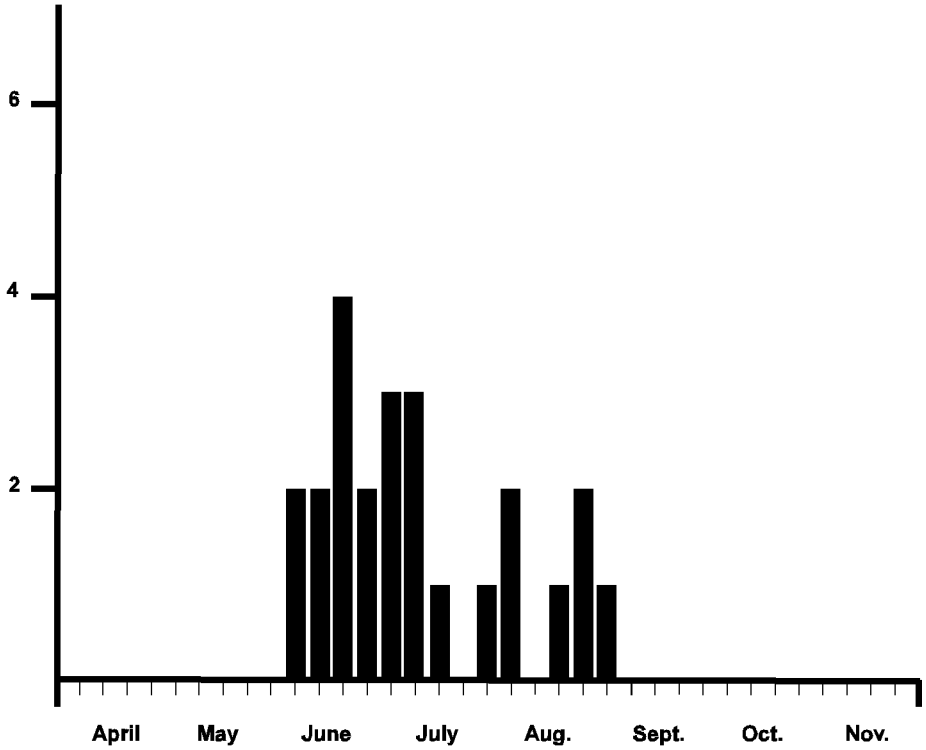
Celithemis fasciata male

Cleithemis fasciata female



Celithemis fasciata distribution based on 24 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

First documented in West Virginia in 2002 in Summers County, *Celithemis fasciata* has been found in ten additional counties. It prefers older ponds with well developed edge vegetation.



Celithemis fasciata adults have been documented from 9 June —5 September with 24 valid records.

Suborder Anisoptera
Family Libellulidae

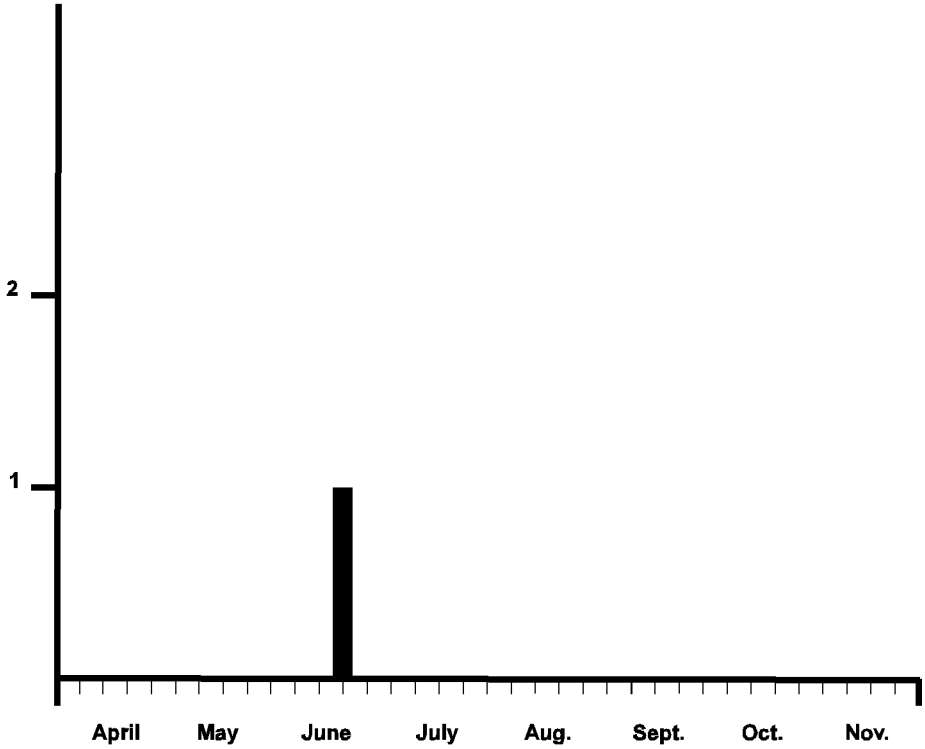
Celithemis verna
Double-ringed Pennant

Celithemis verna male

Cleithemis verna female

Celithemis verna distribution based on 1 record. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Celithemis verna is a coastal plain and southern species that approaches its northern limit in West Virginia. Found at a single pond in Jefferson County in 2005, it hasn't been documented since in the state. It is likely a vagrant from MD populations.



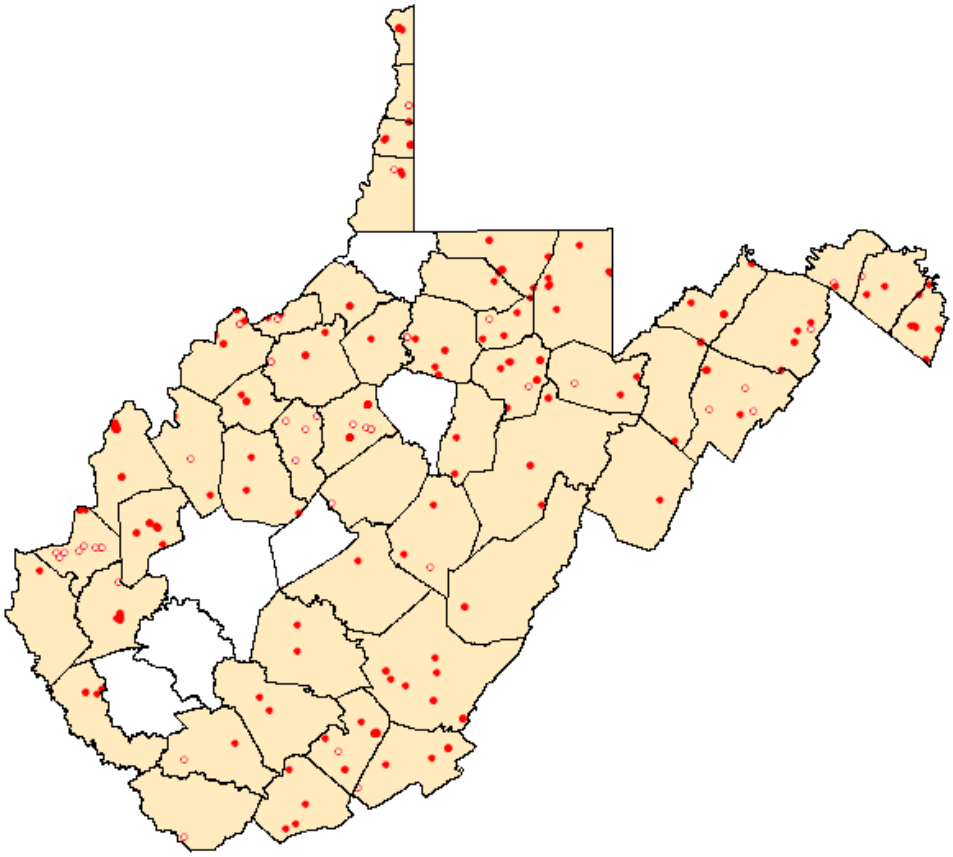
One *Celithemis verna* adult has been documented on 18 June.

Suborder Anisoptera
Family Libellulidae

Erythemis simplicicollis
Eastern Pondhawk

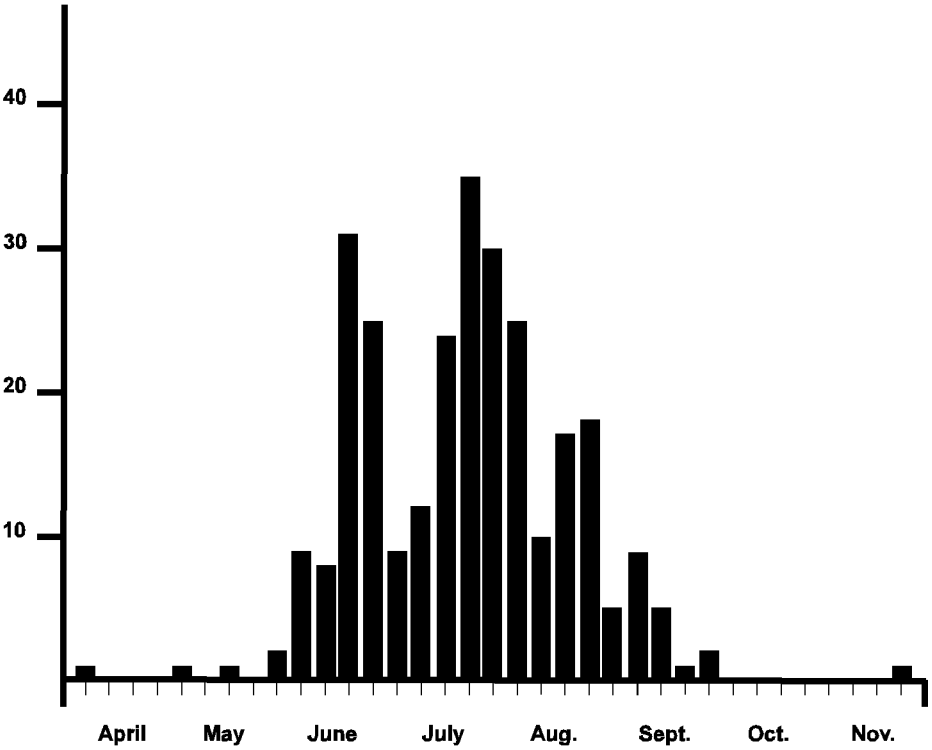
Erythemis simplicicollis male

Erythemis simplicicollis female with meadowhawk prey



Erythemis simplicicollis distribution based on 307 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

A ubiquitous species over much of the United States, *Erythemis simplicicollis* is found statewide at ponds, lakes, and pools of slow streams and rivers. It is one of the most frequently encountered odonates in West Virginia.



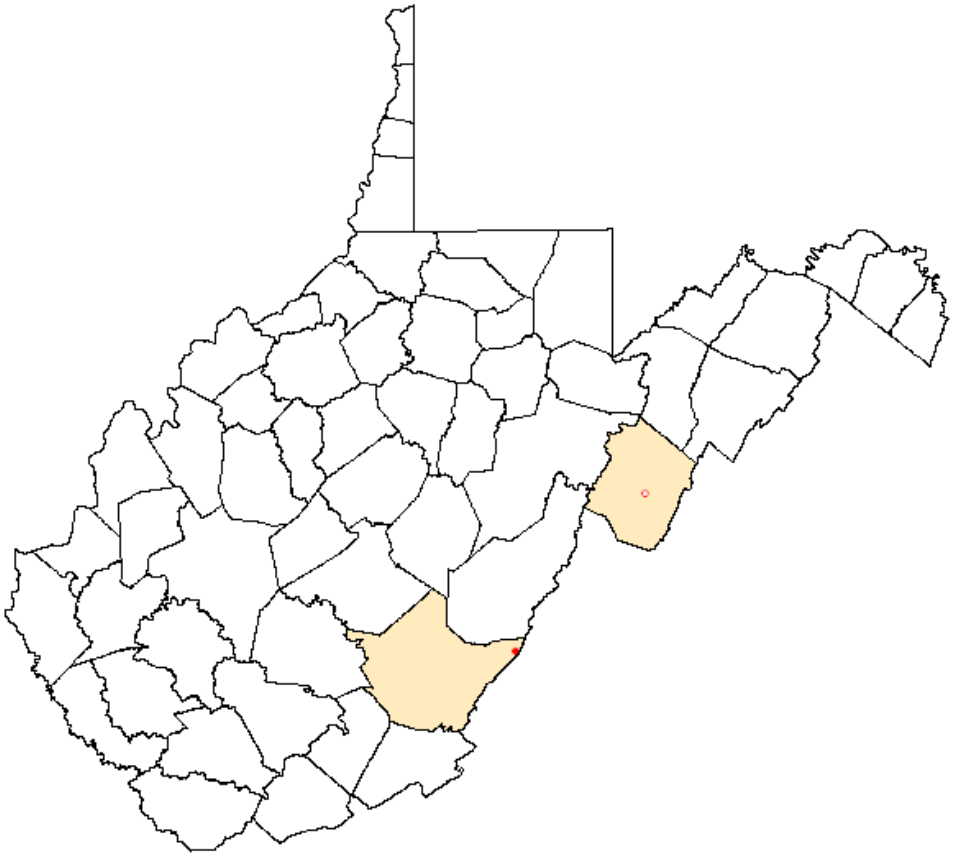
Erythemis simplicicollis adults have been documented from 31 March — 4 October with 281 valid records.

Suborder Anisoptera
Family Libellulidae

Erythrodiplax minuscula
Little Blue Dragonlet

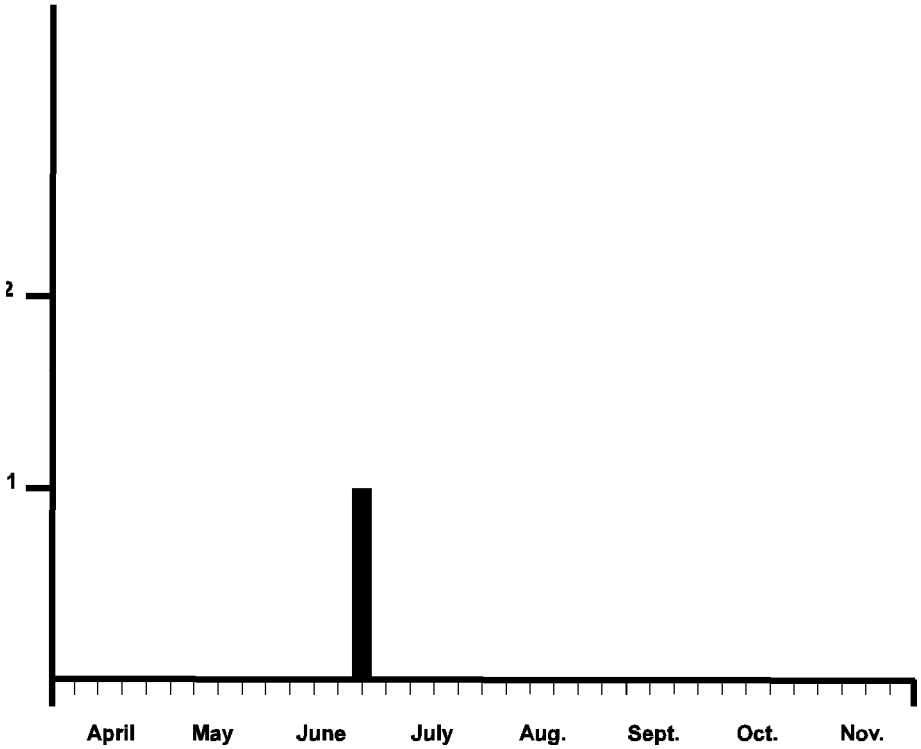
Erythrodiplax minuscula male

Erythrodiplax minuscula female



Erythrodiplax minuscula distribution based on 2 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

First documented in West Virginia in 1930, a second *Erythrodiplax minuscula* was found in 2002 in Greenbrier County. It is primarily a southern species and approaches its northern limit in West Virginia. These specimens are likely vagrants from VA populations.



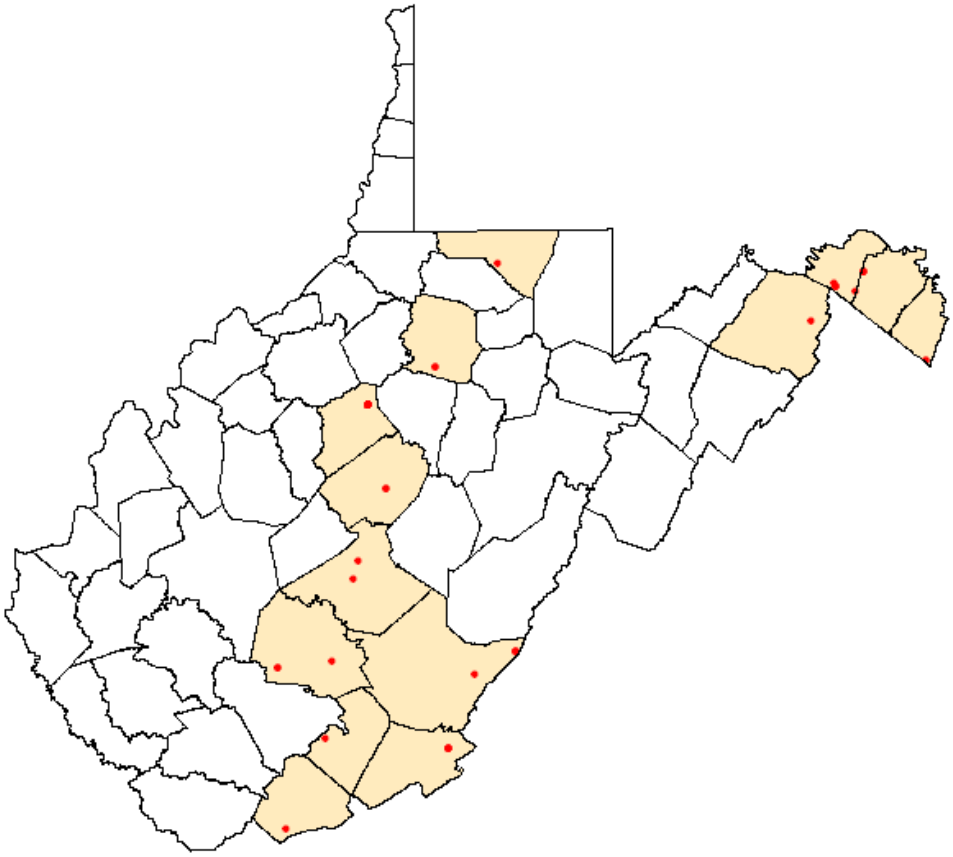
One *Erythrodiplax minuscula* adult has been documented on 27 June.

Suborder Anisoptera
Family Libellulidae

Ladona deplanata
Blue Corporal

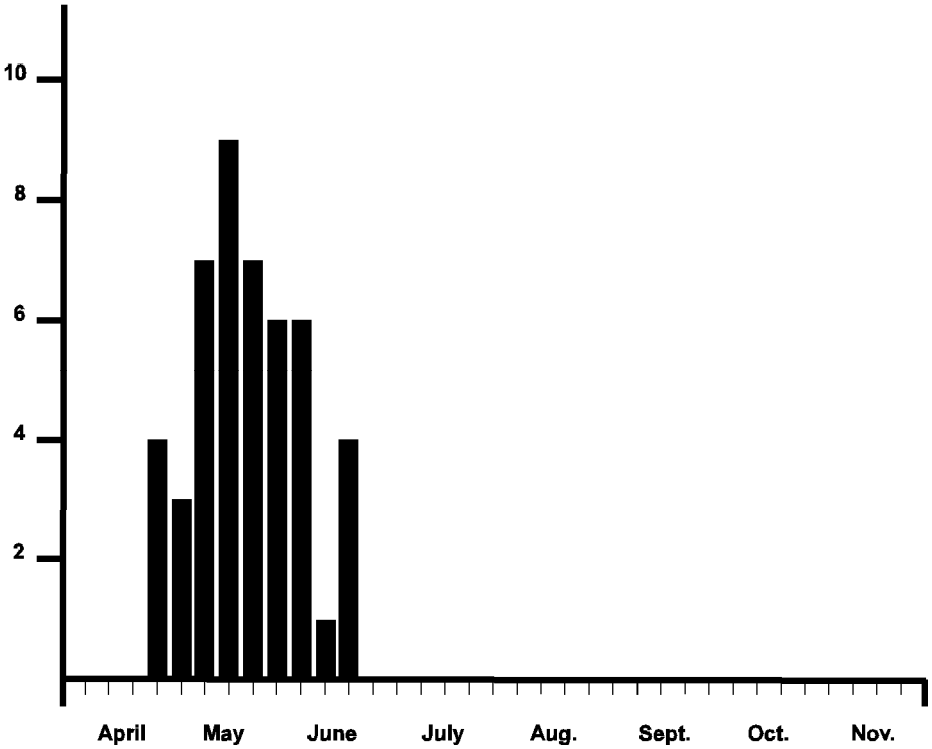
Ladona deplanata male

Ladona deplanata female



Ladona deplanata distribution based on 47 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Ladona deplanata is an early flying species that was first documented in West Virginia in Greenbrier County in 2002. Since then, its distribution in the state has been significantly expanded. It appears to avoid high elevations in favor of ponds in the Eastern Panhandle and western part of the state.



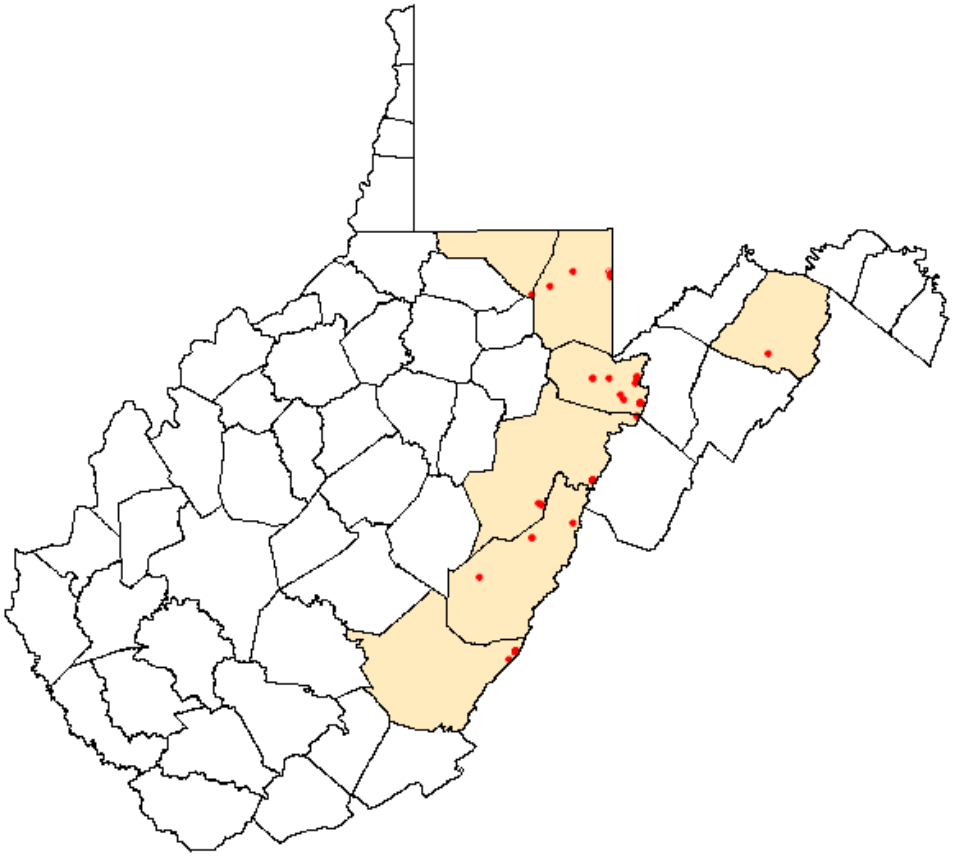
Ladona deplanata adults have been documented on 23 April—22 June with 47 valid records.

