





























## Striped Emeralds - male appendages (continued) Macha Emerald Mocha Emerald Coppery Emerald Coppery Emerald Fine-lined Emerald Fine-lined Emerald Calvert's Emerald Calvert's Emerald Treetop Emerald Treetop Emerald Ozark Emerald Ozark Emerald Texas Emerald Texas Emerald Hine's Emerald Hine's Emerald Clamp-tipped Emerald Clamp-tipped Emerald

From: Dragonflies and Damselflies of the East by Dennis Paulson

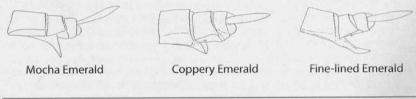
## Striped Emeralds - female abdomen tip Ringed Emerald Hudsonian Emerald Lake Emerald Whitehouse's Emeraldn Incurvate Emerald Forcipate Emerald Kennedy's Emerald Ski-tipped Emerald Williamson's Emerald Ocellated Emerald Brush-tipped Emerald

Quebec Emerald

Muskeg Emerald

**Delicate Emerald** 

Plains Emerald













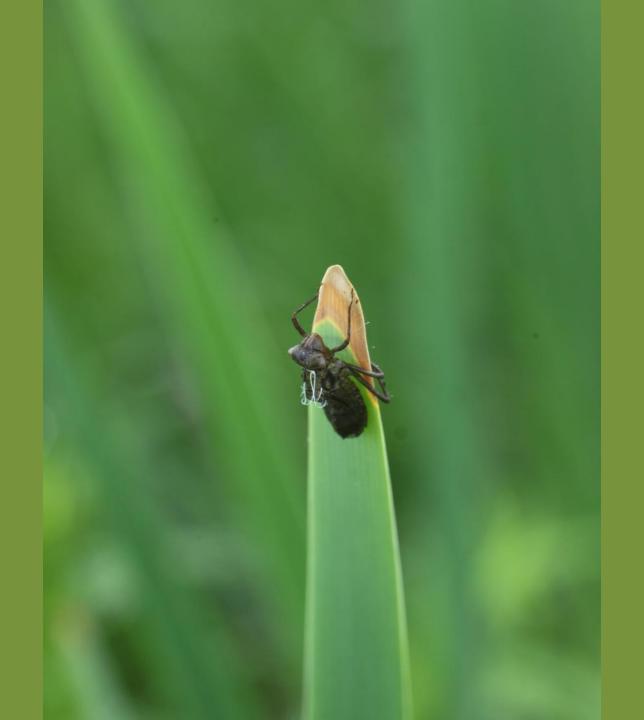










































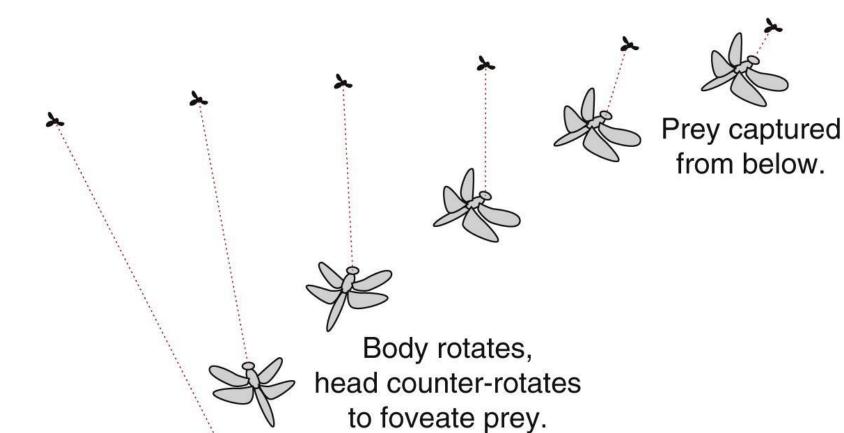






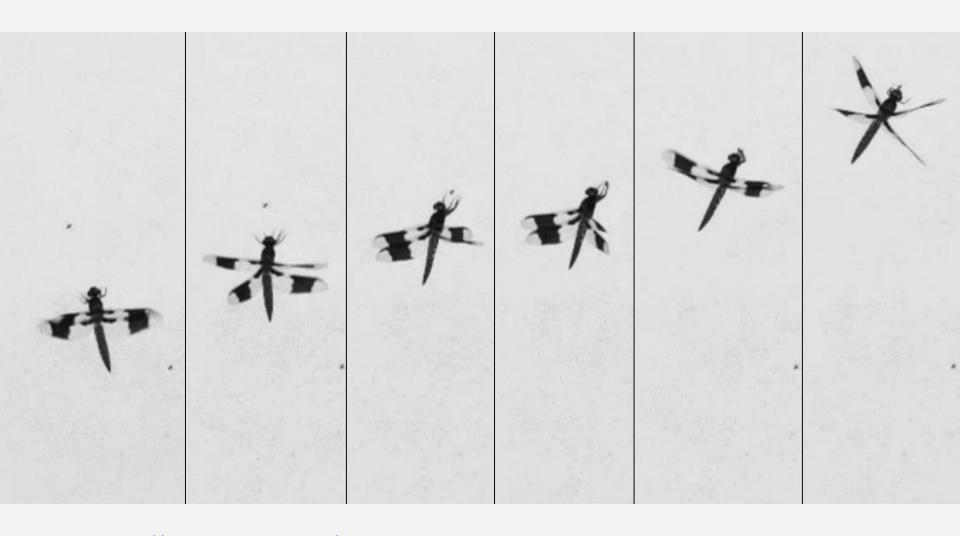






Dragonfly detects prey and takes off.