Suborder Anisoptera
Family Libellulidae

Ladona julia
Chalk-fronted Corporal

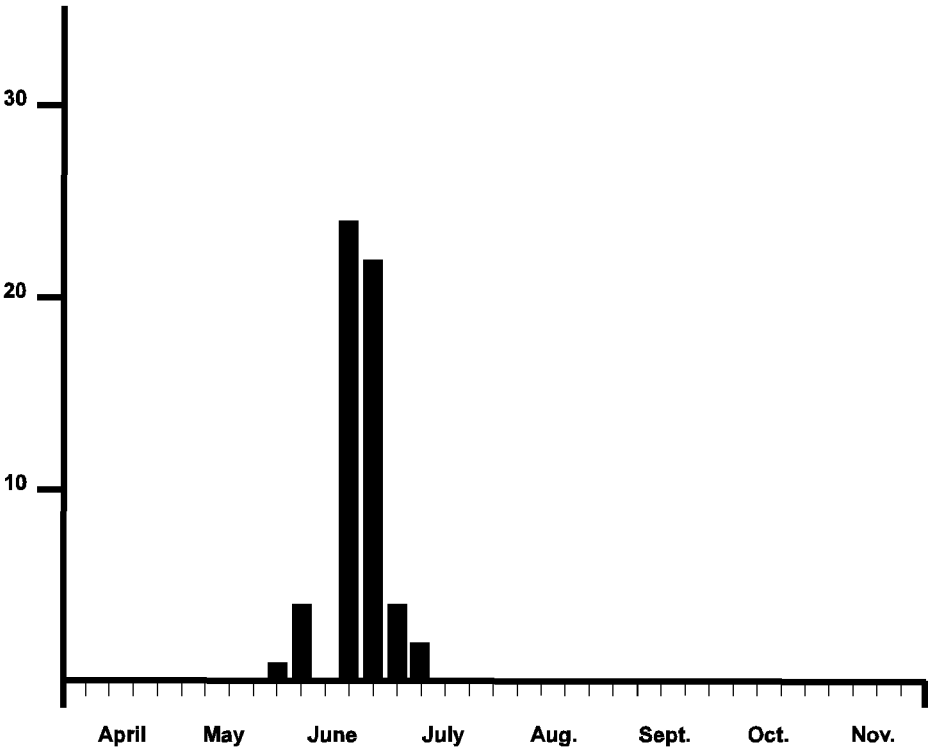
Ladona julia male

Ladona julia female



Ladona julia distribution based on 60 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Ladona julia is a northern species whose southern range limit lies in West Virginia. It inhabits high elevation (above 2500 ft) wetlands and ponds in the state, and can be locally abundant.



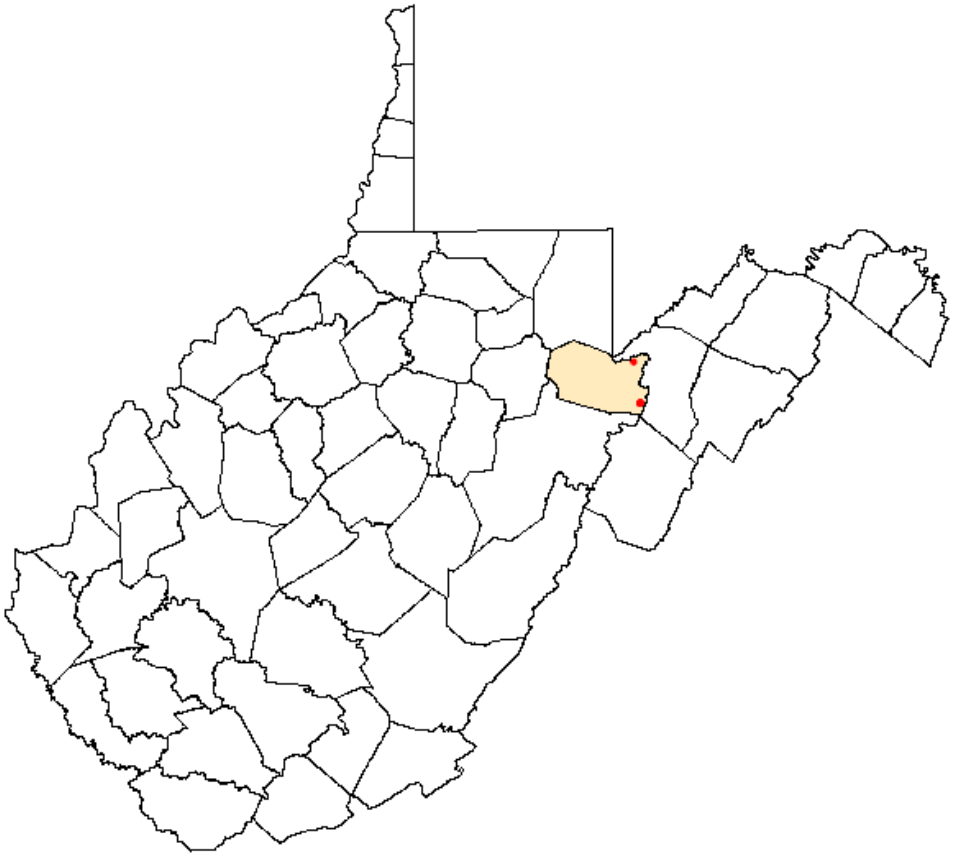
Ladona julia adults have been documented on 27 May—12 July with 59 valid records.

Suborder Anisoptera
Family Libellulidae

Leucorrhinia glacialis
Crimson-ringed Whiteface

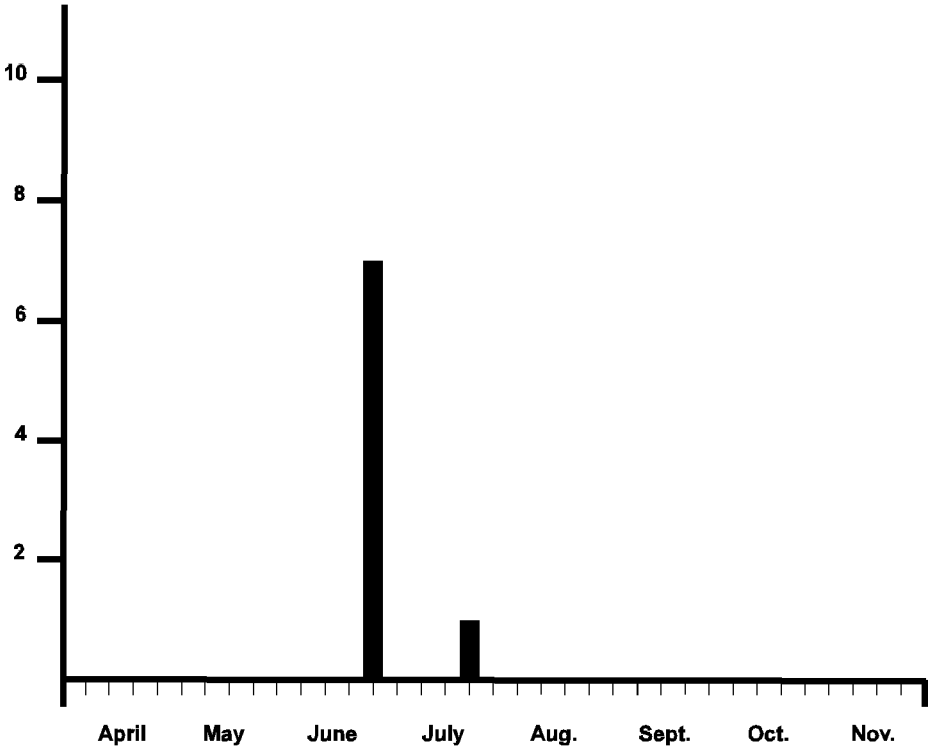
Leucorrhinia glacialis male

Leucorrhinia glacialis female



Leucorrhinia glacialis distribution based on 8 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Leucorrhinia glacialis is a widespread northern species whose southern limit in the east occurs in West Virginia in Canaan Valley and on Dolly Sods in Tucker County. Recent surveys for this species at appropriate habitat in Randolph and Pocahontas counties failed to document any additional sites. It prefers high elevation (above 2500 ft) bogs.



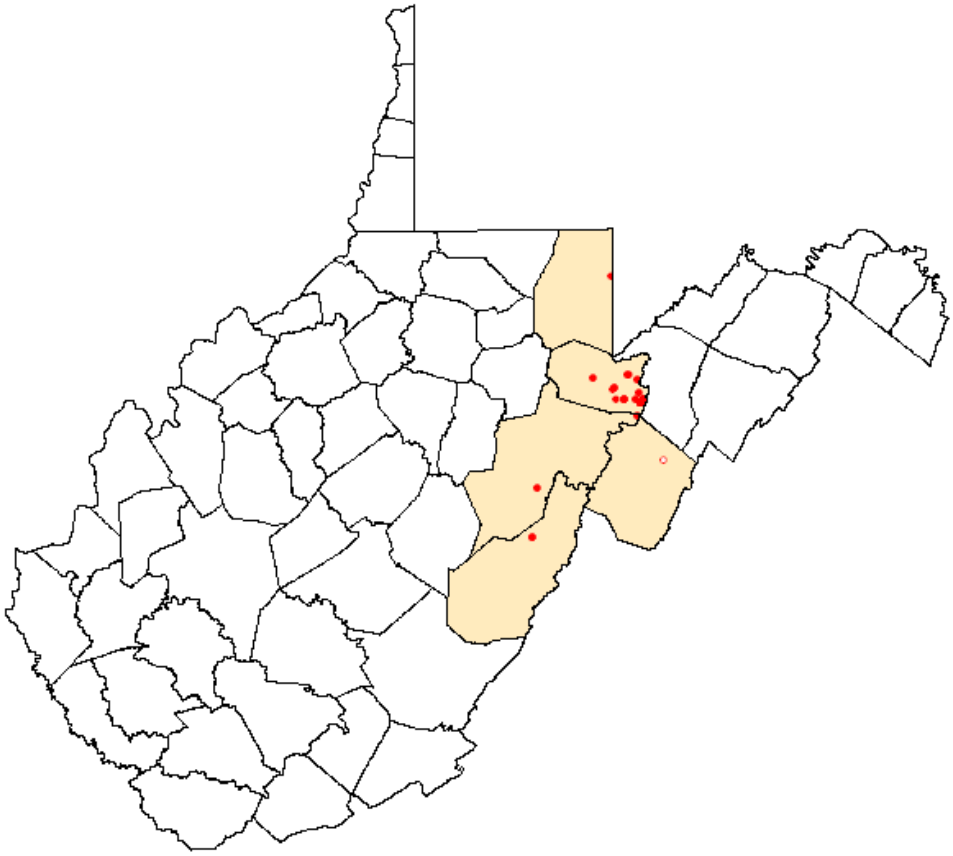
Leucorrhinia glacialis adults have been documented on 24 June — 20 July with 8 valid records.

Suborder Anisoptera
Family Libellulidae

Leucorrhinia hudsonica
Hudsonian Whiteface

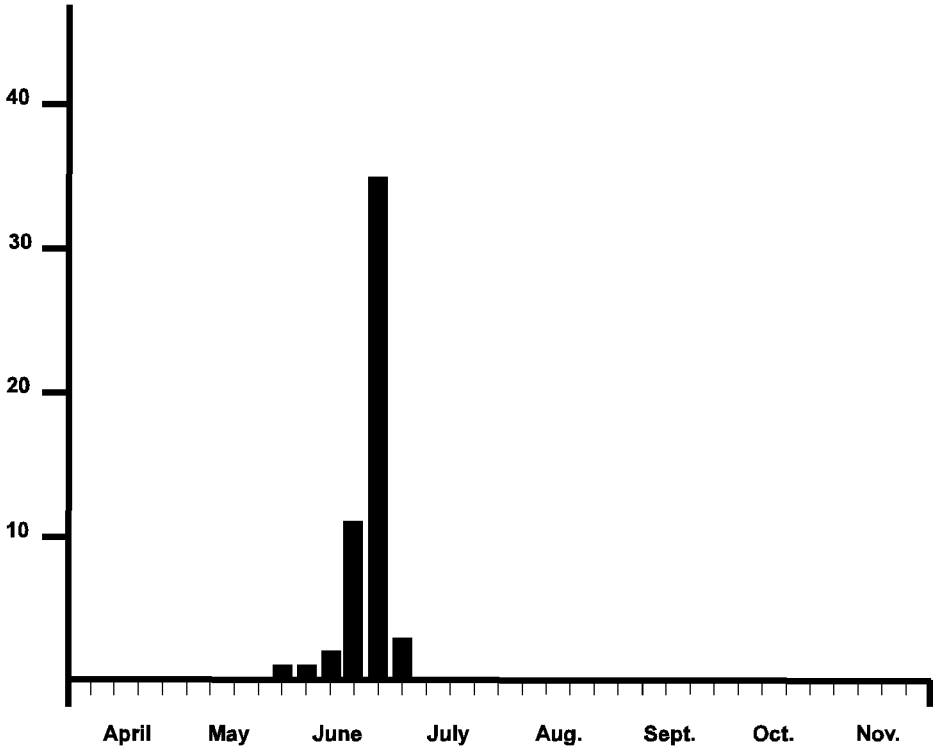
Leucorrhinia hudsonica male

Leucorrhinia hudsonica female



Leucorrhinia hudsonica distribution based on 57 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Leucorrhinia hudsonica is a common odonate at high elevation (above 2500 ft) bogs and wetlands in West Virginia. This is another widespread northern species that reaches the southern limit of its range in West Virginia.



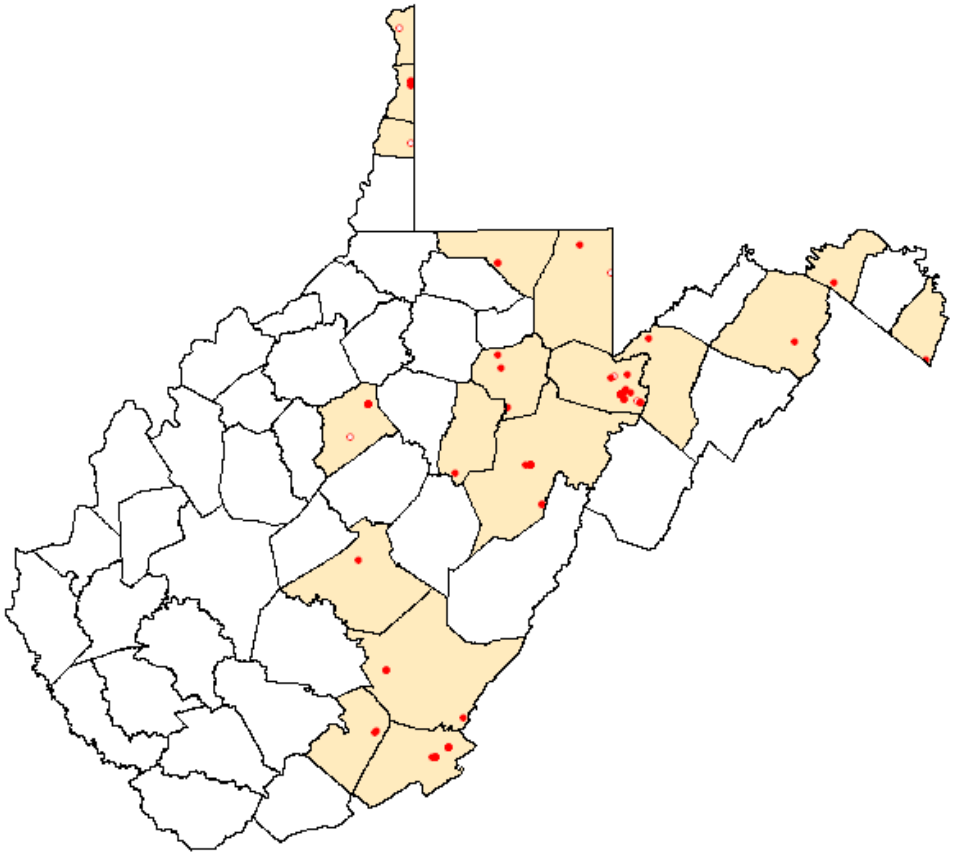
Leucorrhinia hudsonica adults have been documented on 29 May — 11 July with 57 valid records.

Suborder Anisoptera
Family Libellulidae

Leucorrhinia intacta
Dot-tailed Whiteface

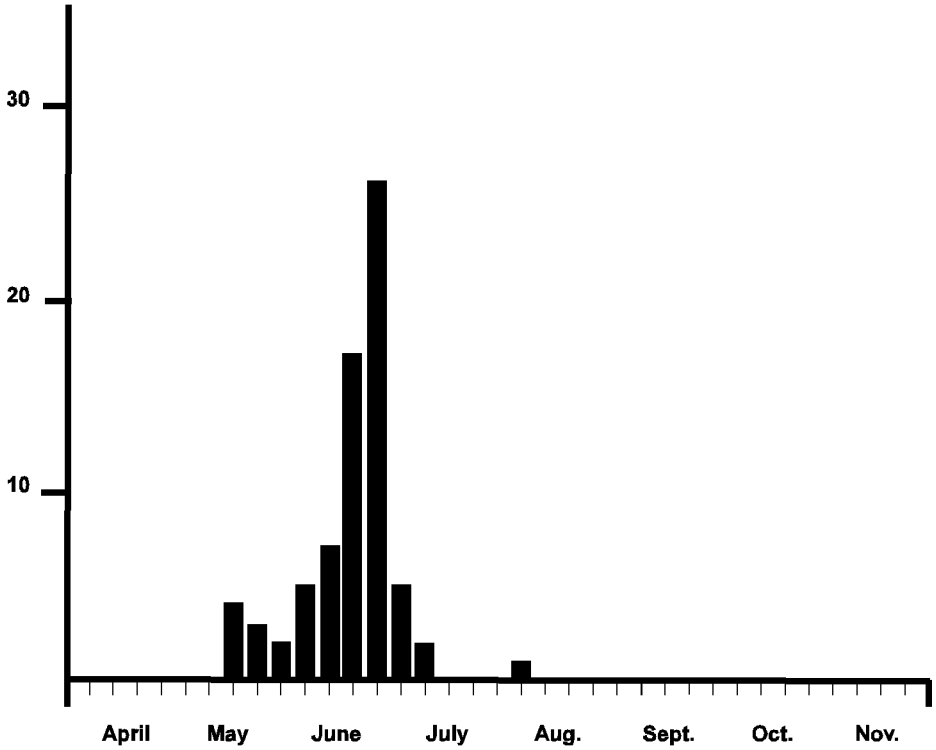
Leucorrhinia intacta male

Leucorrhinia intacta female



Leucorrhinia intacta distribution based on 78 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Leucorrhinia intacta is a widespread northern species that approaches its southern range limit in the east in West Virginia. It is a common species at ponds and wetlands when present. It is especially abundant at sites in Hancock, Brooke, and Ohio counties.



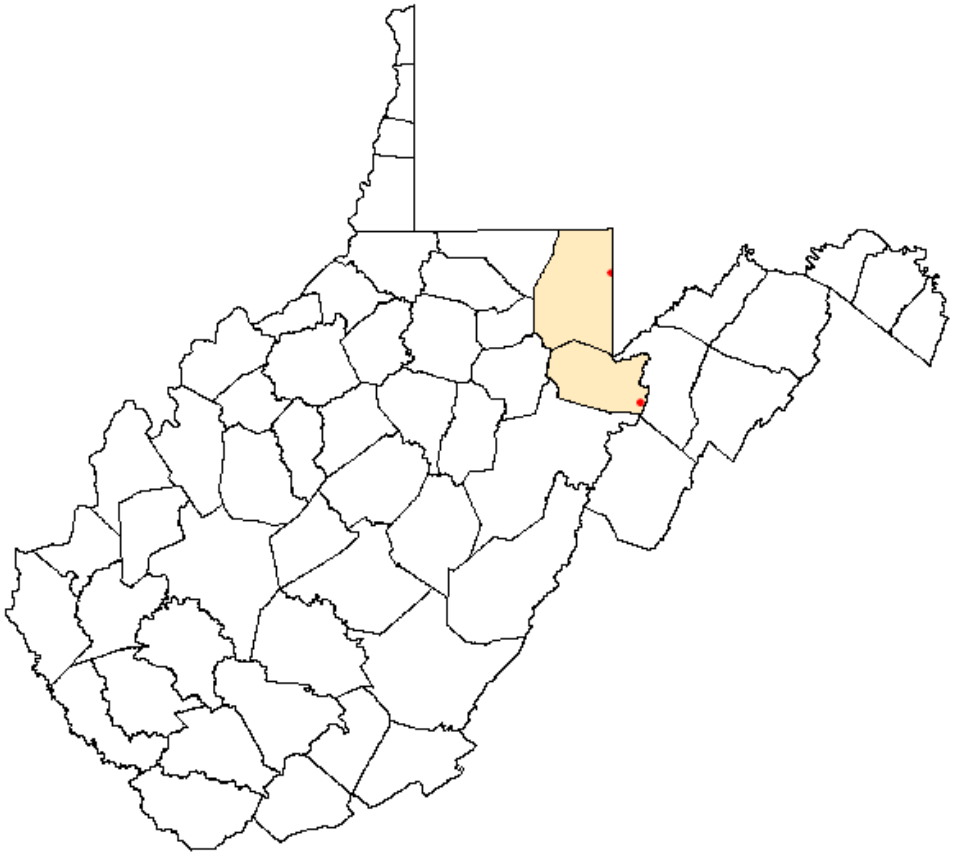
Leucorrhinia intacta adults have been documented on 15 May — 31 July with 72 valid records.

Suborder Anisoptera
Family Libellulidae

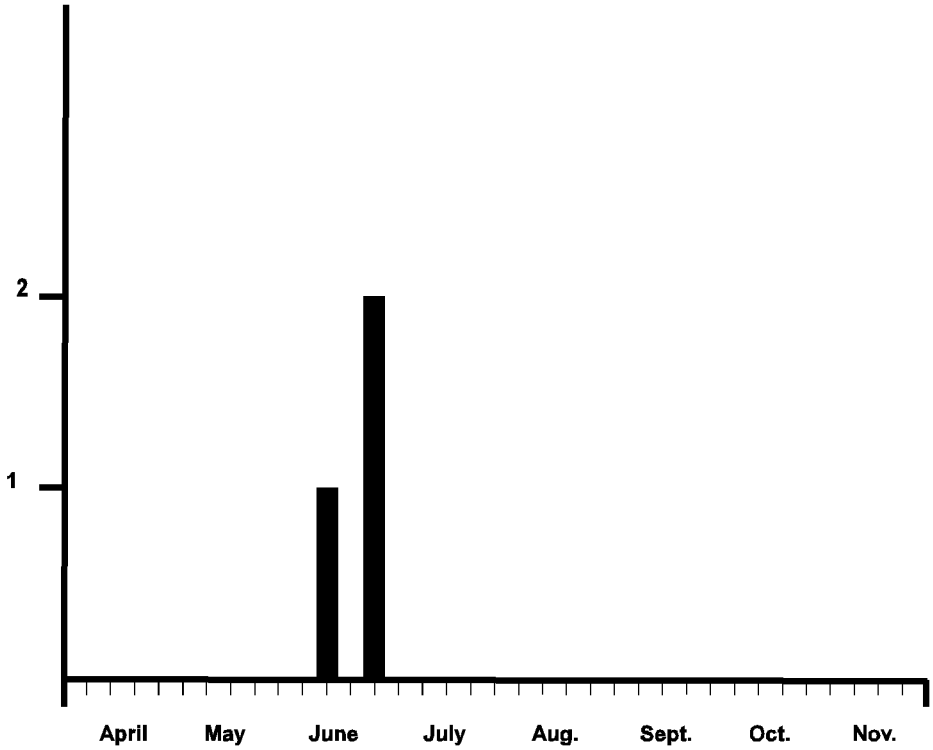
Libellula auripennis
Golden-winged Skimmer

Libellula auripennis male

Libellula auripennis female


Libellula auripennis distribution based on 3 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Libellula auripennis has been documented twice in West Virginia: at Cranesville Swamp in Preston County and on Dolly Sods in Tucker County. It is almost strictly a coastal plain species and the West Virginia records are likely vagrant individuals from populations in MD.