From: "Motor Control: How Dragonflies Catch Their Prey" by Michael H.Dickinson Current Biology (2015) 25: R232-R234



From: https://www.thedodo.com/dragonfly-predicts-top-gun-876349443.html https://www.janelia.org/lab/leonardo-lab





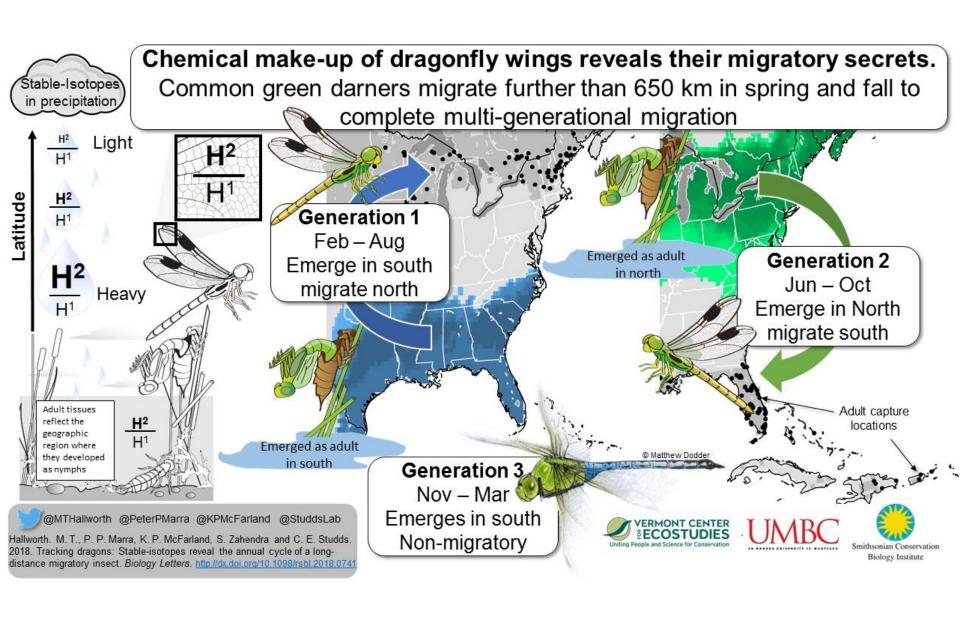


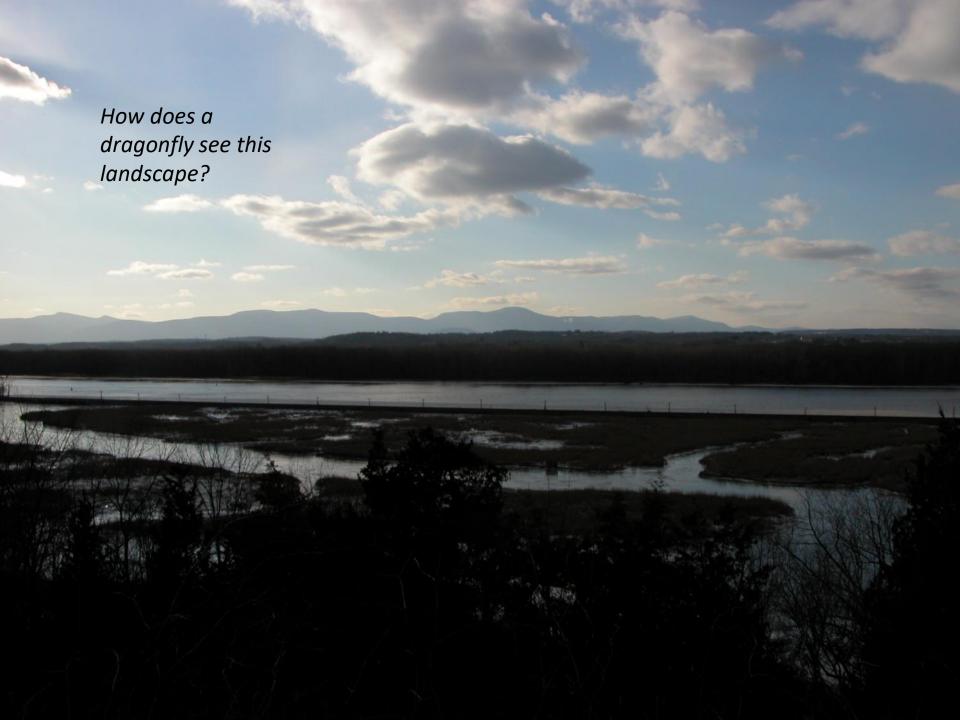
Georg Schmider, Zeller Kermaische Fabriken, Zell, Germany. Circa 1900. (image from ebay.com)





https://vtecostudies.org June July August /blog/move-overmonarchs-vce-andcolleagues-revealastonishing-dragonflymigration/ May September Migrant & Local Generation, Northward Migration Southward Migration March October Non-migratory Generation 3 February January November











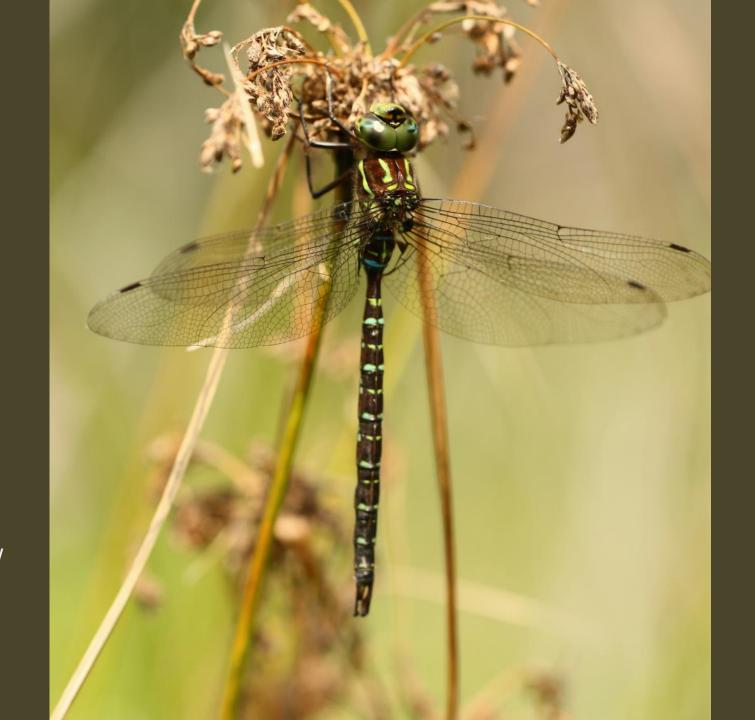




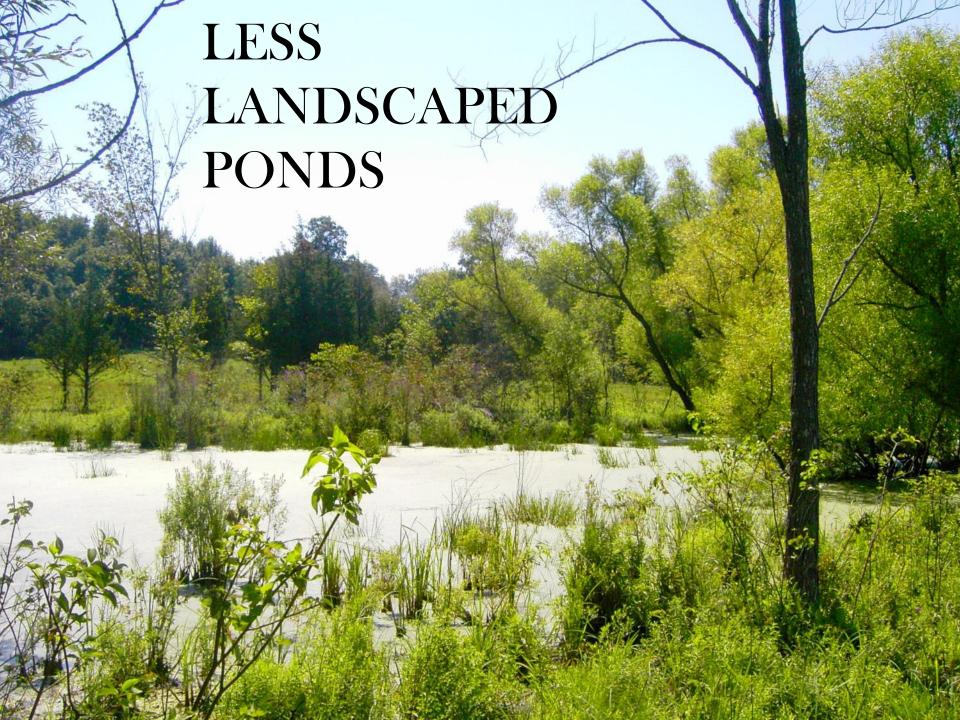








SHADOW DARNER













Dependent Variable: Specialist Dragonflies & Damselflies

% of Variation Explained by Model: 15%

Number of Ponds in Analyses: 84

	Standardized	"Significance"
Significant Variable	Coefficient	of Effect
Presence of Fish	-0.215	0.039
% Pasture within 100'	0.306	0.004