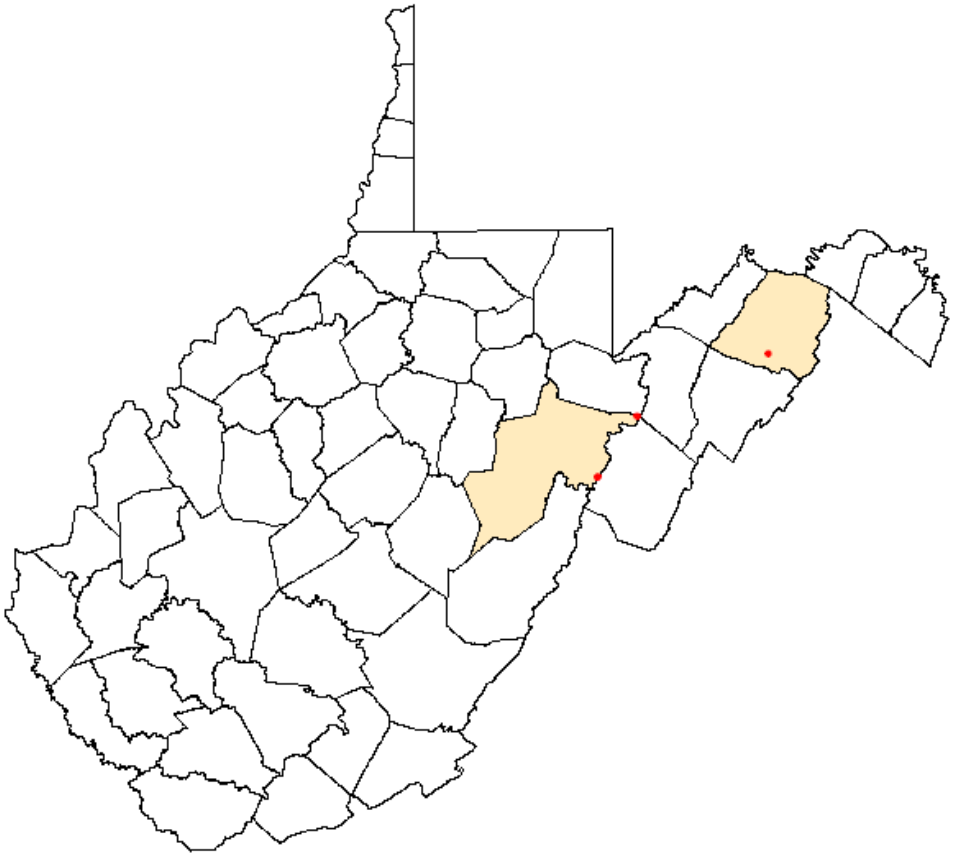
Libellula auripennis adults have been documented 24 June—25 June with 2 valid records.

Suborder Anisoptera
Family Libellulidae

Libellula axilena
Bar-winged Skimmer

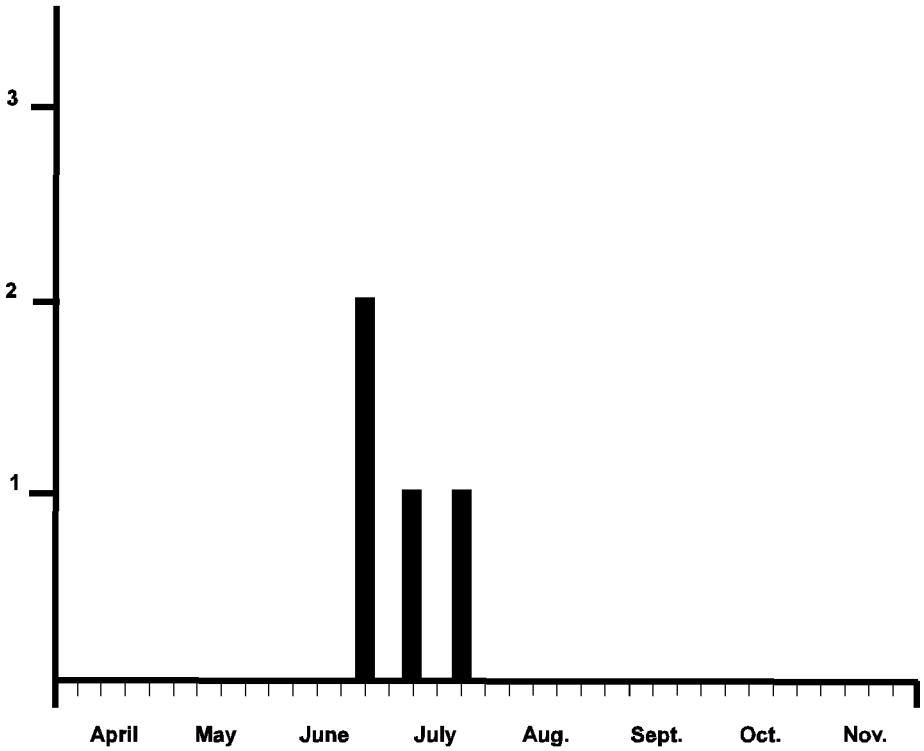
Libellula axilena male

Libellula axilena female



Libellula axilena distribution based on 4 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Libellula axilena was first documented in West Virginia in 2004 in Hampshire County at Short Mountain WMA, and has been documented at 2 additional sites since then. Although it is primarily a coastal plain and southern species that approaches its northern range limit in West Virginia, the multiple records may indicate that it could establish (or already has established) viable populations in the state.



Libellula axilena adults have been documented 22 June — 20 July with 4 valid records.

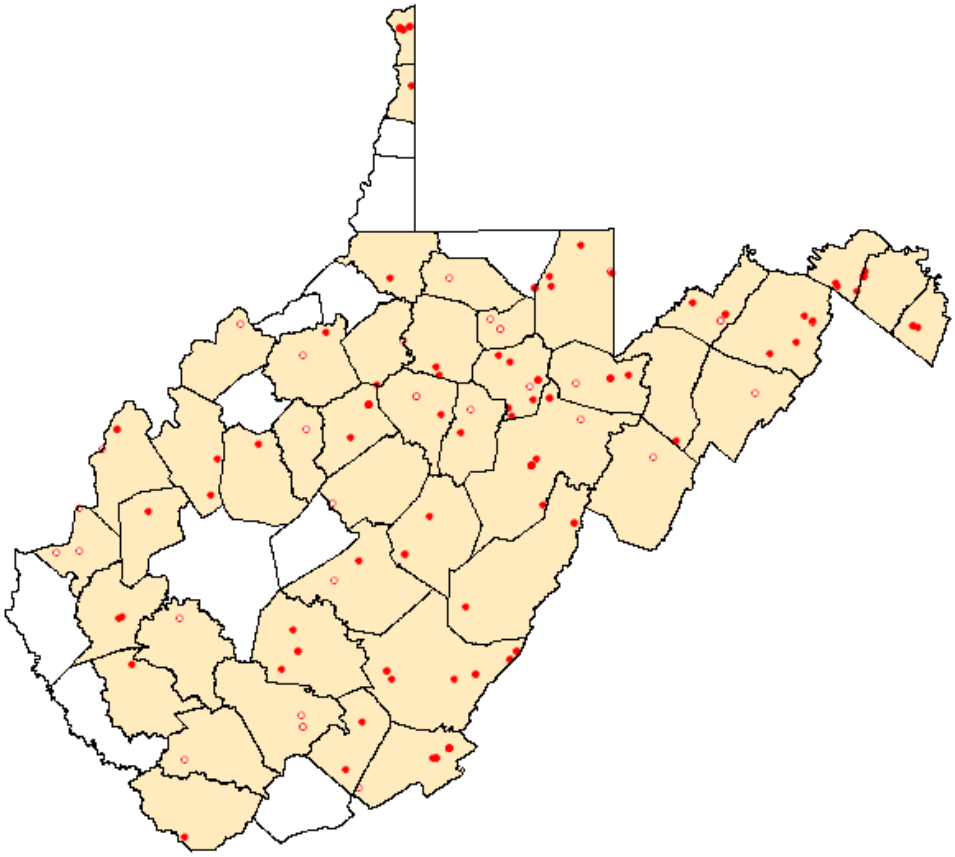
Suborder Anisoptera
Family Libellulidae

Libellula cyanea
Spangled Skimmer

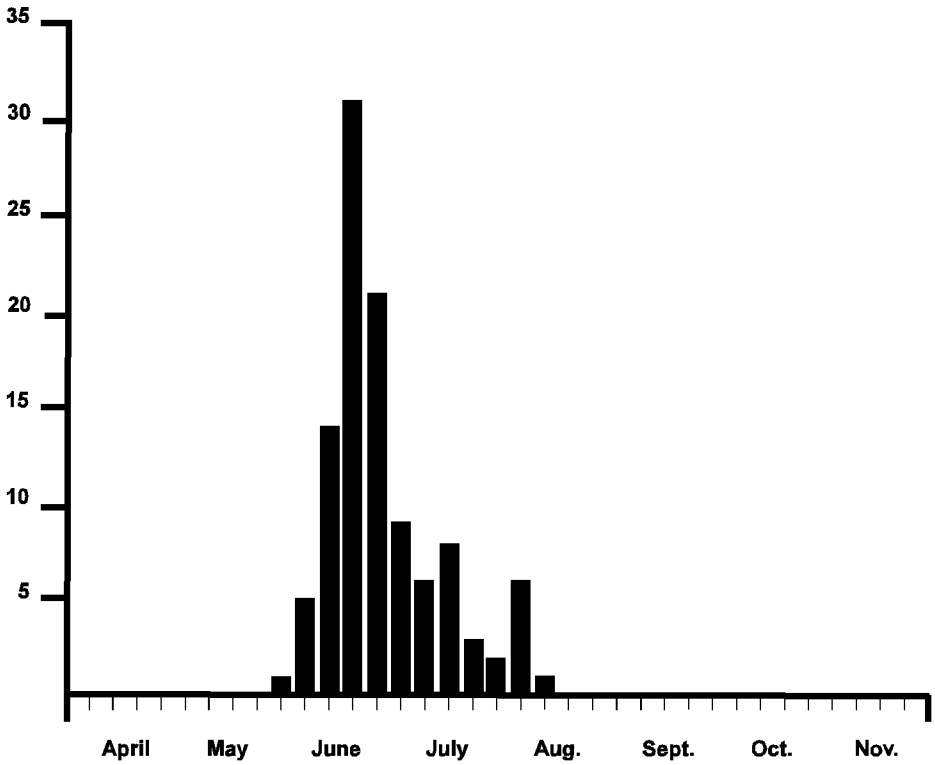
Libellula cyanea male

Libellula cyanea female

Libellula cyanea is a widespread species in the eastern U.S. It is found throughout West Virginia at ponds, lakes, and marshes with well developed edge vegetation.



Libellula cyanea distribution based on 150 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.



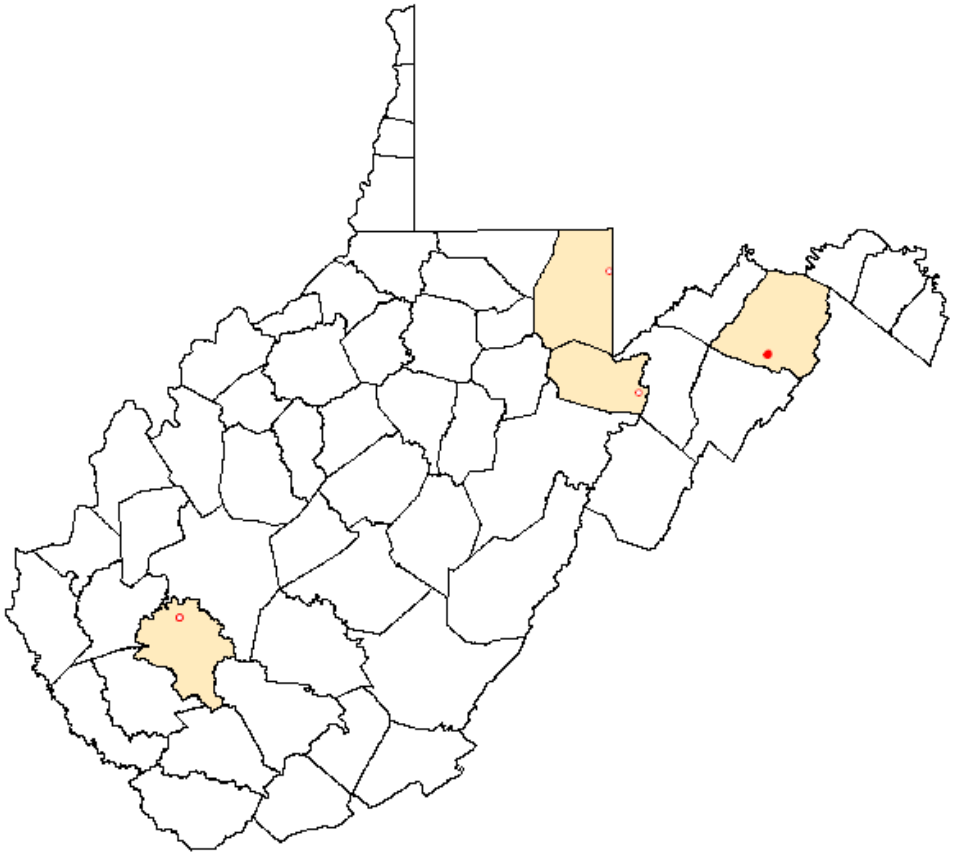
Libellula cyanea adults have been documented 25 May — 31 August with 135 valid records.

Suborder Anisoptera
Family Libellulidae

Libellula flavida
Yellow-sided Skimmer

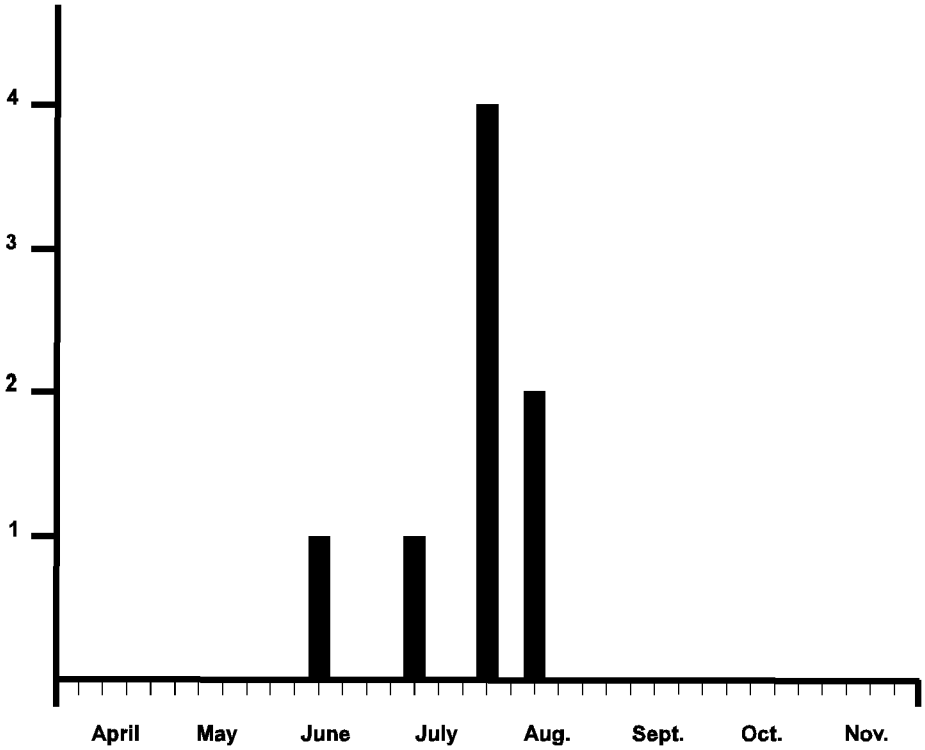
Libellula flavida male

Libellula flavida female



Libellula flavida distribution based on 8 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Libellula flavida is primarily a coastal plain and southern species whose interior northern range limit lies in central PA. Recent records have come from Cranesville Swamp in Preston County and Short Mountain WMA in Hampshire County. It prefers marshy ponds and bogs.



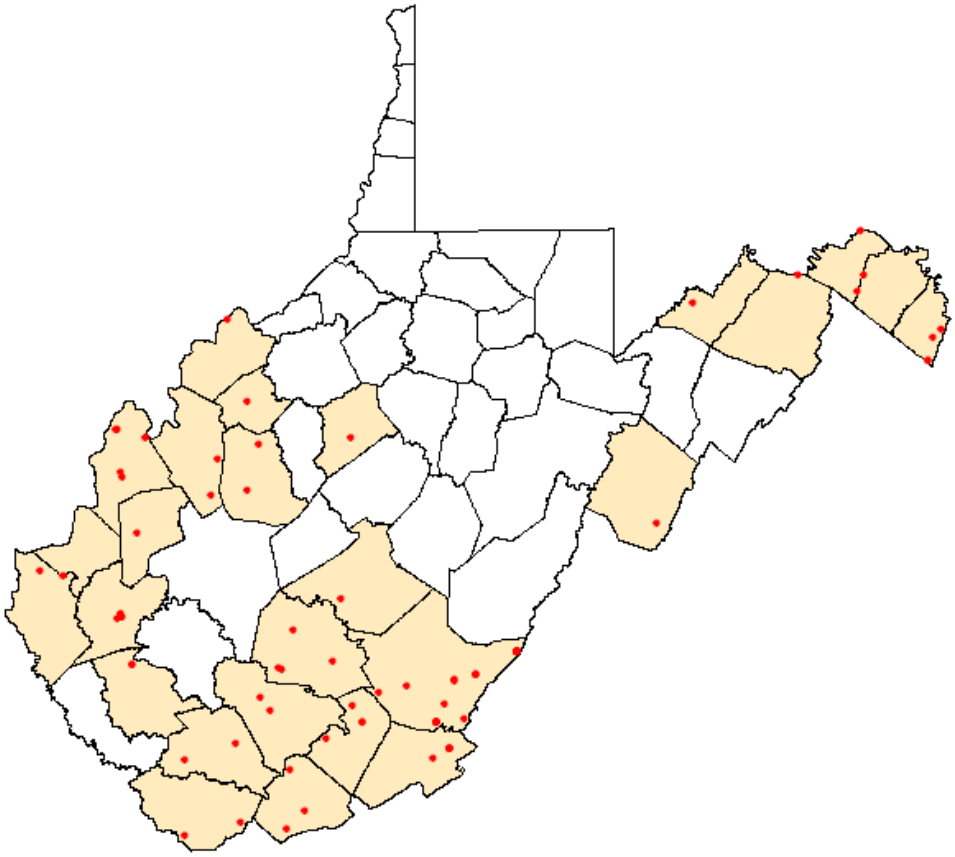
Libellula flavida adults have been documented 9 June — 16 August with 7 valid records.

Suborder Anisoptera
Family Libellulidae

Libellula incesta
Slaty Skimmer

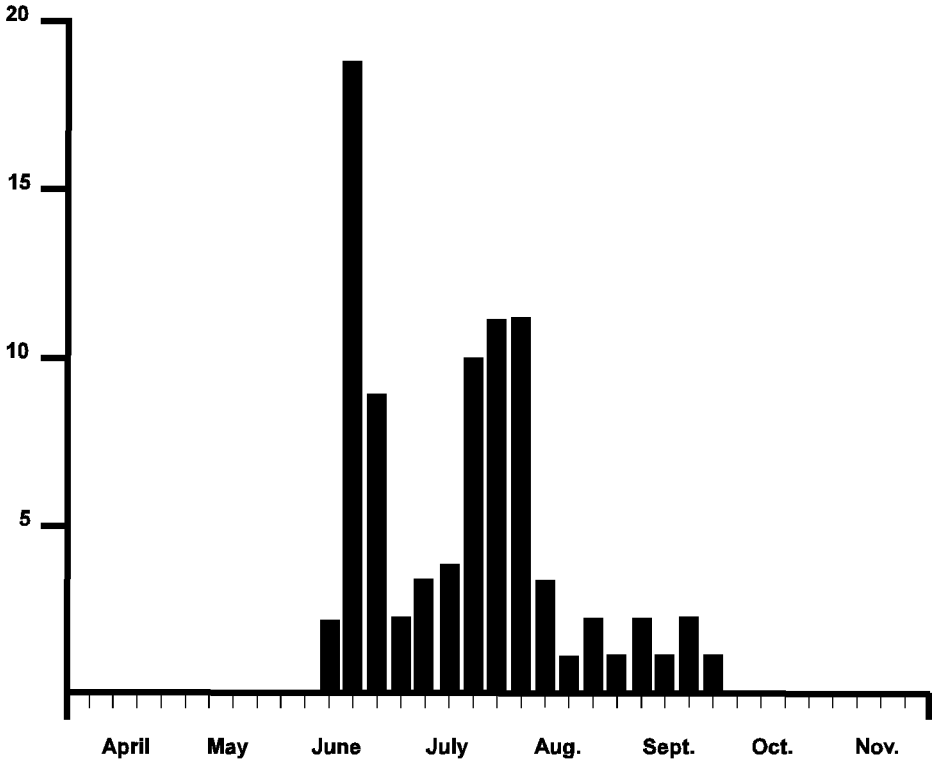
Libellula incesta male

Libellula incesta female



Libellula incesta distribution based on 83 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Libellula incesta is primarily a coastal plain and southern species. Recent surveys have significantly expanded its distribution in West Virginia to cover most of the southern half of the state and the Eastern Panhandle. It prefers ponds and lakes with some emergent vegetation and muddy bottoms.



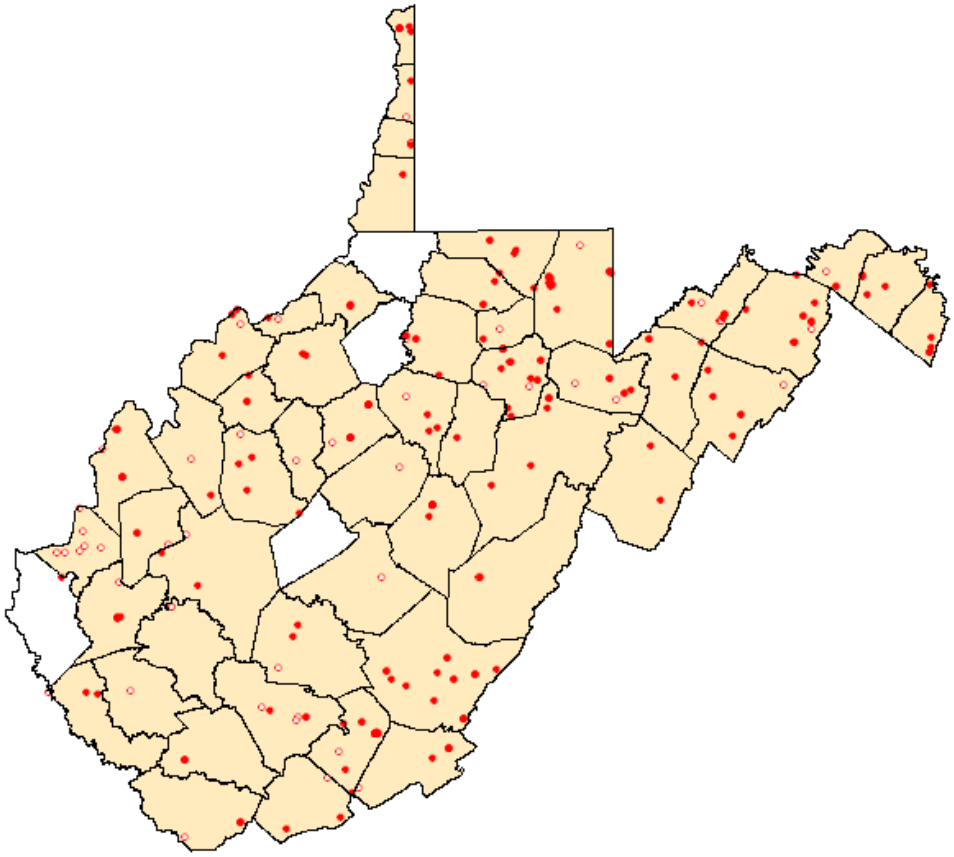
Libellula incesta adults have been documented 12 June — 29 September with 83 valid records.