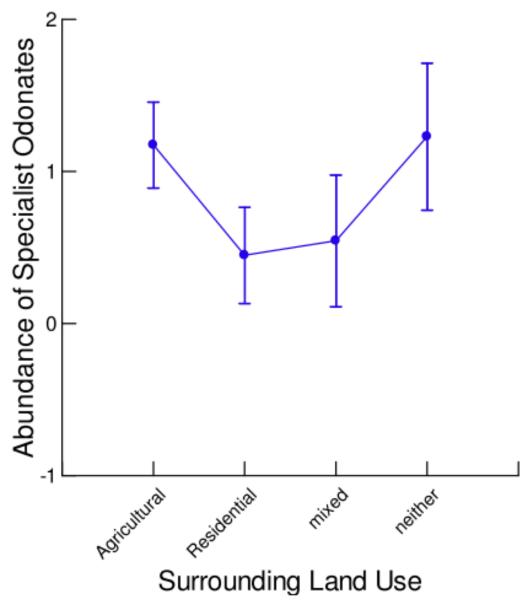
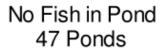


Fig. 80. The abundance of Specialist Dragonflies and Damselflies at ponds in different land use contexts. These insects tended to be more common at agricultural than residential ponds.



## With Fish in Pond 32 Ponds

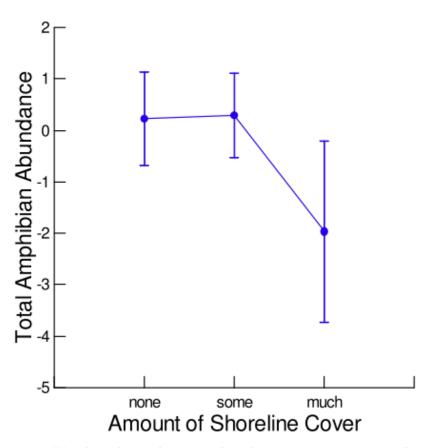


Fig. 71. The relation between shoreline vegetative cover and amphibian abundance in the absence of fish. If anything, amphibian abundance was lower in ponds with much cover.

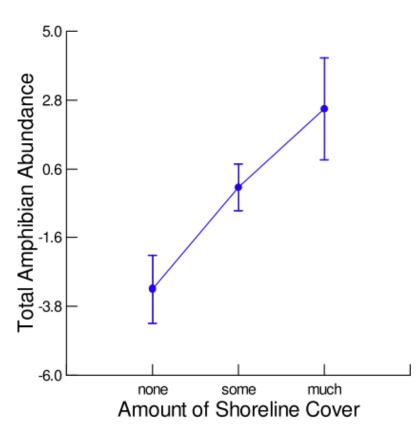


Fig. 72. The relation between shoreline vegetative cover and amphibian abundance in the presence of fish. Amphibian abundance appeared to increase with increasing shoreline cover.

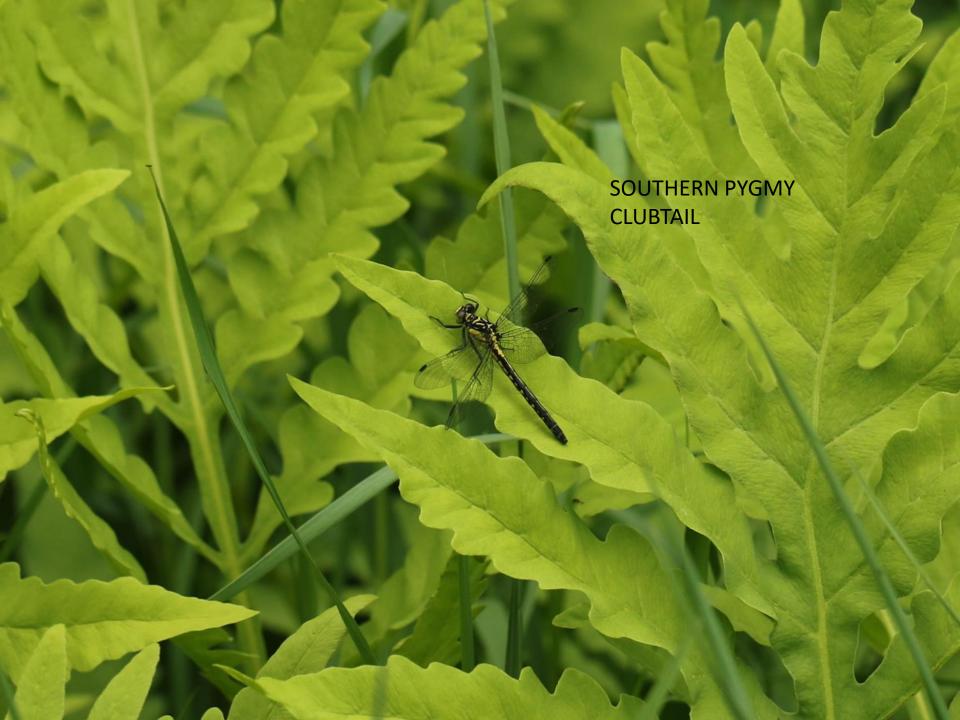


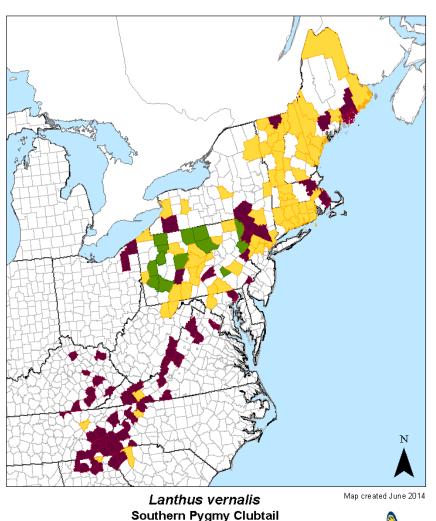
## ROCKY HEADWATER STREAMS











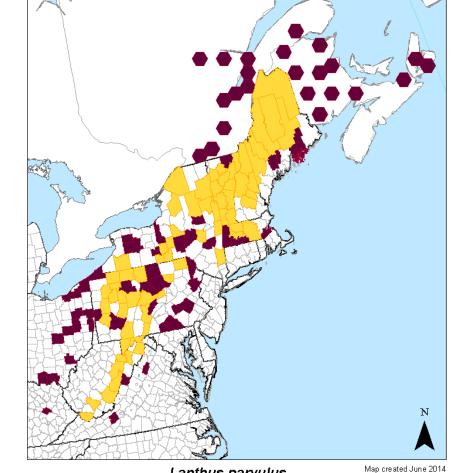
Southern Pygmy Clubtail

Modern Record (post 1969)

Historical Record (pre 1970)

Date Unknown 280 560





Lanthus parvulus Northern Pygmy Clubtail

Modern Record (post 1969)