Suborder Anisoptera
Family Libellulidae

Libellula luctuosa
Widow Skimmer

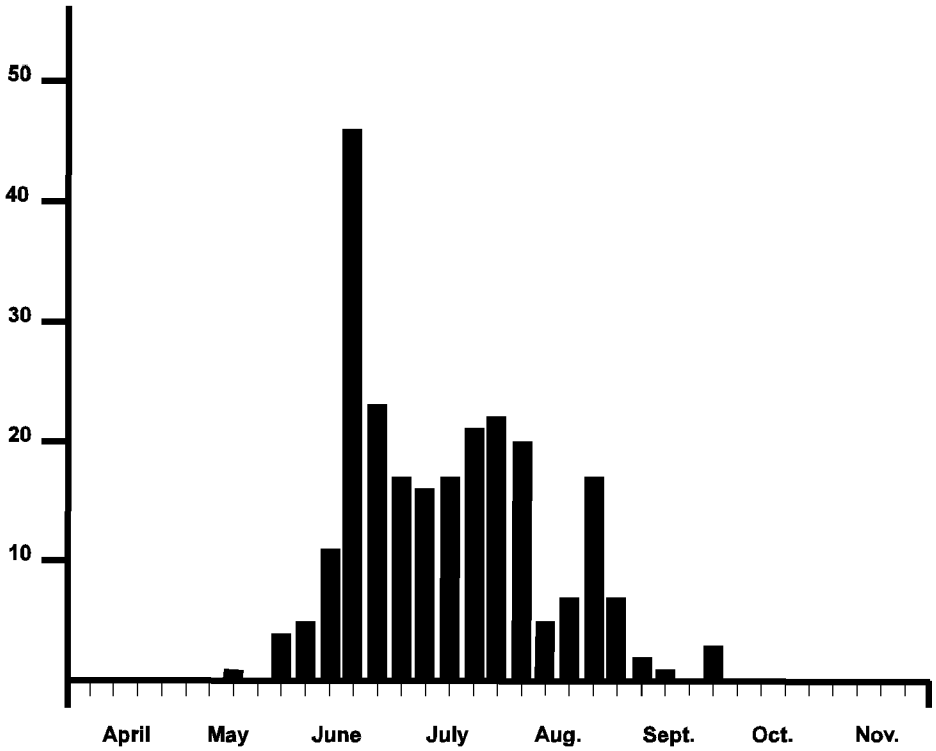
Libellula luctuosa male

Libellula luctuosa female



Libellula luctuosa distribution based on 276 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

One of the most frequently encountered odonates in West Virginia, *Libellula luctuosa* is common at ponds, marshes, lakes, ditches, and bogs. It is often very abundant in herbaceous vegetation surrounding ponds and lakes.



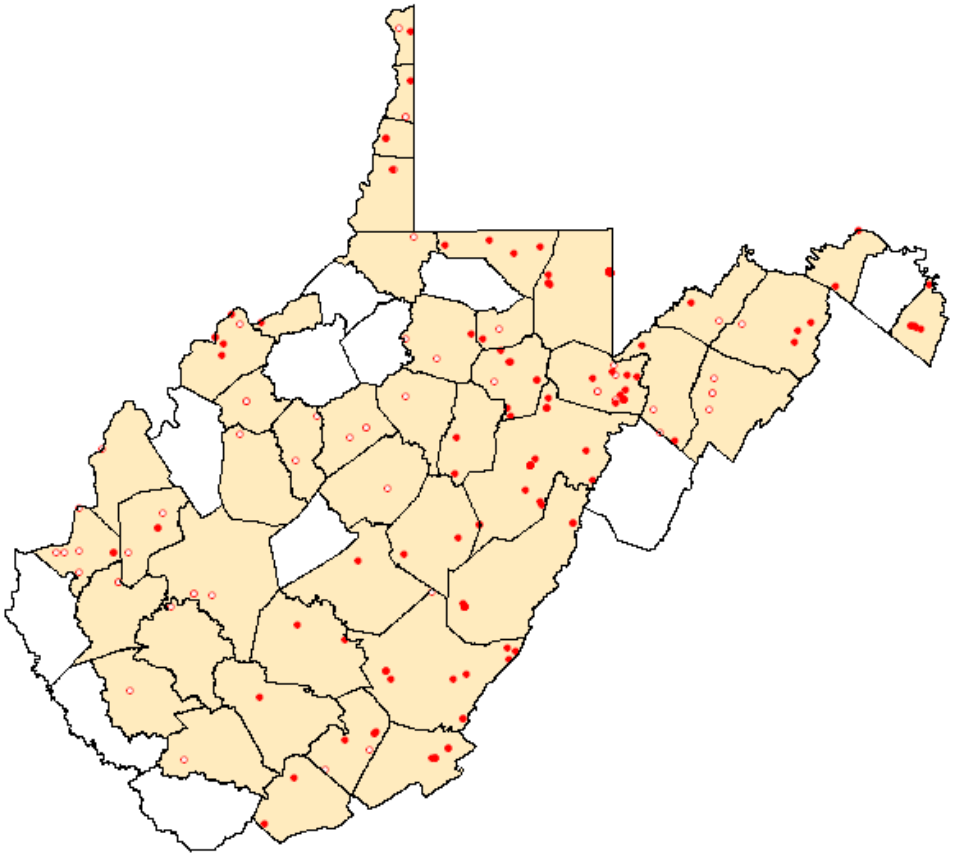
Libellula luctuosa adults have been documented 13 May — 4 October with 245 valid records.

Suborder Anisoptera
Family Libellulidae

Libellula pulchella
Twelve-spotted Skimmer

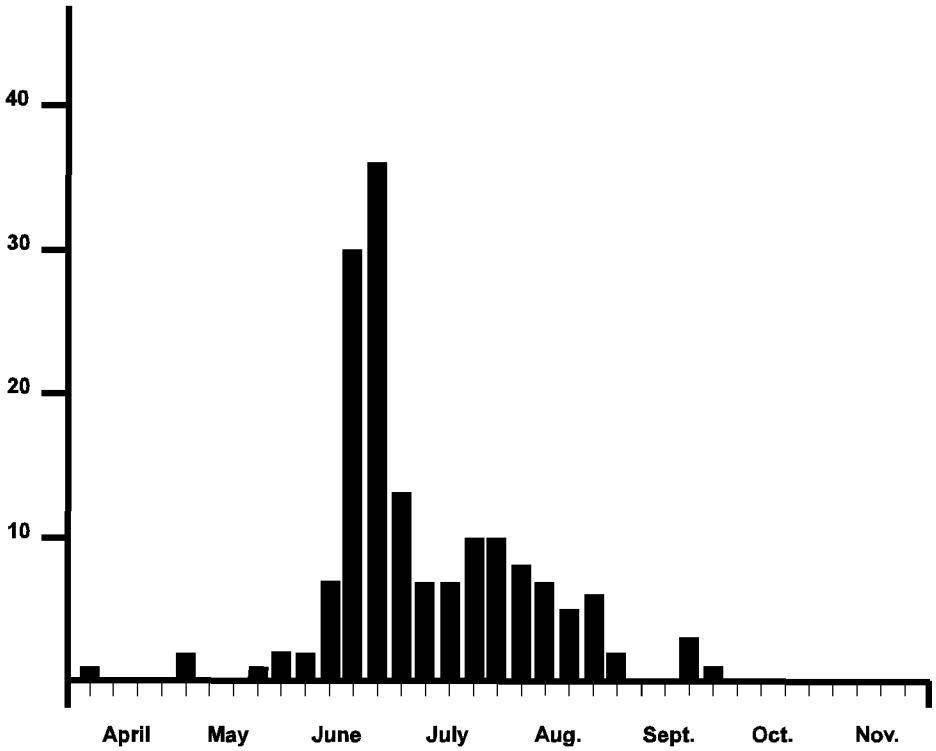
Libellula pulchella male

Libellula pulchella female



Libellula pulchella distribution based on 191 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Libellula pulchella can be found statewide at vegetated ponds, ditches, marshes, and lake edges. Although typically not locally abundant, it is a commonly encountered species.



Libellula pulchella adults have been documented 31 March — 3 October with 160 valid records.

Suborder Anisoptera
Family Libellulidae

Libellula quadrimaculata
Four-spotted Skimmer

Libellula quadrimaculata male

Libellula quadrimaculata female

Libellula quadrimaculata distribution based on 1 record. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

The single record of *Libellula quadrimaculata* in West Virginia is a larval specimen from an unspecified pond in Mason County collected in 1930. Primarily a northern and western species, it reaches the southern limit of its range in the east with this record. This species is likely a vagrant in West Virginia from northern populations.

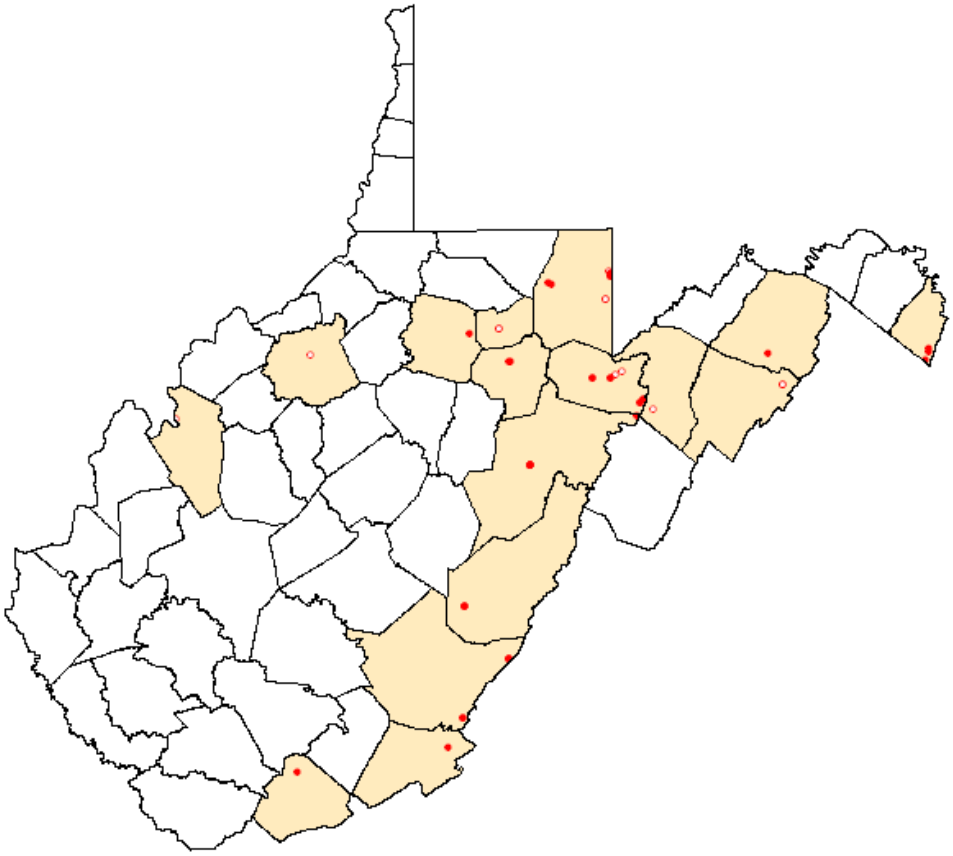
No *Libellula quadrimaculata* adults have been documented in West Virginia.

Suborder Anisoptera
Family Libellulidae

Libellula semifasciata
Painted Skimmer

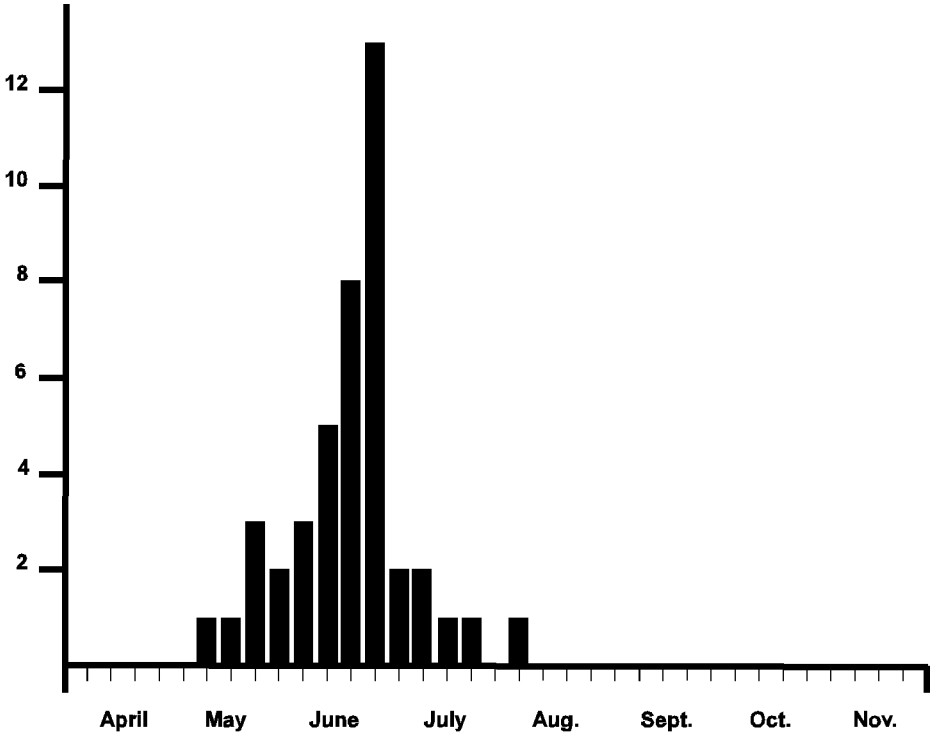
Libellula semifasciata male

Libellula semifasciata female



Libellula semifasciata distribution based on 49 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Libellula semifasciata is primarily found in the mountain counties and the Eastern Panhandle in West Virginia. This distribution reflects the species preference for marshy and boggy habitat that is found in the state in these areas, especially at high elevations (above 2500 ft).



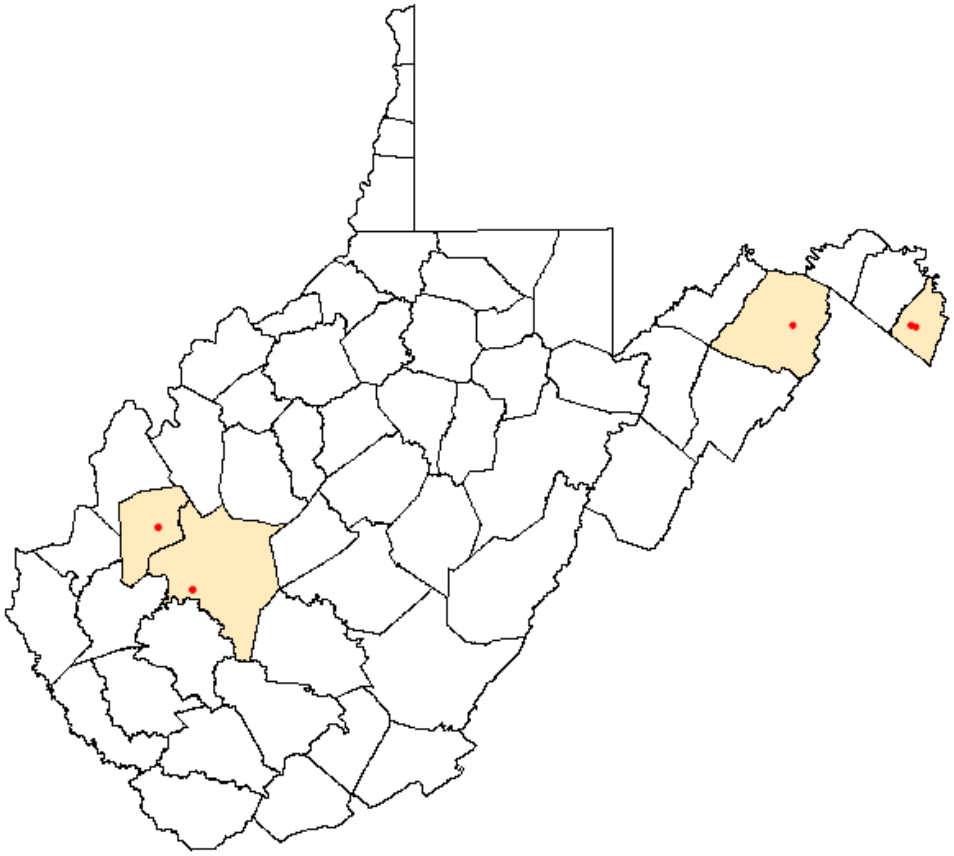
Libellula semifasciata adults have been documented from 10 May — 4 August with 43 valid records.

Suborder Anisoptera
Family Libellulidae

Libellula vibrans
Great Blue Skimmer

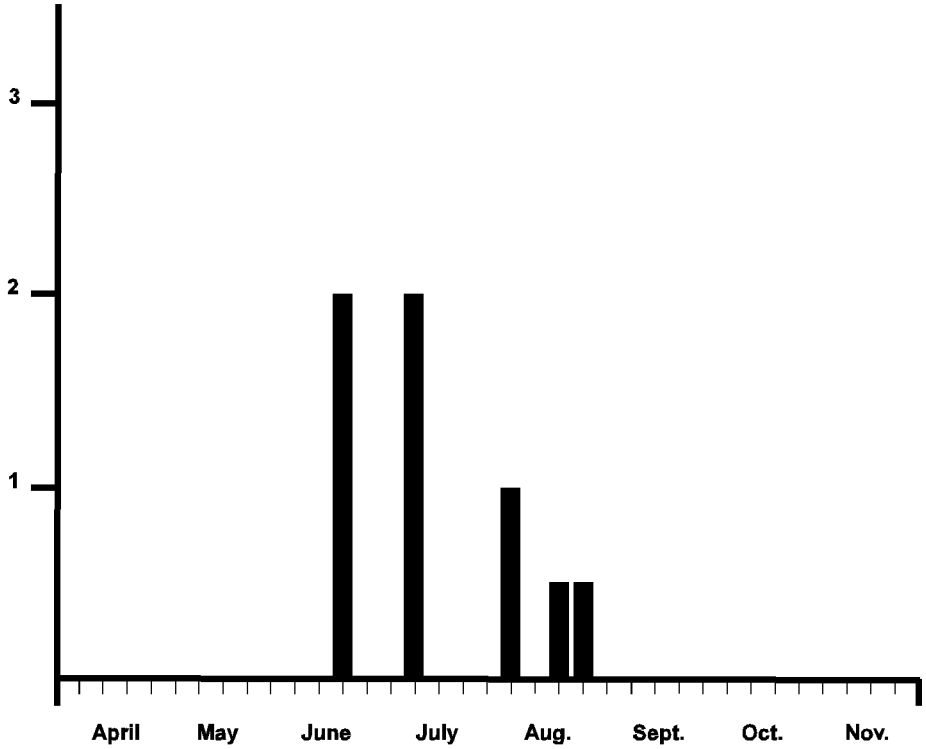
Libellula vibrans male

Libellula vibrans female



Libellula vibrans distribution based on 7 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Libellula vibrans was first documented in West Virginia in 2004 in Jefferson and Hampshire Counties. Additional records in Kanawha and Putnam counties expanded its range in the state considerably. It prefers swamps, forest pools, and slow wooded streams.



Libellula vibrans adults have been documented from 15 June — 25 August with 7 valid records.

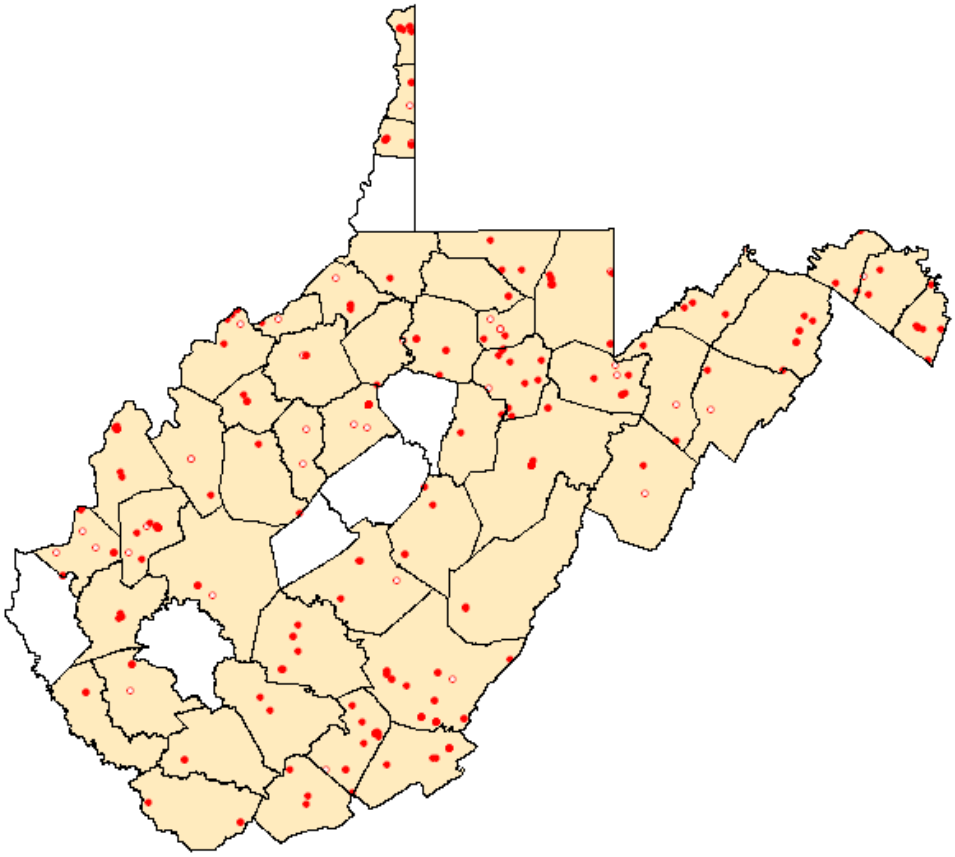
Suborder Anisoptera
Family Libellulidae

Pachydiplax longipennis
Blue Dasher

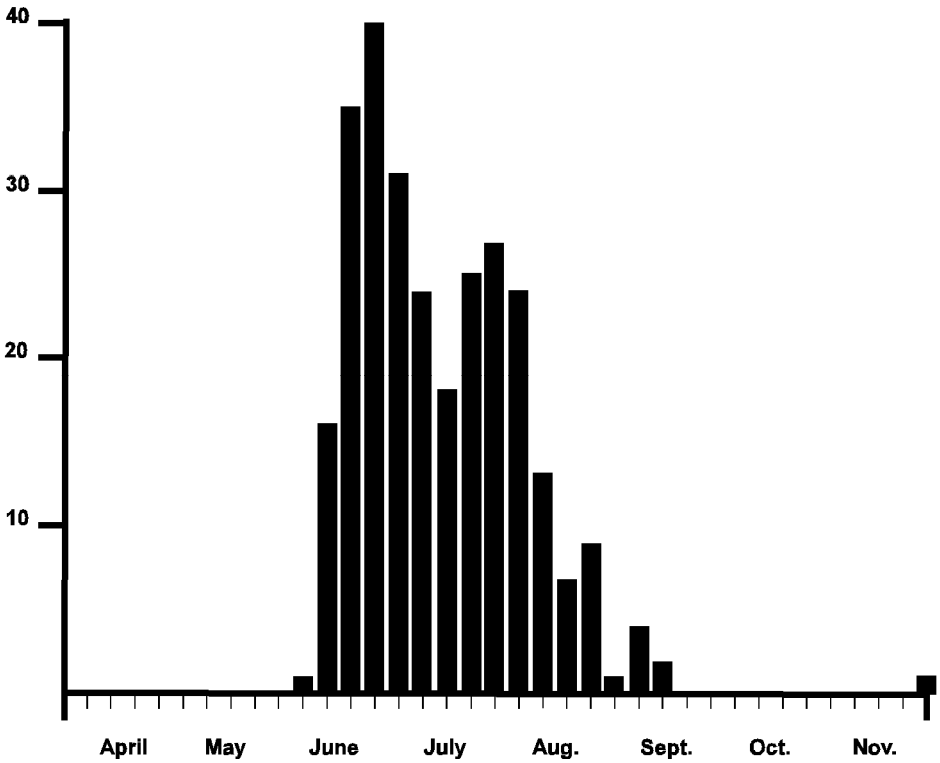
Pachidiplax longipennis male

Pachydiplax longipennis female

Pachydiplax longipennis is a very common, widespread, and abundant odonate at ponds, lakes, slow streams, rivers, and marshes in West Virginia. Its numbers at some sites out number all other odonates combined.