Date Unknown





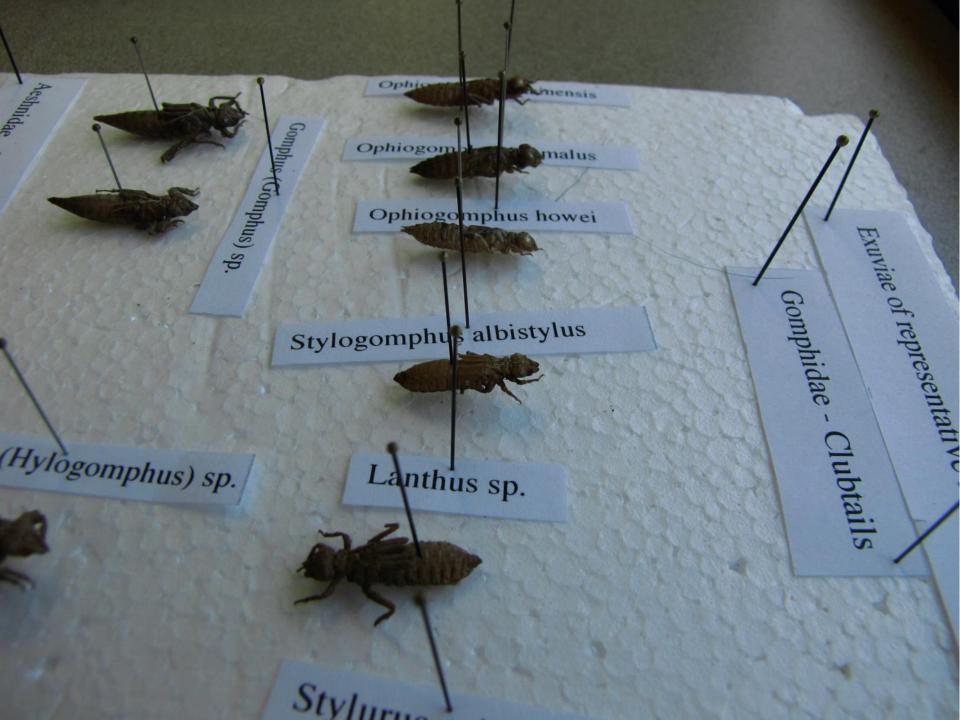


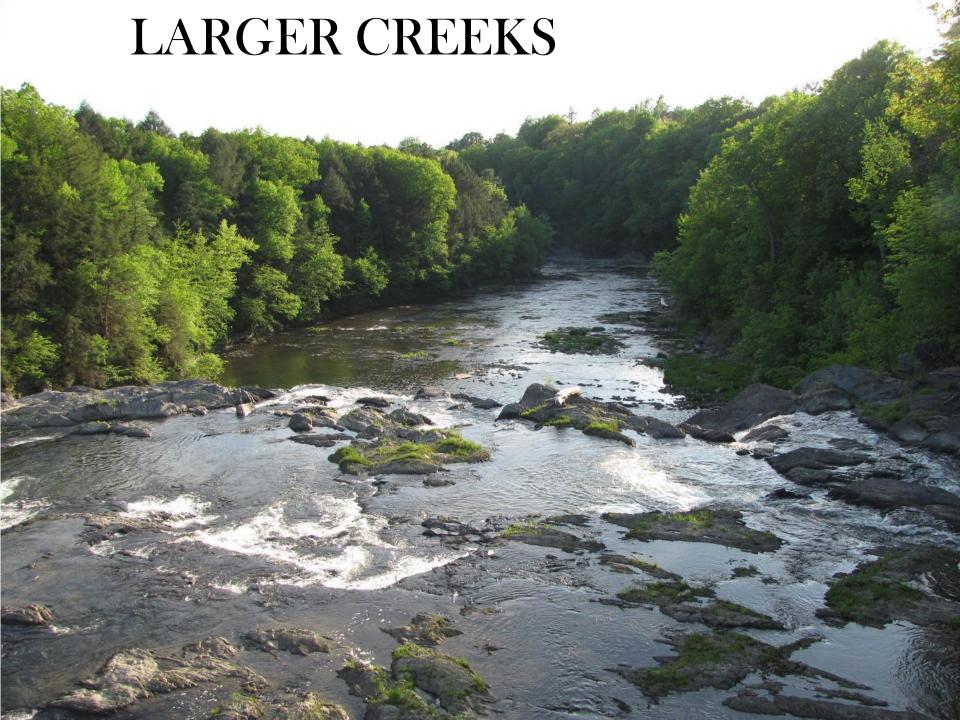














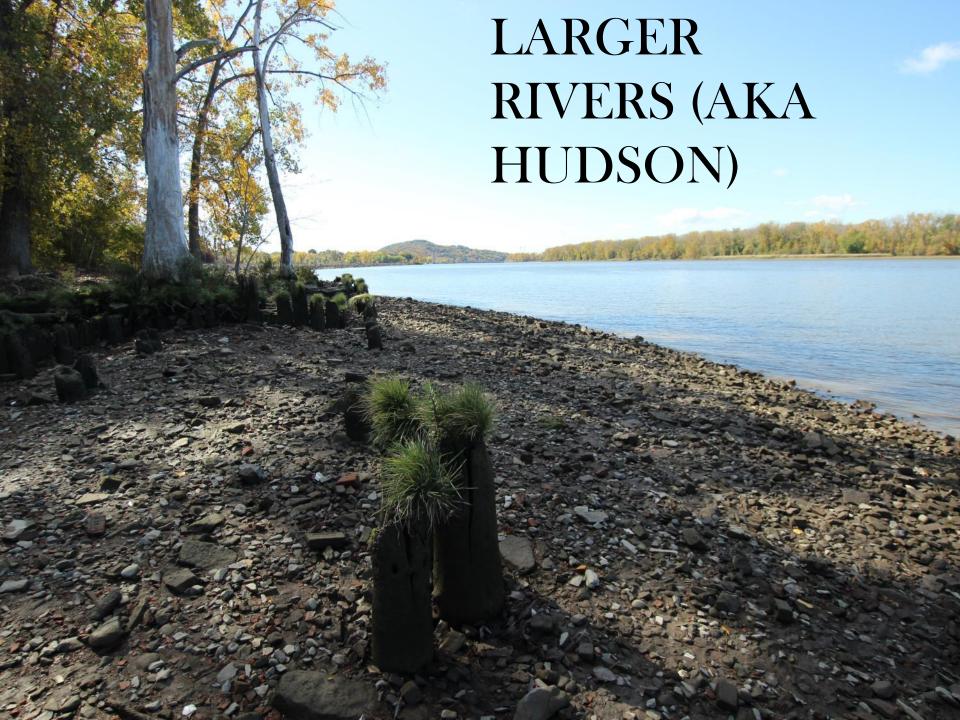






**Table 8: Odonates (dragonflies and damselflies) found during our floodplain work.** Blue highlighted species are ones who appear, based on the literature, to be tied to riverine or stream environments.

Species	Occurrence at our 15 Sites (%)	Species	Occurrence at our 15 Sites (%)	
Ebony Jewelwing	14 (93%)	Familiar Bluet	2 (13%)	
Least Clubtail	9 (60%)	Rusty Snaketail	2 (13%)	
Variable Dancer	9 (60%)	Slender Spreadwing	2 (13%)	
Fawn Darner	8 (53%)	**Spine-crowned Clubtail	2 (13%)	
Stream Bluet	8 (53%)	Spreadwing sp.	2 (13%)	
Illinois River Cruiser	7 (47%)	12-spotted Skimmer	1 (7%)	
Black-shouldered Spinyleg	5 (33%)	**Arrow Clubtail	1 (7%)	
**Brook Snaketail	5 (33%)	Azure Bluet	1 (7%)	
Common Whitetail	5 (33%)	Black Saddlebags	1 (7%)	
Eastern Forktail	4 (27%)	Common Green Darner	1 (7%)	
Fragile Forktail	4 (27%)	Eastern Amberwing	1 (7%)	
Powdered Dancer	4 (27%)	Emerald Spreadwing	1 (7%)	
"Red" Meadowhawk	3 (20%)	Harpoon Clubtail	1 (7%)	
Blue Dasher	3 (20%)	Lance-tipped Darner	1 (7%)	
Dragonhunter	3 (20%)	Lilypad Clubtail	1 (7%)	
Eastern Pondhawk	3 (20%)	Mustached Clubtail	1 (7%)	
Ophiogomph spp.	3 (20%)	Riffle Snaketail	1 (7%)	
River Jewelwing	3 (20%)	Shadow Darner	1 (7%)	
Zebra Clubtail	3 (20%)	Superb Jewelwing	1 (7%)	
Ashy Clubtail	2 (13%)	Twin-spotted Spiketail	1 (7%)	
Common Baskettail	2 (13%)	Umber Shadowdragon	1 (7%)	
Dusky Clubtail	2 (13%)	Widow Skimmer	1 (7%)	





BIG BLUET



RUSSET-TIPPED CLUBTAIL



## DRAGONFLIES & DAMSELFLIES OF COLUMBIA COUNTY



ODSCRIPTION. This is a very distinctive domasity, with

ENLYMENT EXPLICATION OF White wood quite a few fewer denselyings, although it is considered incommon to or white. It can be seen around all types of yimms and DEBAYOURGENDANCE. We have only one Departs COURTON: This medicar sized approfession must

dustrially samp agarties to Montally. BEAMVERING BENDAMVER, No have rights service adversatioped Sparrodovings andy samily to one varys. It is are limited as 20004. They are must offers found ownered.

BUSCHPEON: Like all specialwings the Eligenst Specialwing is long and almoste, and habit its wings apart when purched. It is entertail green with the lower half of the from lighter and a bloot igs of the although. It is band Depart Phonodestops, Inst. N. to not considered endangered. Loss be bound unto eti 3 notes to and shaded

DESCRIPTION: This long this remedining looks similar to some other species, but it is notice to having white riog tipa.

enableings quite regularly. It was be limat owned raind grade and small clearings.

DESCRIPTION: This is a relatively small, stocker periodwing with a mostly blade grey body with light reliew robes and blue area.



COUNTEPTRIES. This is one of the biggers, the mortilless in one news. It is light bloor, with a bright, yellow justice on the iron position of its discount. RESCRIPTION OF SHARE PROPERTY.

RESERVED CRANKE NEWSCIE. As well as being one of our aggest damostilles, the Acrons is also sec-of our most commer. It can be found over most water, repealedly slow moving or stages at peods where they our be seen fifting

DESCRIPTION: This would, should blank to distinct the black flower with bright black lip.

REBAYOURABINDANCE This to one of our most

DOUBLEFIEDG. This reductively large simulately can be lasted to tell apartification sidner panel blants. Moreover, issue distributioning characteristics are the tree with Mark, doesnot strapes, and the accordingle making at the log of

the abdomous BERAVIOUS/ABCNYMACE: This damed is most obou found around swarage pands, or along situs moving rivery. Although we have begat it relativally offer, it is riseasified IRRAEMITTION This is a relatively small obsert that hade two similar to network offers species. Heart are easily recognizable distinguishing furtures in both makes and formine the blank does like of tipe on the thoma; is divided down the control to a Size Hos limit DESENVERUE ARELINGUISCE: We say Boulds-styped

Double-steined Blues (New Degree Southboard)

EXCEPTION. This is a relatively taxed blood that had



MONTEPTION: The Eastern Forbial to could and region. This openion is made intendified by the mater's seem thomas and blank abbones with blue-lip. Francisco as be-dull grey blue with green cyce or bright orange th black strapes and abboness. with black stripes and abdomest.

REEA/101 EA/RUNDANCE: These are probably the mo-

BEST CURRENT WAS DESCRIBED TO THE PARTY OF T

HOCKEPTION. This is a relatively small departite. acily identified by the bright sed relevation of both search tona held statilar to the stange variant of bousin Easter Arthrails, but our be-distinguished by the relative lack of





etingushed flore other forthalls by the upside-down climentise points no its shoulders. Make are a bright sep, with females a store subdated gree public. NEW STREET, MANUAL PRINTED WITH COME ROTHER Printing

Perfectly quite frequency. They can be bond to a mage-habitate, from the edges of peods, forcested on simps, and



DESCRIPTION: This is a small blook. The male is mostly due white the ficulty is a provinces. Hard to distinguish turn the Mandy Black in the field.

DEBUGOURGENOUSCE: We are Reports Floris sub-

abstracting blackleds sectains on the abdeson giving was to pure blue for the exceed and third to last segment in our to indictinguishable from other blocks in the field.

REPORTED TO ANY INDIANCE We have several Month ers. They can be fined arrest wetlands and spot

REPAYOUR WARRANCE We have not own more

Orango West Hisoflogmo eignetand

DESCRIPTION: This is the only makes block in our and

SECUVIOUS ABONDANCE We have soon pole a few warps blacks. It does be boost more all series of skill restor

RESCRIPTION This is one of the largest detaction in n is nowly Mark, while the theory is a distinct two

RECURSIONAL STANCE We are previous descrip-terescionally, and it is relatively common to our error. It can be local around medium to large rivers, pends, and



BENCKEPTON: This is no extremely small, alcohor distinctly. It has a mixtallic green sheets on its abdomer, and upper froms, and a bias under fully.