Pachydiplax longipennis distribution based on 316 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.



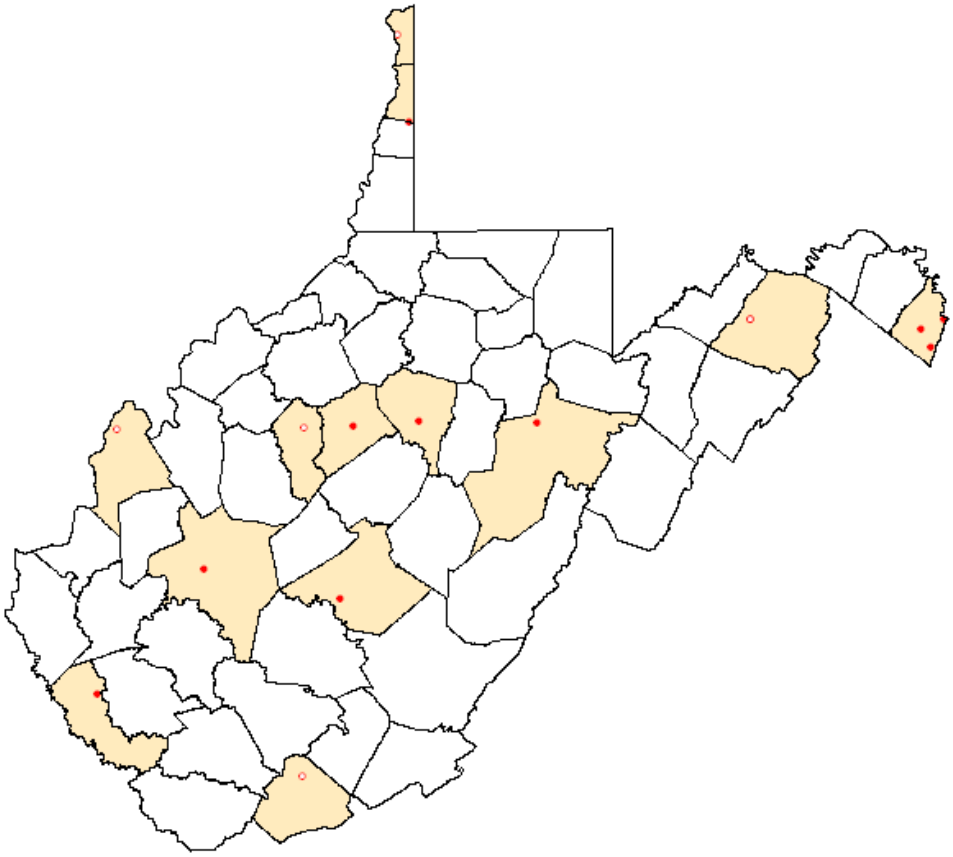
Pachydiplax longipennis adults have been documented from 1 June — 3 October with 297 valid records.

Suborder Anisoptera
Family Libellulidae

Pantala flavescens
Wandering Glider

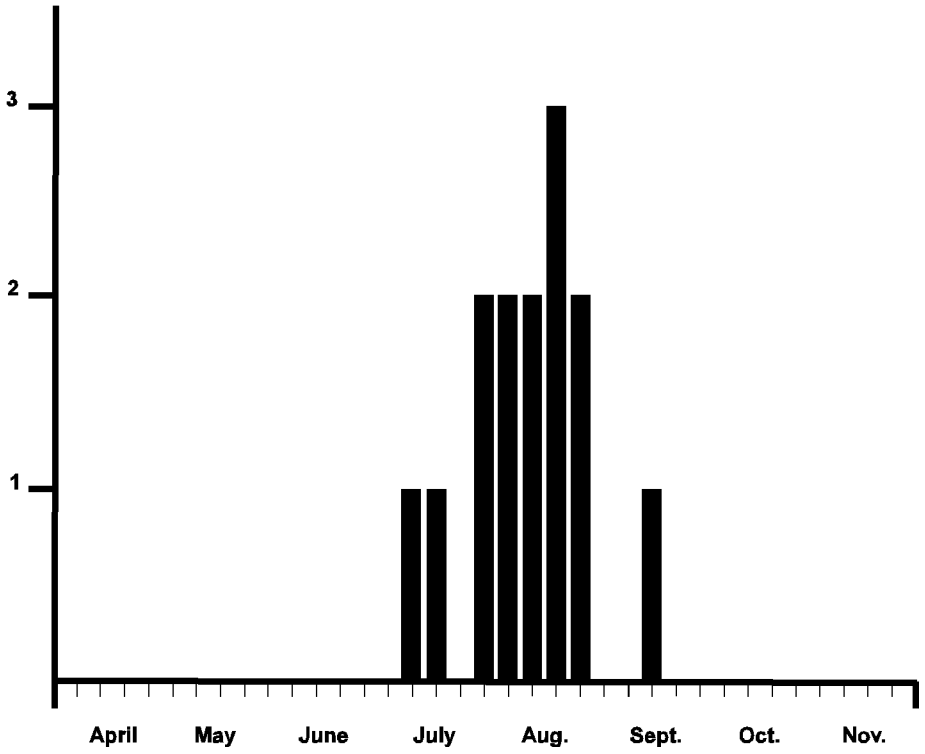
Pantala flavescens male

Pantala flavescens female



Pantala flavescens distribution based on 16 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Although *Pantala flavescens* breeds in West Virginia, many records are likely from migratory individuals. It prefers shallow, non-vegetated pools, remaining after rain events. Eggs can develop into adults in just over a month. They are found world wide.



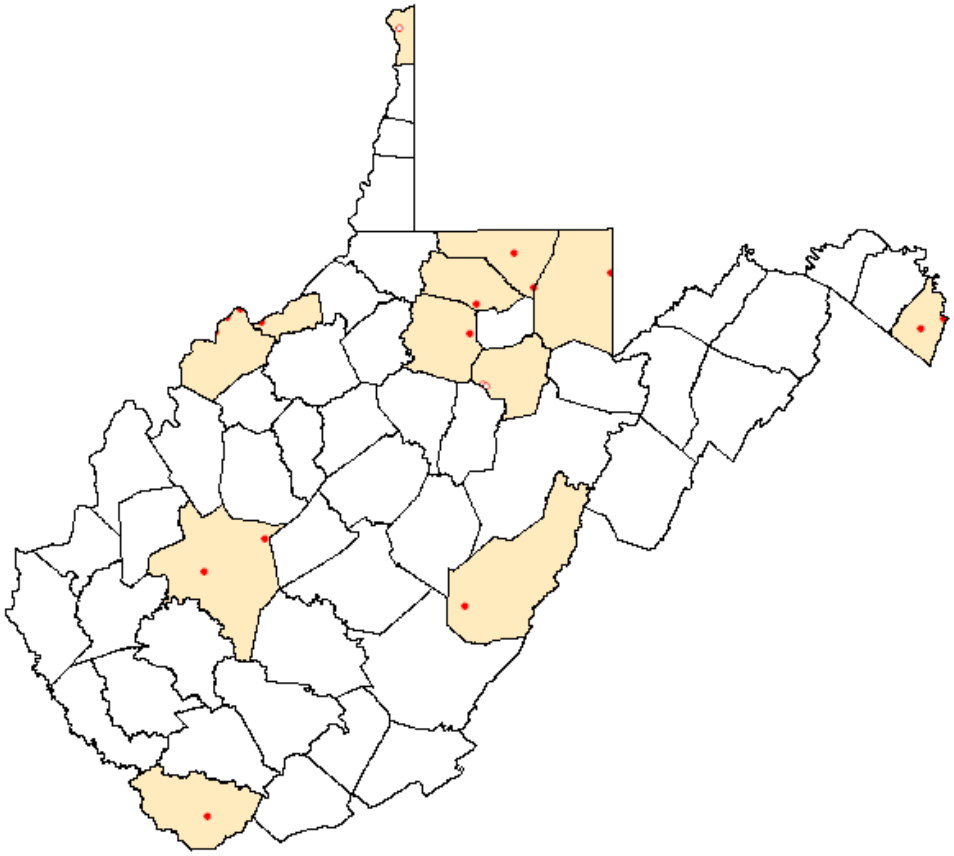
Pantala flavescens adults have been documented from 11 July — 11 September with 14 valid records.

Suborder Anisoptera
Family Libellulidae

Pantala hymenaea
Dot-winged Glider

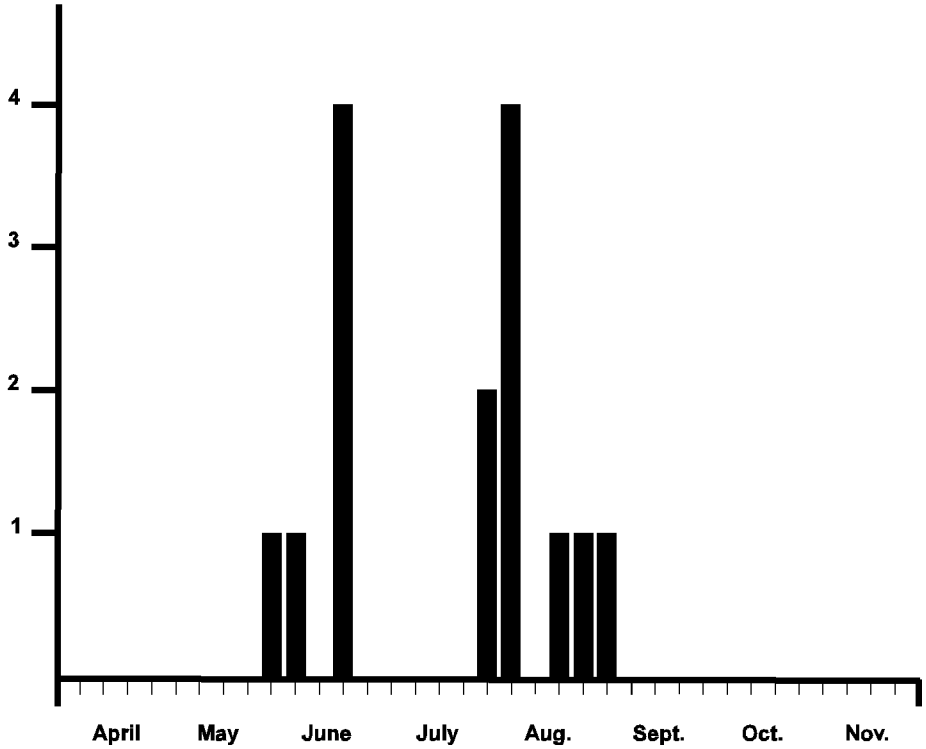
Pantala hymenaea male

Pantala hymenaea female



Pantala hymenaea distribution based on 19 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Pantala hymenaea could be found anywhere in West Virginia as this is a highly migratory species. They prefer shallow, non-vegetated pools for breeding, although they will use almost any open still water. They've been observed attempting to oviposit on wet parking lot pavement and on the hoods and roofs of cars.



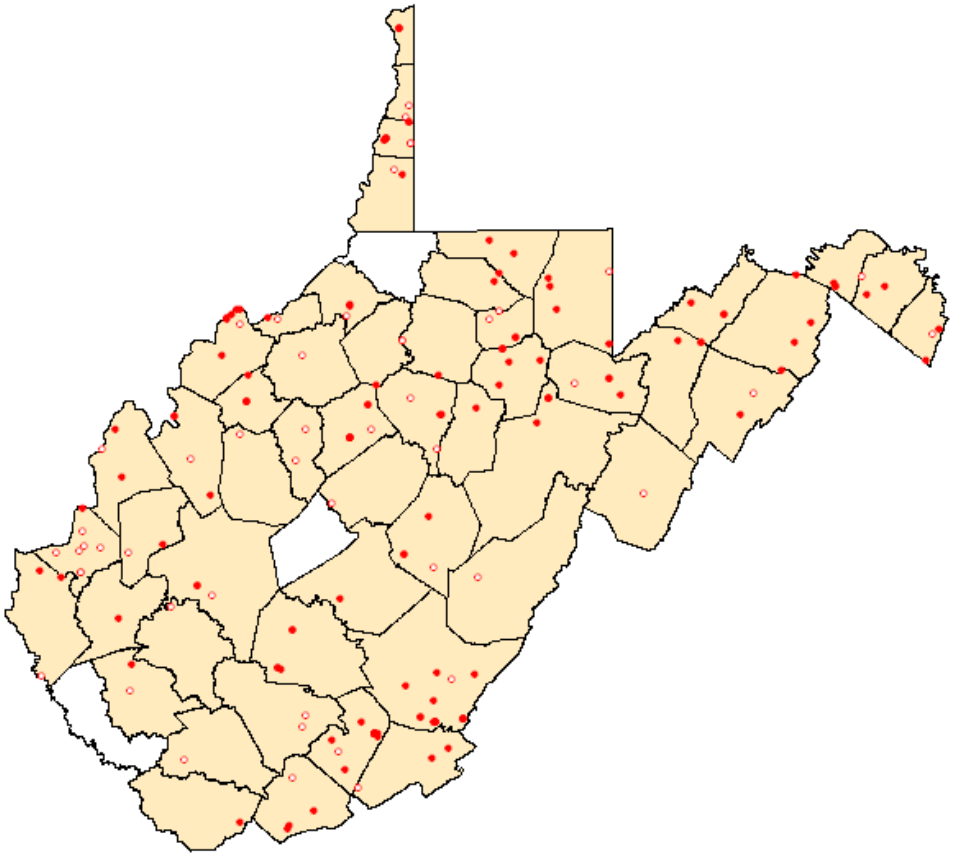
Pantala hymenaea adults have been documented from 29 May — 4 September with 15 valid records.

Suborder Anisoptera
Family Libellulidae

Perithemis tenera
Eastern Amberwing

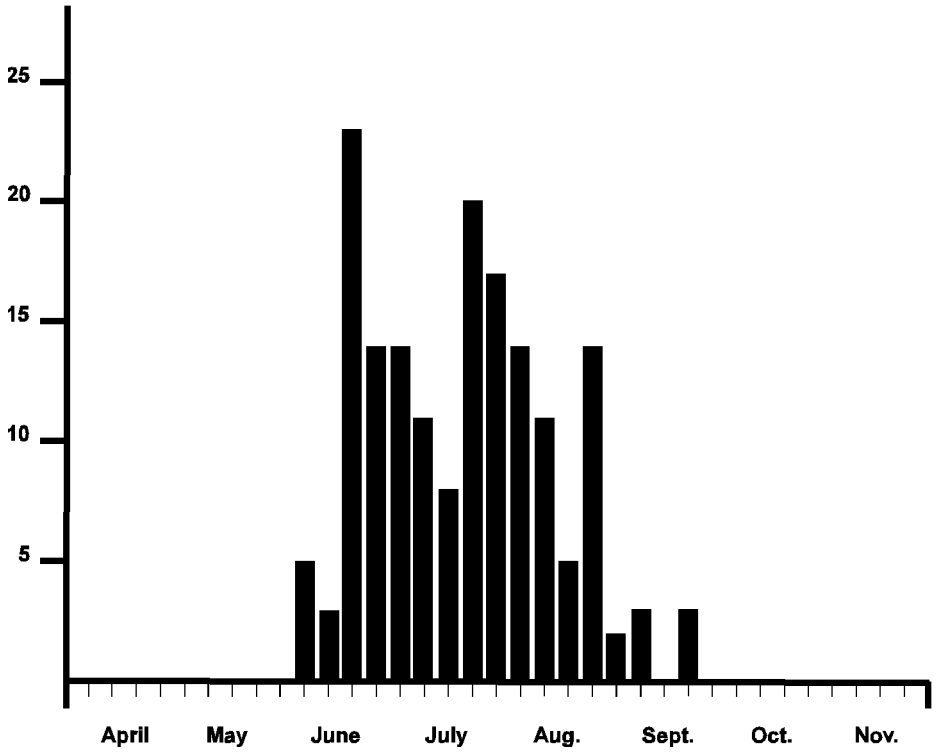
Perithemis tenera male

Perithemis tenera female



Perithemis tenera distribution based on 187 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Perithemis tenera is a very common, widespread, and abundant species in West Virginia. It can be found at virtually every pond, and can tolerate high levels of organic pollution.



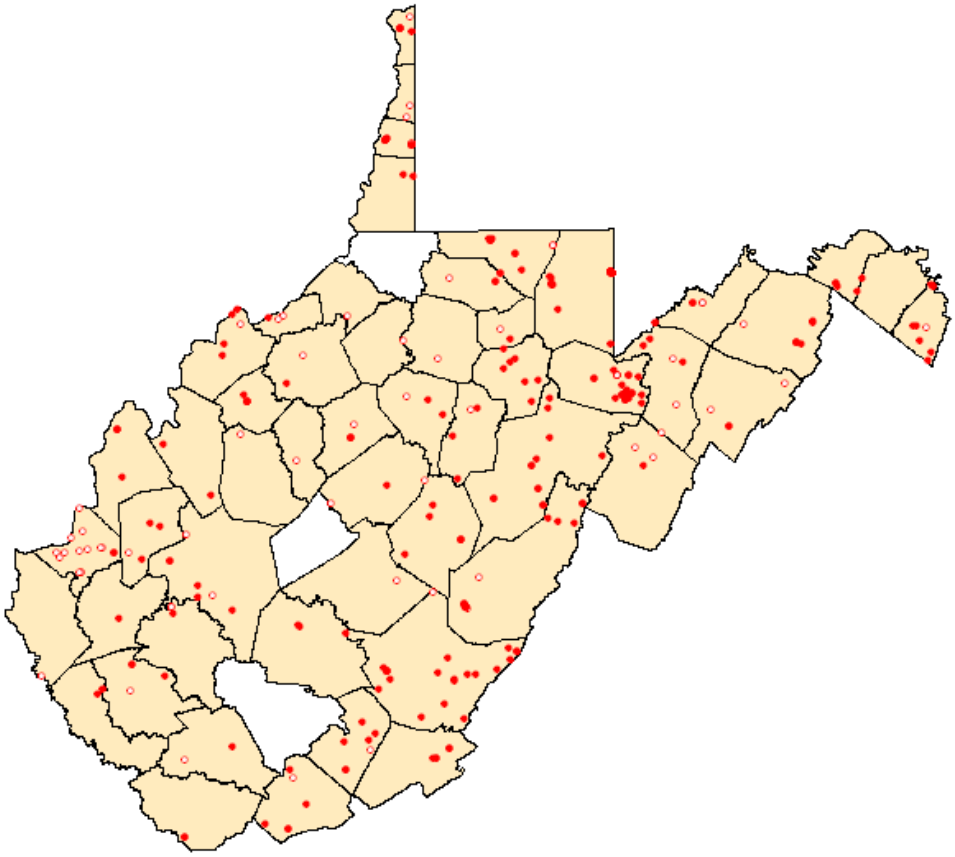
Perithemis tenera adults have been documented from 1 June — 21 September with 167 valid records.

Suborder Anisoptera
Family Libellulidae

Plathemis lydia
Common Whitetail

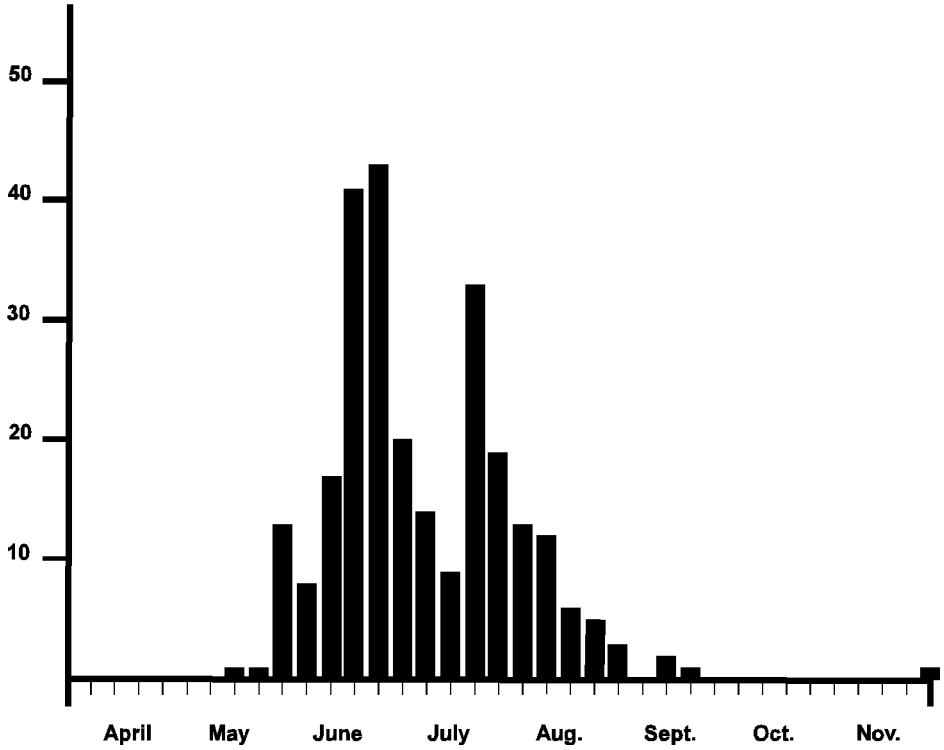
Plathemis lydia male

Plathemis lydia female



Plathemis lydia distribution based on 307 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Plathemis lydia is a common, widespread species found statewide at ponds, lakes, marshes, ditches, and pools of slow streams and rivers.



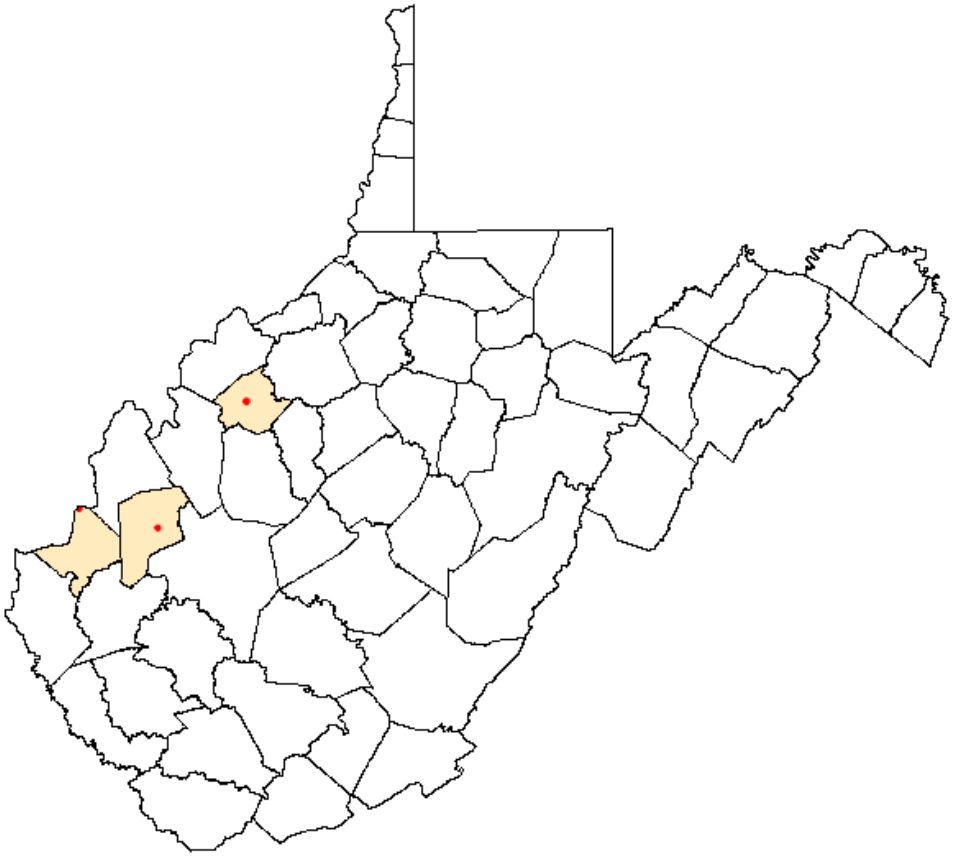
Plathemis lydia adults have been documented from 15 May — 19 September with 262 valid records.

Suborder Anisoptera
Family Libellulidae

Sympetrum ambiguum
Blue-faced Meadowhawk

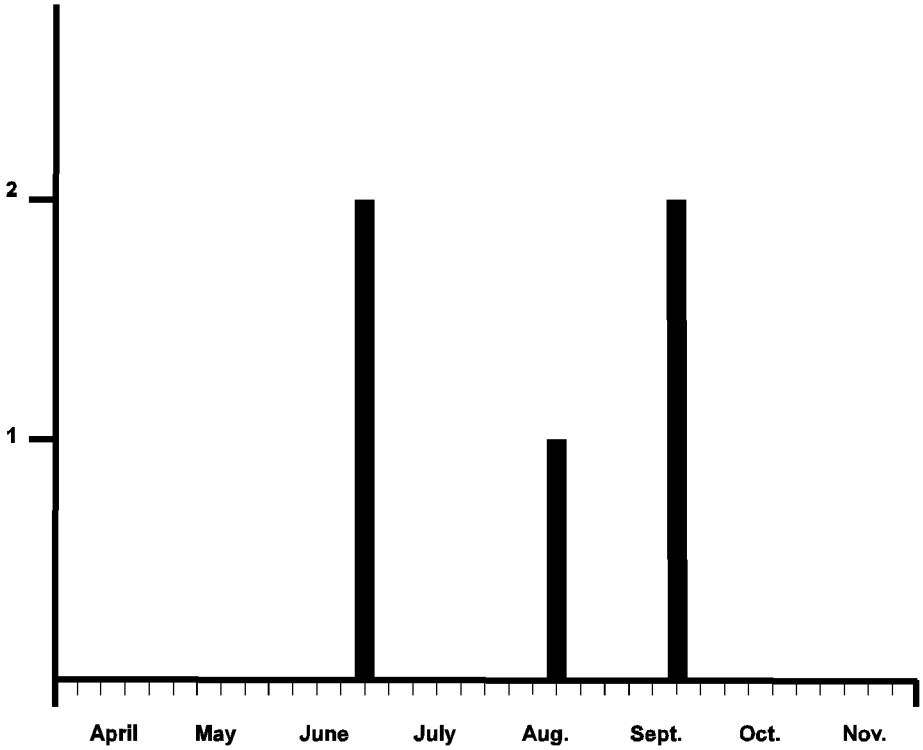
Sympetrum ambiguum male

Sympetrum ambiguum female



Sympetrum ambiguum distribution based on 5 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Sympetrum ambiguum occurs primarily south and west of West Virginia, avoiding the Appalachians almost entirely. It prefers marshy ponds associated with river bottoms, and the sites in the state reflect that preference. It has been found at Greenbottom WMA in Cabell County, Winfield Wetlands in Putnam County, and at the Palestine State Fish Hatchery in Wirt County.



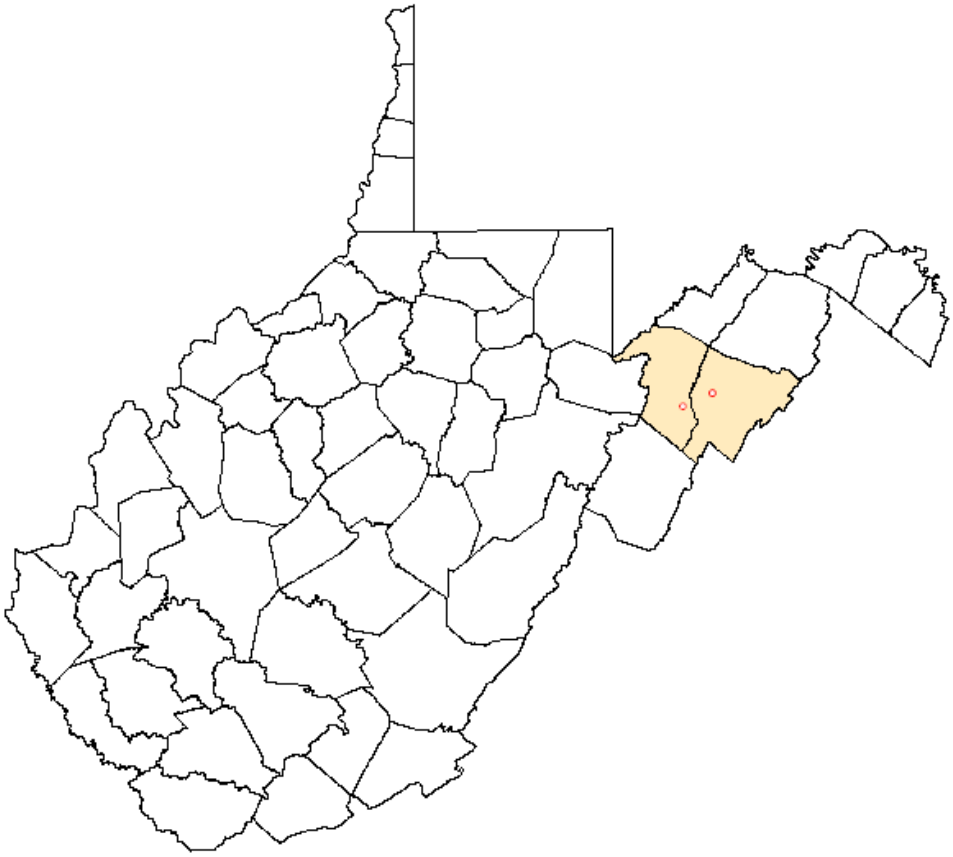
Sympetrum ambiguum adults have been documented from 26 June — 24 September with 5 valid records.

Suborder Anisoptera
Family Libellulidae

Sympetrum corruptum
Varigated Meadowhawk

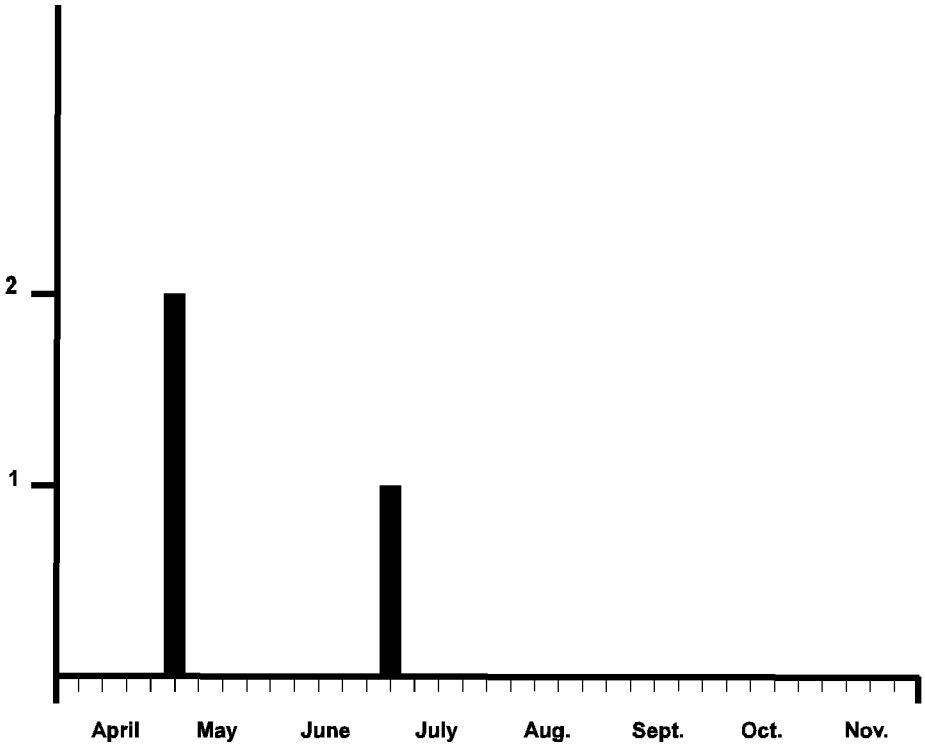
Sympetrum corruptum male

Sympetrum corruptum female



Sympetrum corruptum distribution based on 3 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Sympetrum corruptum in West Virginia is documented by two records from Grant and Hardy counties in the Eastern Panhandle. The bulk of this species' range lies west of the Mississippi River. This species is quite migratory, and these West Virginia records are likely vagrant individuals.



Sympetrum corruptum adults have been documented from 30 April — 2 July with 3 valid records.

Suborder Anisoptera
Family Libellulidae

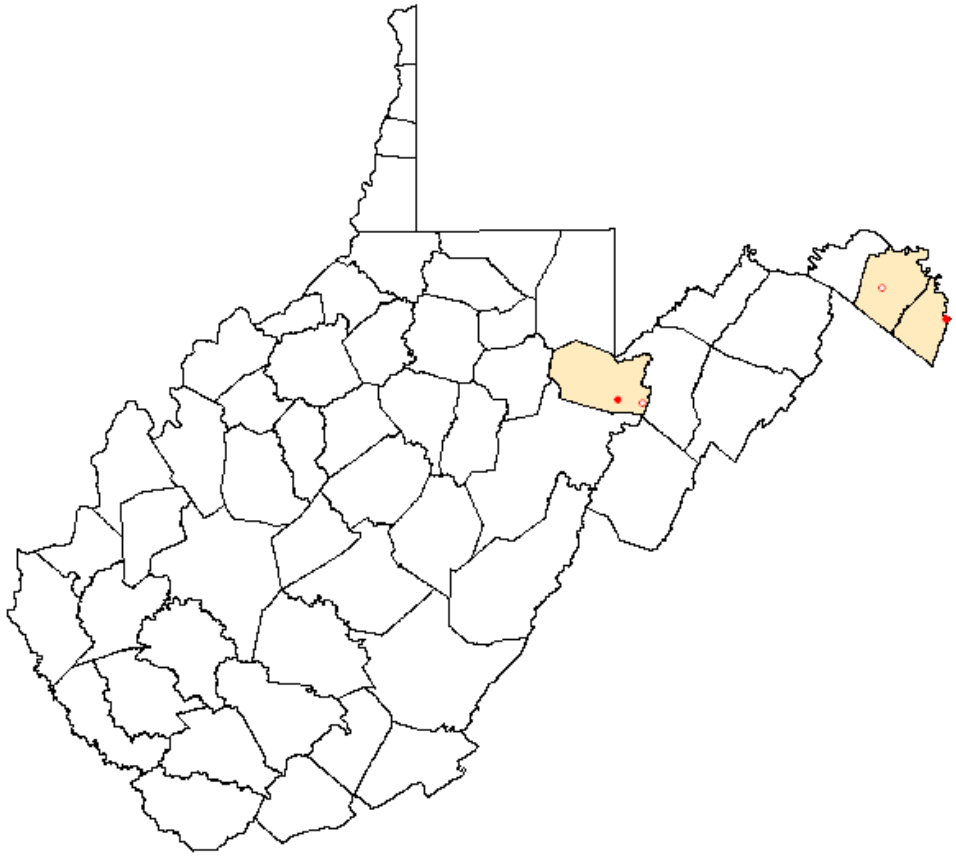
Sympetrum internum
Cherry-faced Meadowhawk
and
Sympetrum janeae
Jane's Meadowhawk

Sympetrum internum/janeae
male

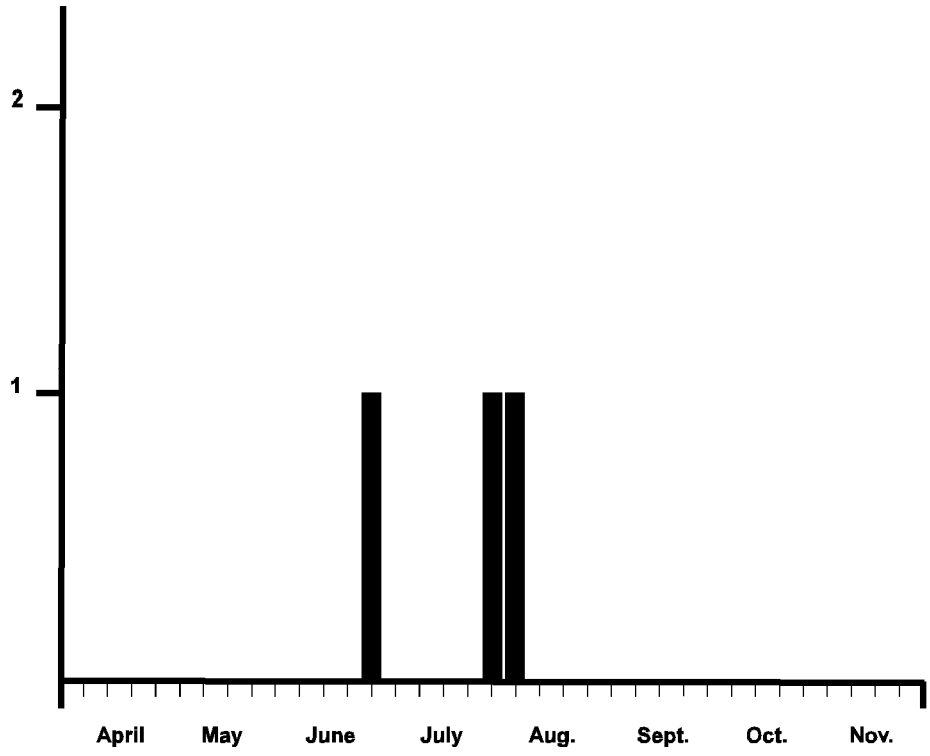
Sympetrum internum/janeae
female

Sympetrum internum has been documented in two counties in West Virginia, the most recent record in 2002 in Tucker County.

The questionable species *Sympetrum janeae* was documented from a single site in 1982 in Berkeley County. Although the taxon is accepted by some odontologists, and rejected by others, increasing evidence is supporting that it is a race or form of *S. internum* (Pilgrim, 2007; Paulson and Dunkle, 2011). West Virginia will henceforth treat is as a race or form of *S. internum*.



Sympetrum internum/janeae distribution based on 4 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.



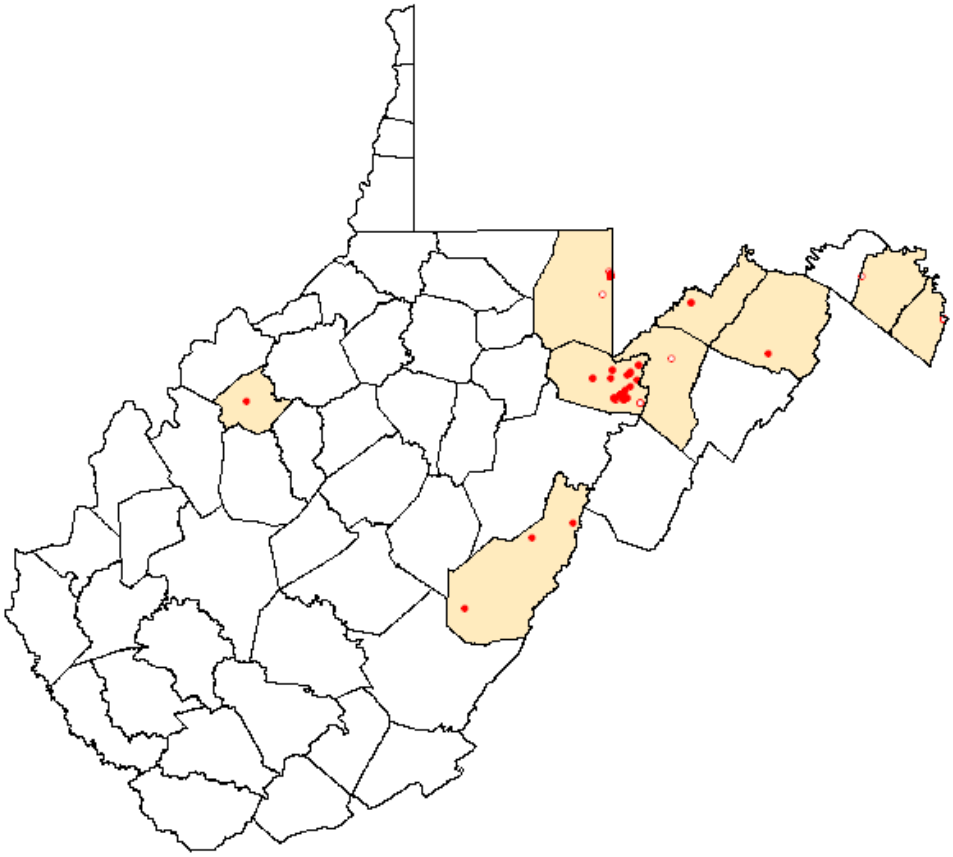
Sympetrum internum/janeae adults have been documented from 24 June — 2 August with 3 valid records.

Suborder Anisoptera
Family Libellulidae

Sympetrum obtrusum
White-faced Meadowhawk

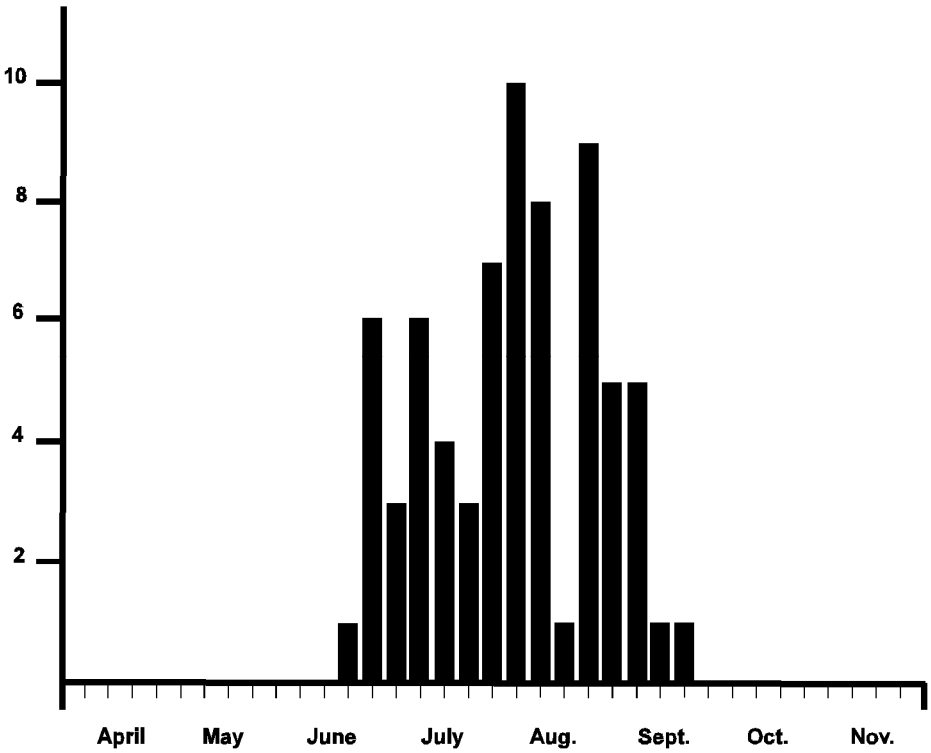
Sympetrum obtrusum male

Sympetrum obtrusum female



Sympetrum obtrusum distribution based on 74 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Sympetrum obtrusum is primarily found at high elevations (above 2500 ft) in West Virginia. Often, at locations such as in Canaan Valley, they are ubiquitous and are very abundant. They are found in fields and open areas surrounding ponds, marshes, bogs, and other still water.



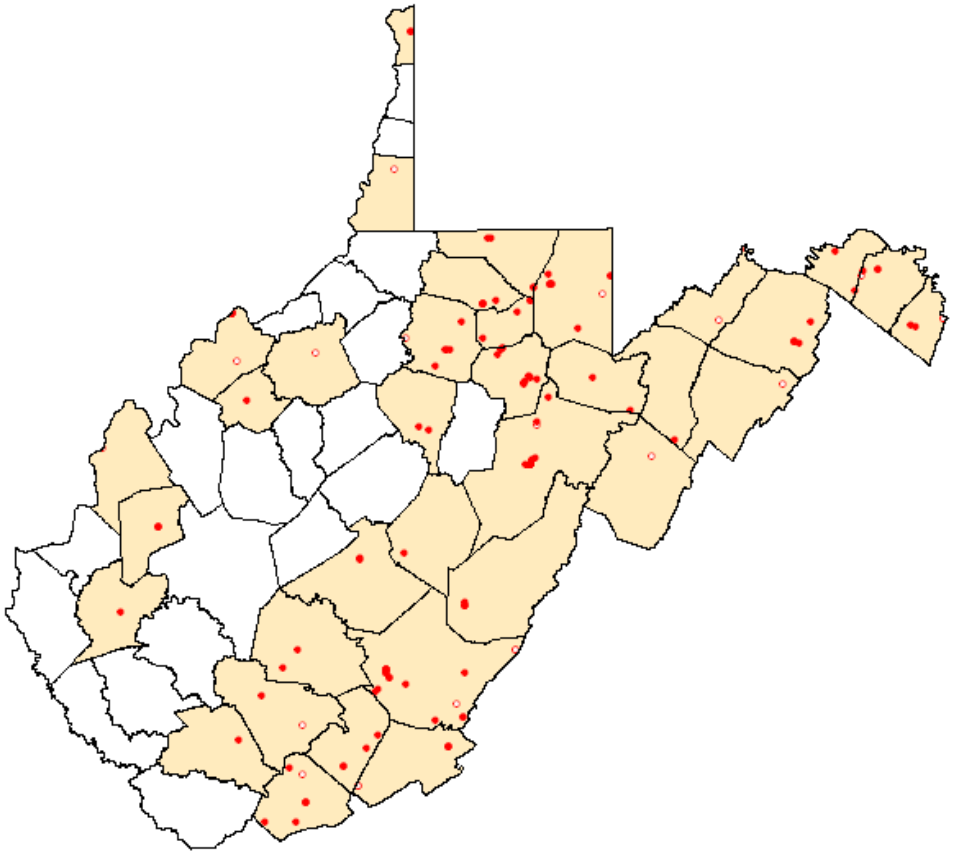
Sympetrum obtrusum adults have been documented on 18 June — 24 September with 70 valid records.