RELEVEN BUILDINGS We have seen theigh figures read-early, although due to their email size thay are and to upon. They can be found in not, greace, mostly



must 8 in the only people domacity in our won-

Vesper Blast (Bisellagma conserum)

over fibure. Where it was by locard, it is consilly assume

Black-tipped Darner Clastina tolerrufl/rei DESCRIPTION: This desgrouly is similar to the Cannals Darroer, the Greats at time! Darroes, and the Lauroe tipped Darroer, with two-forced generalises chared at tipe a and a month of those decisions. Economic the instinction of the tips of

us he a rhallenge to tall uport from other similar specie. Top for here to a small yellow quit between the ries

ot oterflar to the Common Open Berner Brown by tinguished from this species by the bright red (in blass) RESEAUXILICATEUX DANCE. We have only seen a real d Council Engages, and never change as afficial covery. It on a NV status of SQ, or "capeable", it can be train? of pends paraciling or hunting over fields, although



















## DRAGONFLIES & DAMSELFLIES OF COLUMBIA COUNTY





rishbad can be extremely bank to distinguish from other stated is, although the electroneer can be set the possibilities.

month bown, and has a relatively small clob. While it sut he hard to distinguish from other clobes is, it can be said upon he the light yellow detail markings on he

DESCRIPTION: This is a scheduly small Chicago D in



sizes. It has a thin black abdonue, with a yould club and thin pullow rings. It has given error

REPLANTICULARIES DANCE. We see Least Christolic out.



Lileand Clobtall (Arignmetter forción)

BERANCIANARINTALIONS We have only usen a couple of Libyard Childran in Dr in not considered undergonal. It was must often be found around at \$2 system and slow



true childulla, and it is considered amounts as New lab. It can be found over until studied streams.

Bill'le Papitetolia, unil 8 in considered automotio in New York, House be found more with streams and small ever





they approach its pronounced chile.

BELLEVICE ROLLEVING NAMED AND ADDRESS OF THE PROPERTY AND ADDRESS OF THE PARTY ADDRESS OF THE PARTY ADDRESS OF THE PARTY AND ADDRESS OF THE PARTY ADDRESS OF THE PART agened. It can mainly be found around pouls and



ESSAMURANAMUNIANCE We have more only one During Chale all, although it is reconstanced parents by New York. They fly steet sleet moving or still mater last to the

DESERVED CIRCURES DANCE. We have mile own three Beltre, Childade, and it is considered uncommon in N Volk, It can be seen until to chroma and studi rites?



DESIGNATERN: This Emmer is quite may be distinguish from all offers dragonilles. It is almost extinctly black, such a single profiles darred extinctly black, such a single profiles darred strategy and a premium of priling general distribution of the abdence. By open one bright govern

BERAYDORANG NDANCE We see I Blook Benefit chaded rivers, although their ran to make in those-open



their applicated. It has reflect mentages on the value and funishers of its thereo, and pains of seamled yellow their turning down its obtaines.

REBUXTOCESARCISEARCIC We have only men travel boss drugoraftins, allthough in is not endangered. It can be seen normal pooks, alcaded etmanus and patrolling along



RESCRIPTION This model (Time), dort-be-web-lieb tadio dragondy is relatively increasives on, and rate by hallenge to distinguish from other constable. However, he and flated abdumen tip help to manuschess the

REPLYCHOLDER AND ROBATOCK We have only come actual



or, metallic brown thoras and abdoness and eyes tha

REBANDARIANISTANCE. We have seen only two



th a brown thoses and black abdoness with yellow-sp is similar in appearance to other backettain, the only disputating feature teing a small Mark spot at the ba

DEATHOUGH ARUNDANCE, We have you





ELECTRICAL CENTRAL CENTRAL CENTRAL CONTROL CON



quicked from other mondowhowto to the ember or at the base of its wings. Hencover, this can be less



tirely easy to identify because of the block "sold lin" stool usings. Also, the bright solders dat at its otherwisk is abdomics to a very distinctive feature.



Blue Durine (Parkol/plan benjippenis). HOUSEPPERSON, There is a specific framewille, and marrie

BEELEVICEBUADUNESCHIC The Bits Darbor in a recessor disagnetic. It can be found alcorating even on



Cidico Pennant Kehthemis etiect

DECK DETRONS Their court and designates in distinction

GLAVERUS ARENDANCE. We have users much undered Calles Premaints in the meany. It can be to main punds or in months (able presided on the real





I he bright not enhantion. However, it is extractely nition to other mouden breaks much as the Bules, and much including partial also in the field. REMANIOL WARRINGSONCE, Johnson has been soon





Dot-tailed Whitefloo (Leacorrhinic (rigida)



Emises Fondbank (Pertralplax long/pourla)

DESCRIPTION: This is a medium annul droppedly, whole must defining characteristic is the bright white and of the oblimum, Males are a full liber, while females are a

REMOVED CROWN CONTRACTOR Worker Franchis Principal and







BEACKICE ADDITIONS OF the Mady Research





uni brown, and the male has amoral brown, parches legs. The funcion's usuge very from emissily clear to

HAVYOUROREMDANCE, No see Eastern



