Suborder Anisoptera
Family Libellulidae

Sympetrum rubicundulum
Ruby Meadowhawk

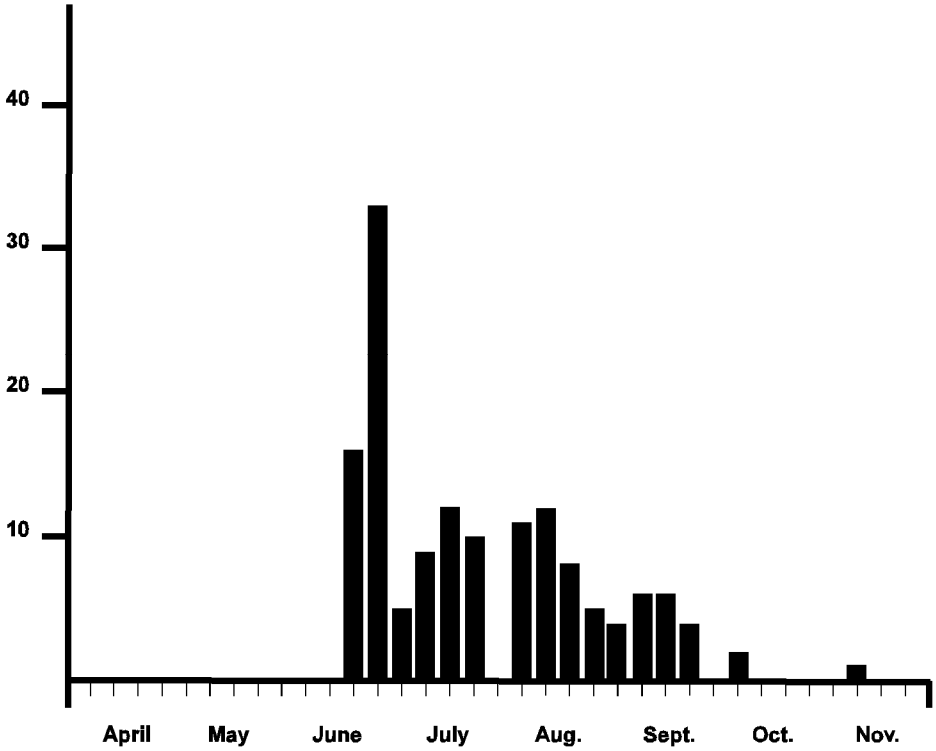
Sympetrum rubicundulum male

Sympetrum rubicundulum female



Sympetrum rubicundulum distribution based on 164 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Sympetrum rubicundulum is one of the most widespread and common meadowhawks in West Virginia. Not appearing until mid-June or later, it will fly late into the autumn. It can be found around ponds and other still water perched on herbaceous vegetation.



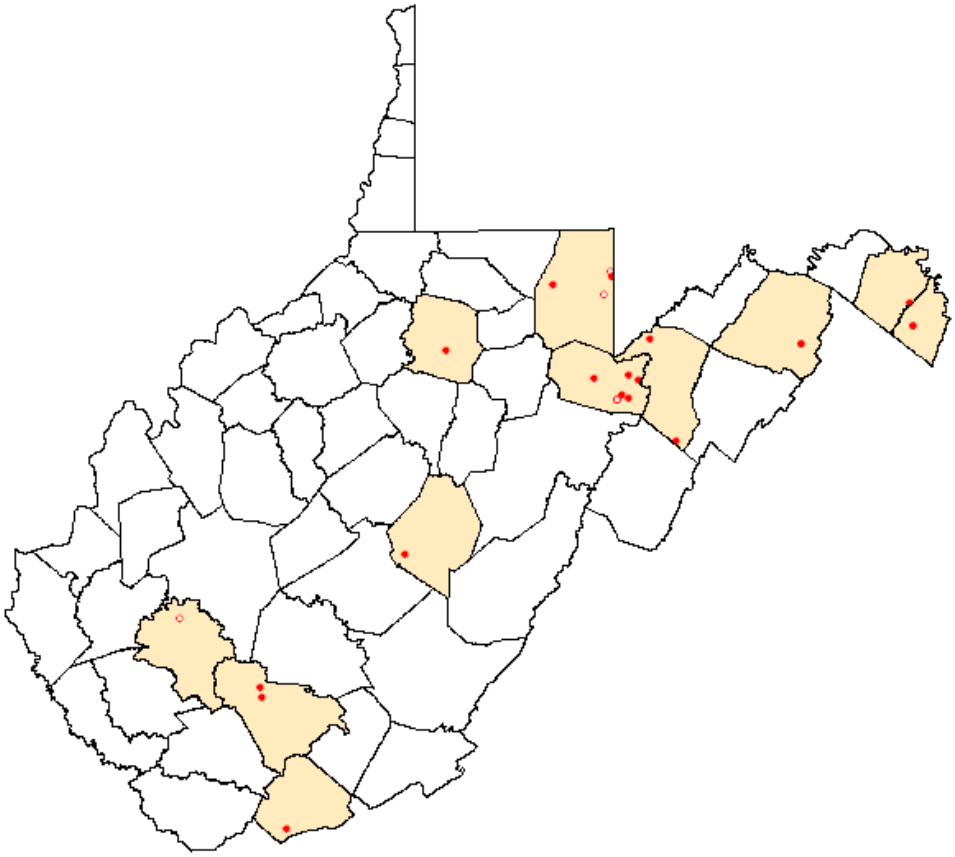
Sympetrum rubicundulum adults have been documented on 15 June — 14 November with 144 valid records.

Suborder Anisoptera
Family Libellulidae

Sympetrum semicinctum
Band-winged Meadowhawk

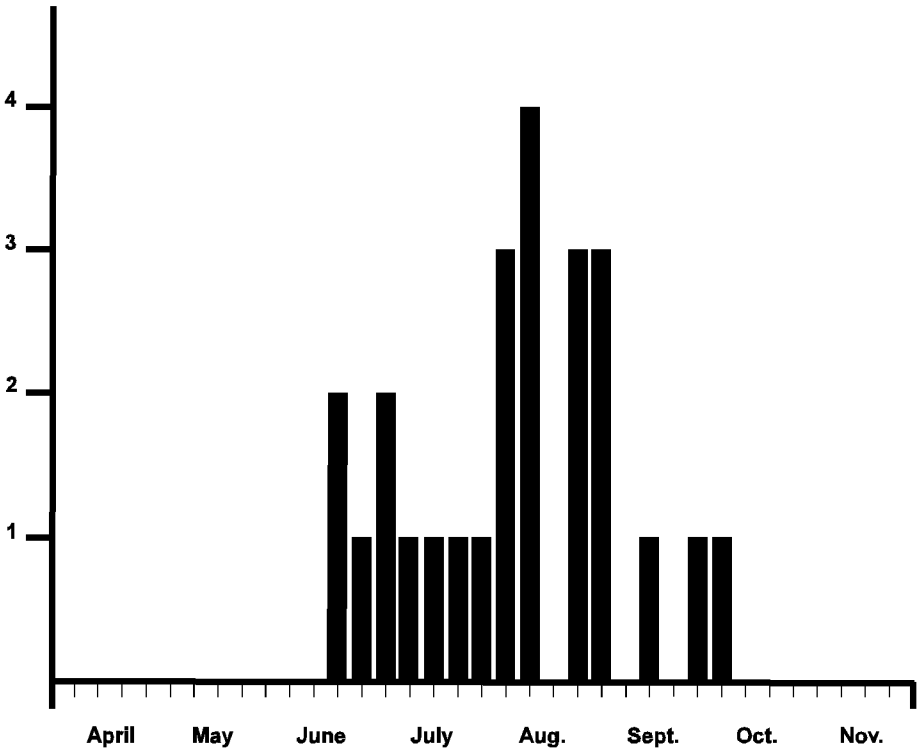
Sympetrum semicinctum male

Sympetrum semicinctum female



Sympetrum semicinctum distribution based on 27 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Sympetrum semicinctum, West Virginia's smallest meadowhawk, has been documented at scattered locations around the state. Its preferred habitat of marshy areas fed primarily by spring fed streams may account for its spotty distribution.



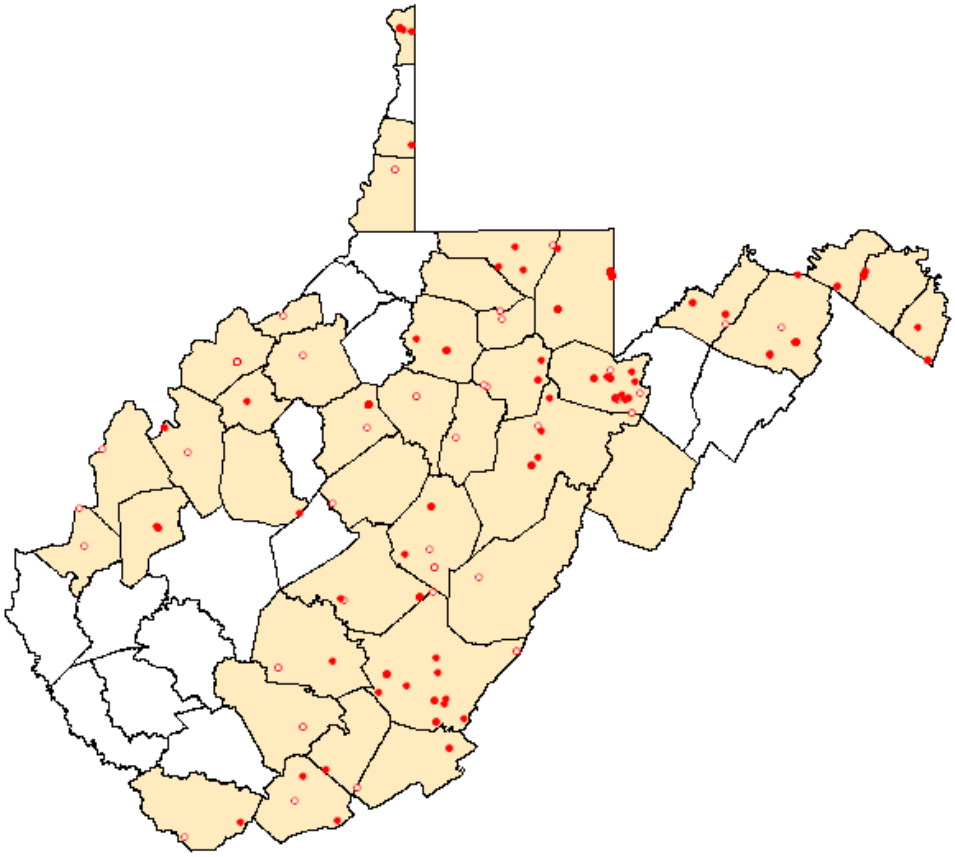
Sympetrum semicinctum adults have been documented on 15 June — 10 October with 25 valid records.

Suborder Anisoptera
Family Libellulidae

Sympetrum vicinum
Autumn Meadowhawk

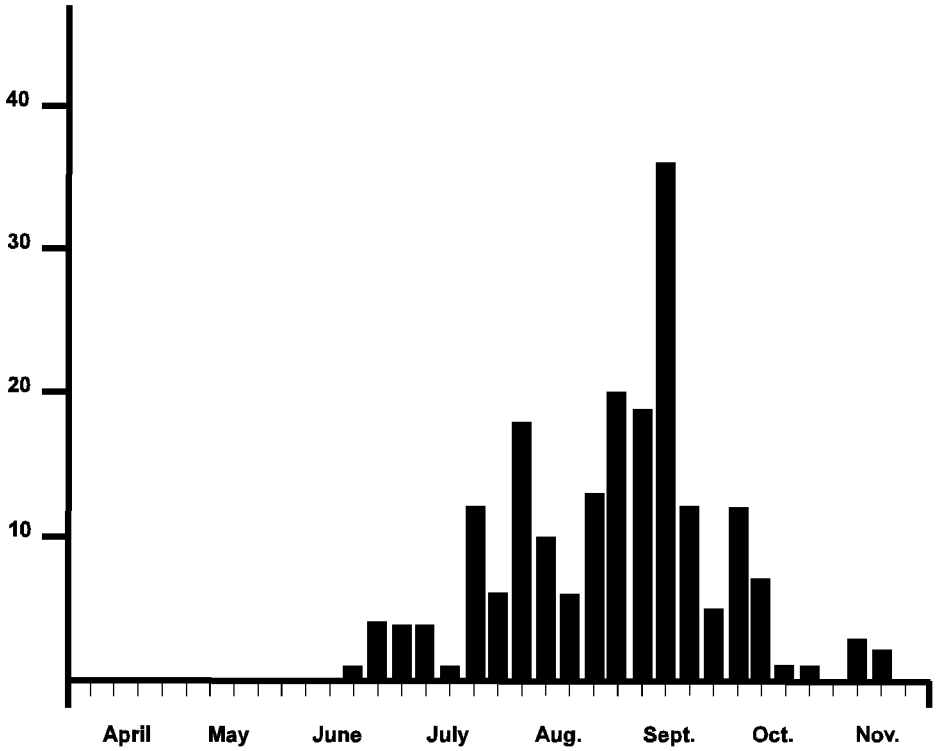
Sympetrum vicinum male

Sympetrum vicinum female



Sympetrum vicinum distribution based on 244 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Sympetrum vicinum is an abundant and ubiquitous odonate in West Virginia from mid-June until frost. In some areas, young adults will almost carpet herbaceous vegetation along trails and forest roads near breeding areas such as ponds and marshes.



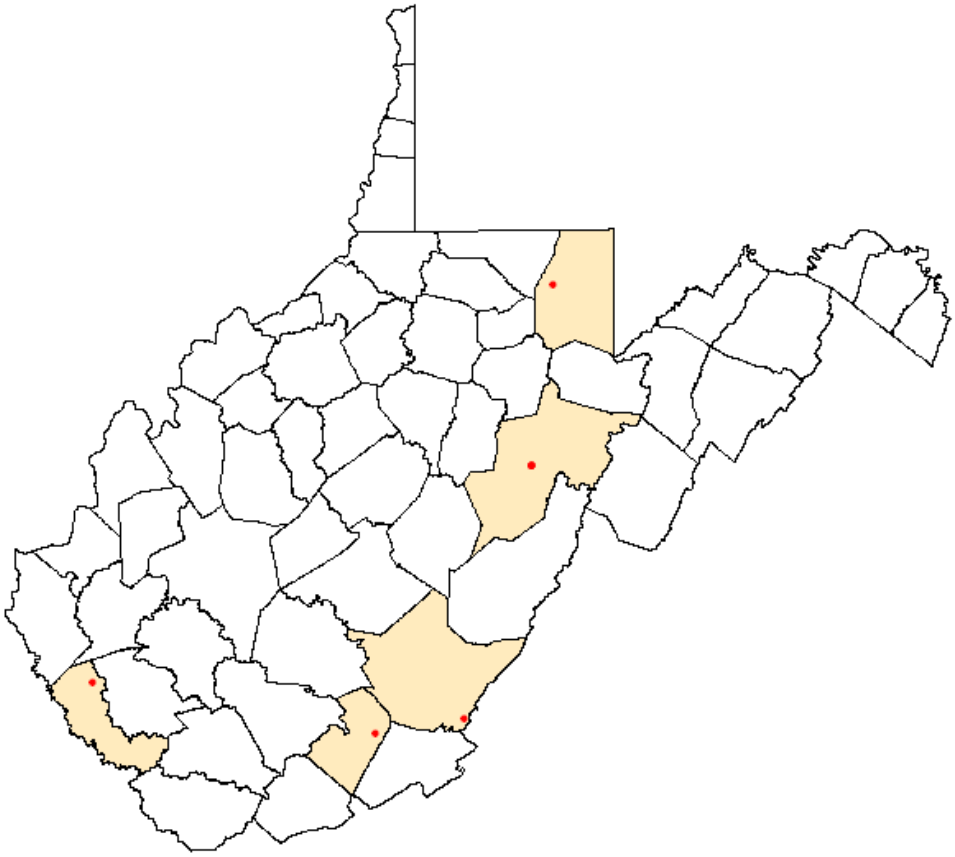
Sympetrum vicinum adults have been documented on 17 June — 20 November with 197 valid records.

Suborder Anisoptera
Family Libellulidae

Tramea carolina
Carolina Saddlebags

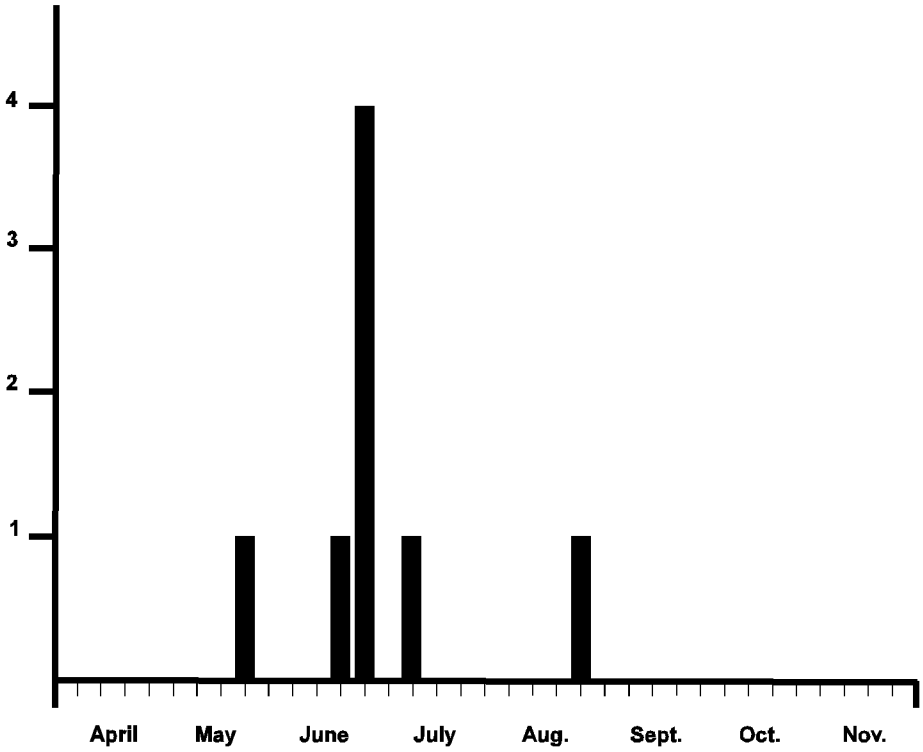
Tramea carolina male

Tramea carolina female



Tramea carolina distribution based on 8 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Tramea carolina has been documented sporadically in West Virginia in five counties. A highly migratory species, they may migrate into the state from significant southern populations. Breeding behavior has been documented in the state.



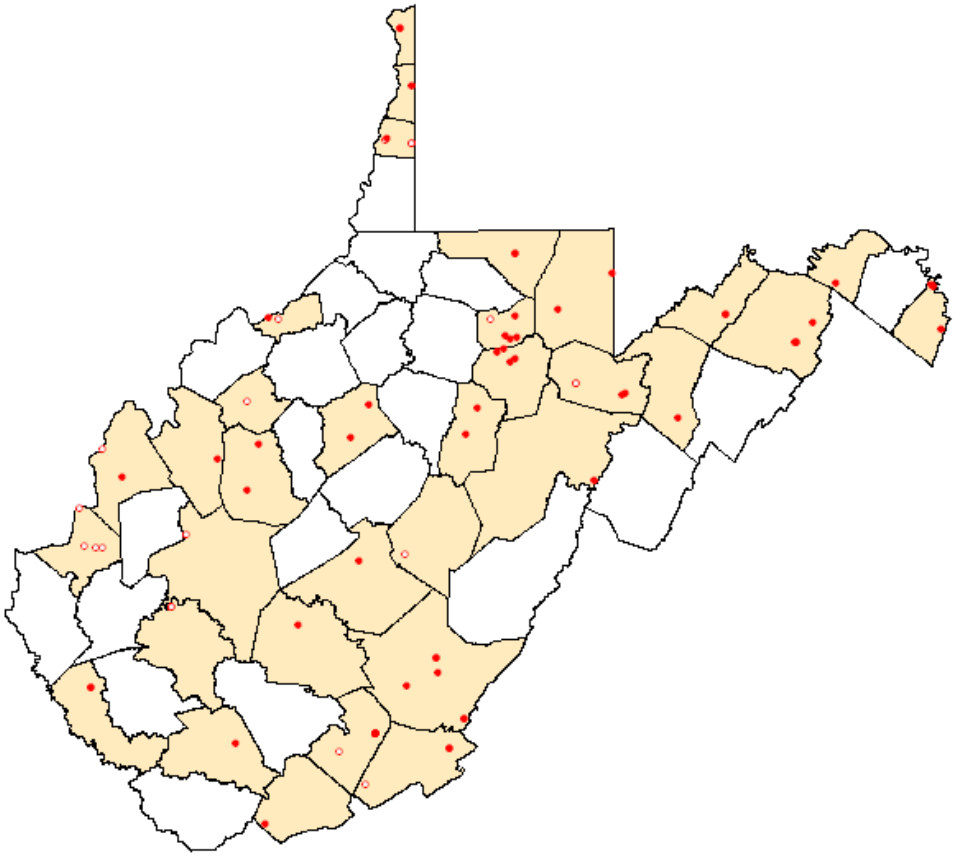
Tramea carolina adults have been documented on 24 May — 22 August with 8 valid records.

Suborder Anisoptera
Family Libellulidae

Tramea lacerata
Black Saddlebags

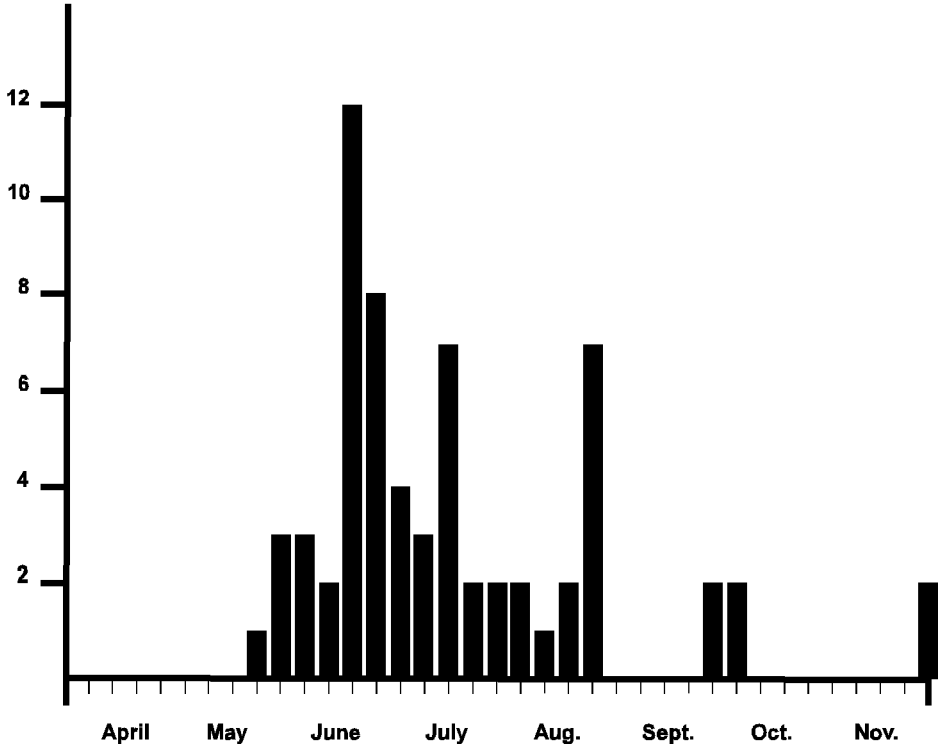
Tramea lacerata male & female in tandem

Tramea lacerata female



Tramea lacerata distribution based on 79 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Tramea lacerata is a common species found around breeding ponds and foraging above fields and other open areas. Difficult to net because of its swift high flight, its black coloration and large basal wing spots makes it easy to identify in flight. It likely occurs statewide.



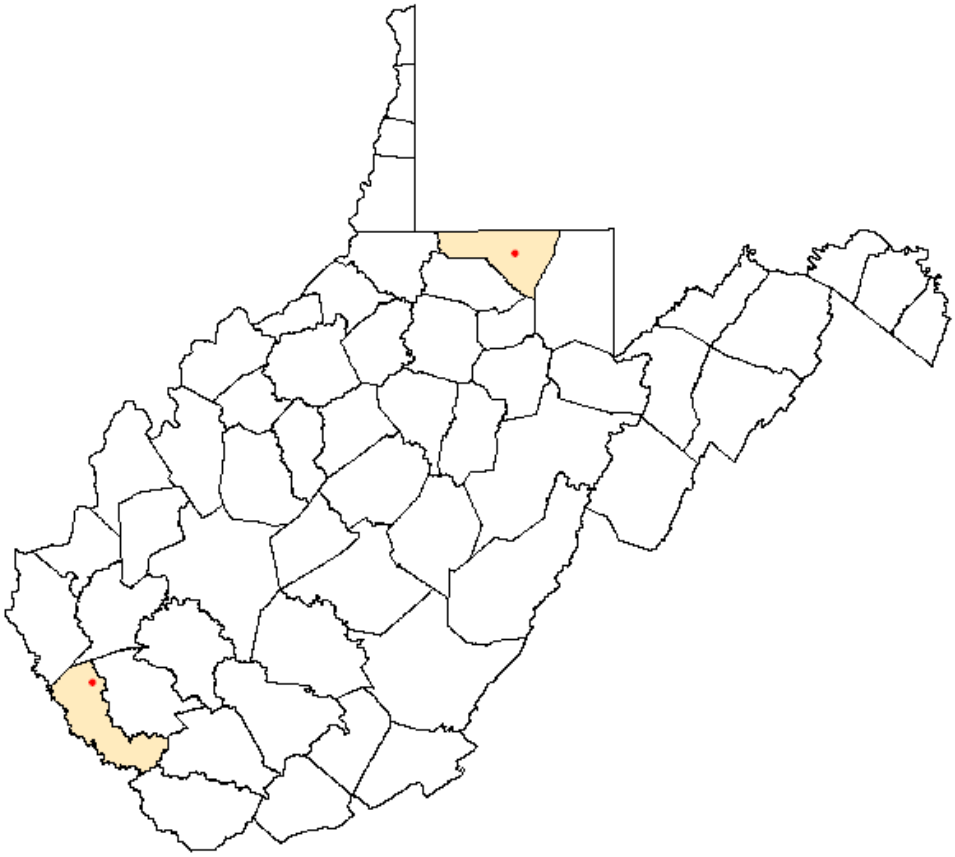
Tramea lacerata adults have been documented on 20 May — 9 October with 62 valid records.

Suborder Anisoptera
Family Libellulidae

Tramea onusta
Red Saddlebags

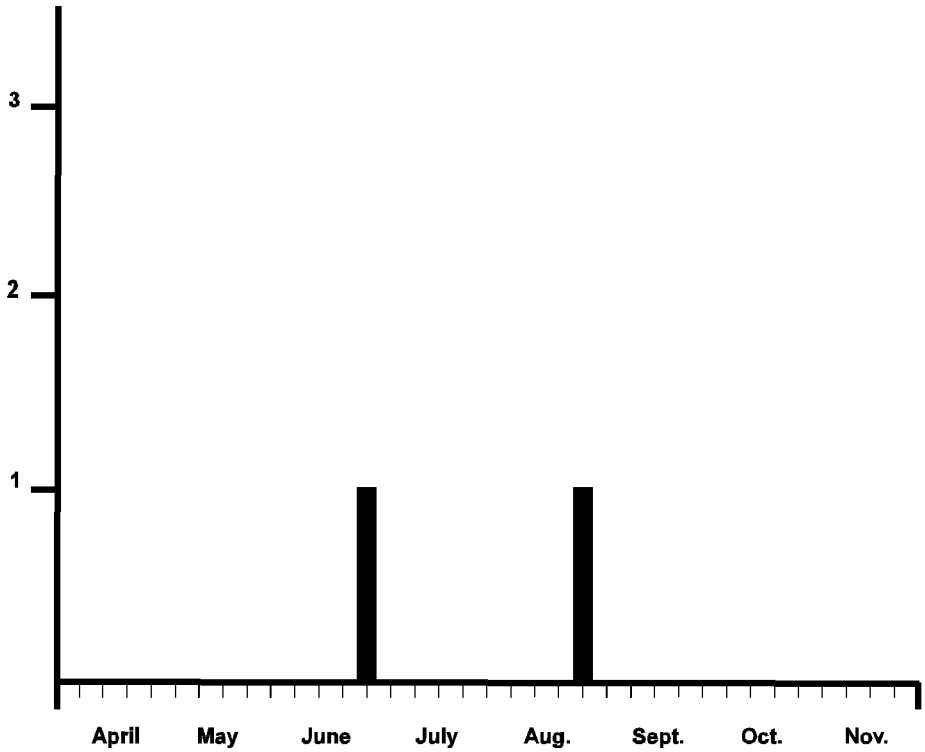
Tramea onusta male

Tramea onusta female



Tramea onusta distribution based on 2 records. Open dots are 1994 and earlier records; solid dots are 1995-2010 records.

Tramea onusta was first documented in West Virginia in 2005 in Mingo County. One other individual was collected in 2006 in Monongalia County. A highly migratory species, these records are likely from individuals migrating east from western populations, although breeding behavior has been observed.



Tramea onusta adults have been documented on 30 June — 22 August with 2 valid records.

Appendix 2. Odonate species diversity in West Virginia by Bailey eco-region. See Figure 4 for a map of the eco-regions in the state.

Family	Genus	Species	Northern Ridge & Valley	Allegheny Mountain & Valley[1]	Western Allegheny Mountains	High Allegheny[2]	Central Low Plateau	Coalfields[3]	Ohio Valley Lowlands	Northern Blue Ridge Mountains	Teays-Elk Plateau	Great Valley	East Hocking Plateau
Calopterygidae	*Calopteryx*	*amata*		x	x	x		x					
	Calopteryx	*angustipennis*	x		x	x							
	Calopteryx	*maculata*	x	x	x	x	x	x	x	x	x	x	
	Hetaerina	*americana*	x	x	x		x	x	x	x	x	x	
	Hetaerina	*titia*					x		x			x	
Lestidae	*Archilestes*	*grandis*		x	x		x					x	
	Lestes	*australis*	x			x			x				
	Lestes	*congener*	x	x	x	x	x						
	Lestes	*disjunctis*		x	x	x					?		
	Lestes	*dryas*	x						x				
	Lestes	*eurinus*	x	x	x	x	x	x				x	
	Lestes	*forcipatus*	x	x	x	x		x	x				
	Lestes	*inaequalis*	x	x	x					x			
	Lestes	*rectangularis*	x	x	x	x	x	x	x	x		x	
	Lestes	*unguiculatus*	x										
	Lestes	*vigilax*	x	x	x	x	x	x	x				
Coenagrionidae	*Amphigrion*	*saucium*	x	x	x	x	x	x				x	
	Argia	*apicalis*	x	x	x		x	x	x	x	x	x	x
	Argia	*fumipennis*	x	x	x	x	x	x	x	x	x	x	x
	Argia	*moesta*	x	x	x	x	x	x	x	x	x	x	
	Argia	*sedula*	x	x			x	x	x	x	x	x	
	Argia	*tibialis*	x	x			x	x	x	x	x	x	
	Argia	*translata*	x	x	x	x	x	x	x	x	x	x	
	Chromagrion	*conditum*	x	x	x	x	x	x	x	x			
	Enallagma	*annexum*	x	x	x	x	x						
	Enallagma	*antennatum*		x	x		x						
	Enallagma	*aspersum*	x	x	x	x	x	x	x		x	x	
	Enallagma	*basidens*	x	x	x	x	x	x	x	x	x	x	
	Enallagma	*boreale*				x							
	Enallagma	*civile*	x	x	x	x	x	x	x	x	x	x	
	Enallagma	*divigans*	x	x	x	x	x	x	x		x		
	Enallagma	*exsulans*	x	x	x	x	x	x	x	x	x	x	
	Enallagma	*geminatum*	x	x	x	x	x	x	x	x	x	x	x
	Enallagma	*hageni*	x	x	x	x	x	x	x				
	Enallagma	*signatum*	x	x	x	x	x	x	x		x	x	
	Enallagma	*traviatum*	x	x	x		x	x	x	x	x		
	Enallagma	*vernale*		x	x	x							
	Enallagma	*vespersum*	x	x	x	x	x						
	Ischnura	*hastata*	x	x	x	x	x	x	x			x	
	Ischnura	*kellicotti*						x					
	Ischnura	*posita*	x	x	x	x	x	x	x	x	x	x	x
	Ischnura	*prognata*	x										
	Ischnura	*verticalis*	x	x	x	x	x	x	x	x	x	x	x
	Nehalennia	*gracilis*		x		x							
	Nehalennia	*irene*	x	x	x	x		x					
	Telebasis	*byersi*							x				
Petaluridae	*Tachopteryx*	*thoreyi*	x	x			x	x			x		
Aaeshnidae	*Aeshna*	*canadensis*		x	x	x							
	Aeshna	*tuberculifera*	x	x	x	x	x	x					
	Aeshna	*umbrosa*	x	x	x	x	x	x	x		x		
	Aeshna	*verticalis*	x		x	x	x	x					
	Anax	*junius*	x	x	x	x	x	x	x	x	x	x	
	Anax	*longipes*	x	x	x	x	x	x					
	Basiaeschna	*janata*	x	x	x	x	x	x	x	x	x		x
	Boyeria	*grafiana*	x	x	x	x	x	x	x				
	Boyeria	*vinosa*	x	x	x	x	x	x	x	x	x		

Family	Genus	Species	Northern Ridge & Valley	Allegheny Mountain & Valley[1]	Western Allegheny Mountains	High Allegheny[2]	Central Low Plateau	Coalfields[3]	Ohio Valley Lowlands	Northern Blue Ridge Mountains	Teays-Elk Plateau	Great Valley	East Hocking Plateau
	Epiaeschna	*heros*		x	x	x	x		x		x		x
	Nasiaeschna	*pentacantha*											x
	Rhionaeschna	*mutata*			x	x							
Gomphidae	*Arigomphus*	*villosipes*	x	x	x	x	x	x	x				
	Dromogomphus	*spinosus*	x	x	x	x	x	x	x	x		x	
	Dromogomphus	*spoliatus*	x				x	x	x		x		
	Gomphus	*abbreviatus*	x			x							
	Gomphus	*adelphus*	x	x		x							
	Gomphus	*descriptus*	x	x		x	x	x	x				
	Gomphus	*exilis*	x	x	x	x	x	x	x	x	x		
	Gomphus	*fraternus*		x	x		x		x				
	Gomphus	*lineatifrons*	x	x	x								
	Gomphus	*lividus*	x	x	x	x	x	x	x	x			x
	Gomphus	*quadricolor*	x	x	x	x	x	x	x				
	Gomphus	*rogersi*	x	x				x					
	Gomphus	*vastus*		x	x		x	x	x	x			
	Gomphus	*viridifrons*	x	x	x	x	x	x	x		x		
	Hagenius	*brevistylus*	x	x	x	x	x	x		x			
	Lanthus	*parvulus*	x	x	x	x		x					
	Lanthus	*vernalis*			x								
	Ophiogomphus	*carolus*	x	x									
	Ophiogomphus	*incurvatus alleghan*	x	x									
	Ophiogomphus	*mainensis fastig*	x			x							
	Ophiogomphus	*rupinsulensis*	x	x	x								
	Progomphus	*obscurus*	x		x		x	x	x		x		
	Stylogomphus	*albistylus*	x	x	x	x	x	x	x				
	Stylurus	*notatus*					x						
	Stylurus	*plagiatus*			x					x			
	Stylurus	*scudderi*						x					
	Stylurus	*spiniceps*			x		x			x			
Cordulegastridae	*Cordulegaster*	*bilineata*		x		x							
	Cordulegaster	*diastatops*		x	x	x		x					
	Cordulegaster	*erronea*	x	x	x		x	x					
	Cordulegaster	*maculata*	x	x	x	x	x	x	x		x		
	Cordulegaster	*obliqua*	x	x		x	x	x	x				
Macromiidae	*Didymops*	*transversa*	x	x	x	x	x	x	x	x			
	Macromia	*alleghaniensis*	x	x			x	x	x				
	Macromia	*illinoiensis*	x	x	x	x	x	x	x	x	x		
	Macromia	*taeniolata*	x				x	x	x				
Corduliidae	*Cordulia*	*shurtleffi*	x	x	x	x		x	x				
	Epitheca	*canis*			x	x							
	Epitheca	*costalis*		x									
	Epitheca	*cynosura*	x	x	x	x	x	x	x	x	x		
	Epitheca	*princeps*	x	x	x	x	x	x	x	x	x		x
	Helocordulia	*uhleri*	x	x		x	x	x					
	Neurocordulia	*molesta*					x		x				
	Neurocordulia	*obsoleta*							x				
	Neurocordulia	*yamaskanensis*	x	x			x	x					
	Somatochlora	*elongata*	x	x		x							
	Somatochlora	*forcipata*				x							
	Somatochlora	*linearis*		x		x		x	x				
	Somatochlora	*tenebrosa*	x	x	x	x		x	x	x	x		
Libellulidae	*Celithemis*	*elisa*	x	x	x	x	x	x	x	x	x		x
	Celithemis	*eponina*	x	x	x	x	x	x	x	x		x	x
	Celithemis	*fasciata*	x	x			x	x		x	x		
	Celithemis	*verna*								x			
	Erythemis	*simplicicollis*	x	x	x	x	x	x	x	x	x	x	x
	Erythrodiplax	*miniscula*	x	x									
	Ladona	*deplanata*	x	x			x	x		x			
	Ladona	*julia*	x	x	x	x							
	Leucorrhinia	*glacialis*				x							
	Leucorrhinia	*hudsonica*	x			x							

Family	Genus	Species	Northern Ridge & Valley	Allegheny Mountain & Valley[1]	Western Allegheny Mountains	High Allegheny[2]	Central Low Plateau	Coalfields[3]	Ohio Valley Lowlands	Northern Blue Ridge Mountains	Teays-Elk Plateau	Great Valley	East Hocking Plateau
	Leucorrhinia	*intacta*	x	x	x	x	x	x		x			
	Libellula	*auripennis*			x	x							
	Libellula	*axilena*	x			x							
	Libellula	*cyanea*	x	x	x	x	x	x	x		x	x	x
	Libellula	*flavida*	x		x	x							
	Libellula	*incesta*	x	x	x		x	x	x	x	x	x	x
	Libellula	*luctuosa*	x	x	x	x	x	x	x	x	x	x	x
	Libellula	*pulchella*	x	x	x	x	x	x	x		x	x	x
	Libellula	*quadrimaculata*							x				
	Libellula	*semifasciata*	x	x	x	x	x		x	x			
	Libellula	*vibrans*	x					x	x			x	
	Pachydiplax	*longipennis*	x	x	x	x	x	x	x	x	x	x	x
	Pantala	*flavescens*	x	x	x		x	x		x	x	x	x
	Pantala	*hymenaea*			x	x	x	x	x	x	x	x	
	Perithemis	*tenera*	x	x	x	x	x	x	x	x	x	x	x
	Plathemis	*lydia*	x	x	x	x	x	x	x	x		x	x
	Sympetrum	*ambiguum*							x				
	Sympetrum	*corruptum*	x										
	Sympetrum	*internum*	x			x				x			
	Sympetrum	*obtrusum*	x		x	x			x	x			
	Sympetrum	*rubicundulum*	x	x	x	x	x	x	x	x	x	x	x
	Sympetrum	*semicinctum*	x		x	x	x	x				x	
	Sympetrum	*vicinum*	x	x	x	x	x	x	x	x		x	x
	Tramea	*carolina*		x	x		x						x
	Tramea	*lacerata*	x	x	x	x	x	x	x	x	x	x	x
	Tramea	*onusta*					x	x					
Total Species			**107**	**103**	**97**	**96**	**90**	**89**	**78**	**53**	**48**	**40**	**26**

= species documented from at least 9 of the 11 eco-regions in West Virginia

1. Allegheny Mountain and Valley includes Eastern Allegheny Mountain and Valley and Western Allegheny Mountain and Valley eco-regions
2. High Allegheny includes Northern High Allegheny and Southern High Allegheny eco-regions
3. Coalfields includes Eastern Coalfields and Western Coalfields eco-regions

Appendix 3. Photographic credits

Photographs are listed in the order that they appear in Appendix 1 for each photographer. All photographers donated their work free of charge for educational and illustrative purposes for the West Virginia Dragonfly and Damselfly Atlas. M = image of male specimen, F = image of female specimen.

Giff Beaton (www.giffbeaton.com/dragonflies.htm)
Calopteryx angustipennis MF, *Hetaerina titia* MF, *Archilestes grandis* F, *Lestes australis* F, *Lestes congener* M, *Lestes eurinus* M, *Lestes inaequalis* M, *Amphigrion saucium* F, *Argia apicalis* F, *Argia sedula* F, *Argia translata* F, *Chromagrion conditum* F, *Enallagma basidens* MF, *Enallagma civile* F, *Enallagma divagans* MF, *Enallagma geminatum* MF, *Enallagma signatum* F, *Enallagma traviatum* MF, *Enallagma vesperum* F, *Ischnura kellicotti* MF, *Ischnura prognata* MF, *Nehalennia gracilis* MF, *Telebasis byersi* MF, *Tachopteryx thoreyi* F, *Aeshna umbrosa* F, *Anax junius* F, *Anax longipes* F, *Basiaeschna janata* F, *Boyeria grafiana* M, *Boyeria vinosa* F, *Nasiaeschna pentacantha* MF, *Arigomphus villosipes* M, *Dromogomphus spoliatus* M, *Gomphus lineatifrons* F, *Gomphus lividus* MF, *Gomphus rogersi* F, *Gomphus vastus* M, *Hagenius brevistylus* M, *Lanthus vernalis* M, *Ophiogomphus incurvatus alleghaniensis* F, *Ophiogomphus mainensis fastigiatus* MF, *Progomphus obscurus* 2M, *Stylogomphus albistylus* M, *Stylurus plagiatus* MF, *Cordulegaster bilineata* F, *Cordulegaster erronea* MF, *Cordulegaster maculata* F, *Cordulegaster obliqua* MF, *Didymops transversa* M, *Macromia alleghaniensis* M, *Epitheca costalis* F, *Epitheca princeps* M, *Helocordulia uhleri* MF, *Neurocordulia molesta* MF, *Neurocordulia obsoleta* MF, *Somatochlora linearis* F, *Celithemis elisa* F, *Celithemis eponina* F, *Celithemis fasciata* F, *Celithemis verna* MF, *Erythrodiplax minuscula* MF, *Ladona deplanata* F, *Libellula auripennis* MF, *Libellula cyanea* F, *Libellula incesta* F, *Libellula luctuosa* F, *Libellula pulchella* F, *Libellula vibrans* MF, *Pantala flavescens* MF, *Sympetrum ambiguum* MF, *Sympetrum corruptum* F, *Sympetrum rubicundulum* MF, *Sympetrum vicinum* F, *Tramea carolina* MF, *Tramea onusta* M

Allen Barlow
Gomphus quadricolor MF, *Gomphus viridifrons* M, *Neurocordulia yamaskanensis* M

Michael Blust
Sympetrum internum/janeae MF

Steve Collins
Somatochlora forcipata F

Glenn Corbiere (www.dragonhunter.net)
Rhionaeschna mutata MF, *Ophiogomphus carolus* MF, *Somatochlora forcipata* M

Stephen Cresswell (www.stephencresswell.com)
Calopteryx maculata M, *Hetaerina americana* M, *Archilestes grandis* M, *Lestes australis* F, *Lestes congener* F, *Lestes vigilax* M, *Argia apicalis* M, *Argia fumipennis* M, *Argia translata* M, *Enallagma exsulans* M, *Enallagma hageni* M, *Enallagma signatum* M, *Enallagma vesperum* M, *Ischnura hastata* M, *Ischnura posita* M, *Ischnura verticalis* MF, *Aeshna canadensis* M, *Aeshna*

tuberculifera F, *Dromogomphus spinosus* M, *Gomphus adelphus* M, *Gomphus exilis* M, *Cordulegaster diastatops* M, *Erythemis simplicicollis* M, *Leucorrhinia glacialis* M, *Leucorrhinia hudsonica* M, *Leucorrhinia intacta* M, *Libellula cyanea* M, *Libellula pulchella* M, *Libellula semifasciata* M, *Sympetrum corruptum* M, *Sympetrum obtrusum* M, *Sympetrum semicinctum* F, *Sympetrum vicinum* M, *Tramea lacerata* MF

Dave Czaplak (odolep.com/index.htm)
Lestes inaequalis F, *Argia tibialis* MF, *Enallagma aspersum* MF, *Enallagma exsulans* F, *Enallagma hageni* F, *Nehalennia irene* F, *Aeshna canadensis* F, *Aeshna tuberculifera* F, *Aeshna verticalis* MF, *Basiaeschna janata* M, *Arigomphus villosipes* F, *Dromogomphus spinosus* F, *Gomphus descriptus* M, *Gomphus lineatifrons* M, *Gomphus rogersi* M, *Gomphus vastus* F, *Gomphus viridifrons* F, *Lanthus parvulus* F, *Ophiogomphus rupinsulensis* M, *Cordulegaster bilineata* M, *Cordulegaster maculata* M, *Macromia alleghaniensis* F, *Macromia i, illinoiensis* F, *Macromia taeniolata* M, *Cordulia shurtleffi* MF, *Epitheca canis* MF, *Somatochlora elongata* MF, *Somatochlora tenebrosa* MF, *Leucorrhinia glacialis* F, *Libellula axilena* M

Marion Dobbs
Ophiogomphus incurvatus incurvatus M to illustrate *O. i. alleghaniensis* M

Charles Fortney
Plathemis lydia F

Linda Gilbert
Enallagma antennatum F

Christine Hanrahan
Stylurus notatus M

Joey Herron
Plathemis lydia M

Cheryl Jennings
Pantala hymenaea M

Greg W. Lasley (www.greglasley.net/dragonix.html)
Lestes dryas F, *Argia moesta* M, *Dromogomphus spoliatus* F, *Enallagma annexum* M & pair, *Macromia taeniolata* F, *Epitheca princeps* F, *Ladona julia* M, *Leucorrhinia intacta* F, *Sympetrum obtrusum* F, *Tramea onusta* F

David McShaffrey (www.marietta.edu/~odonata/images.html)
Calopteryx amata M, *Hetaerina americana* F, *Lestes rectangularis* M, *Lestes unguiculatus* MF, *Enallagma antennatum* M, *Anax junius* tandem, *Anax longipes* M, *Boyeria vinosa* M, *Epiaeschna heros* F, *Hagenius brevistylus* F, *Macromia i. illinoiensis* M, *Epitheca cynosura* F, *Libellula incesta* M, *Perithemis tenera* MF

Thomas Murray (www.pbase.com/tmurray74)
Calopteryx amata F, *Argia moesta* F, *Lestes disjunctus* MF, *Lestes eurinus* F, *Argia fumipennis* F, *Enallagma boreale* MF, *Enallagma civile* M, *Ischnura hastata* F, *Gomphus abbreviatus* MF, *Gomphus adelphus* F, *Gomphus descriptus* F, *Lanthus parvulus* M, *Lanthus vernalis* F, *Ophiogomphus rupinsulensis* F, *Stylurus spiniceps* MF, *Cordulegaster diastatops* F, *Epitheca cynosura* F, *Neurocordulia yamaskanensis* F, *Ladona julia* F, *Leucorrhinia hudsonica* F, *Libellula quadrimaculata* F

Darrin O'Brien
Stylurus notatus M

Susan Olcott
Lestes rectangularis F, *Aeshna umbrosa* M, *Boyeria grafiana* M, *Celithemis eponina* M, *Libellula luctuosa* M, *Sympetrum semicintum* M

Dennis Paulson (www.ups.edu/x5667.xml)
Enallagma vernale MF, *Gomphus fraternus* MF

Jeffery S. Pippen (www.duke.edu/~jspippen/dragonflies.htm)
Calopteryx maculata F, *Lestes dryas* M, *Lestes vigilax* F, *Amphigrion saucium* M, *Argis sedula* M, *Chromagrion conditum* M, *Ischnura posita* F, *Epiaeschna heros* M, *Gomphus exilis* F, *Progomphus obscurus* M, *Stylurus albistylus* F, *Didymops transversa* F, *Epitheca costalis* M, *Somatochlora linearis* M, *Celithemis elisa* M, *Celithemis fasciata* M, *Ladona deplanata* M, *Libellula axilena* F, *Libellula quadrimaculata* M, *Libellula semifasciata* F, *Pachydiplax longipennis* MF

Mark Plonsky (www.pbase.com/mplonsky/dragons)
Nehalenniia irene M, *Erythemis simplicicollis* F