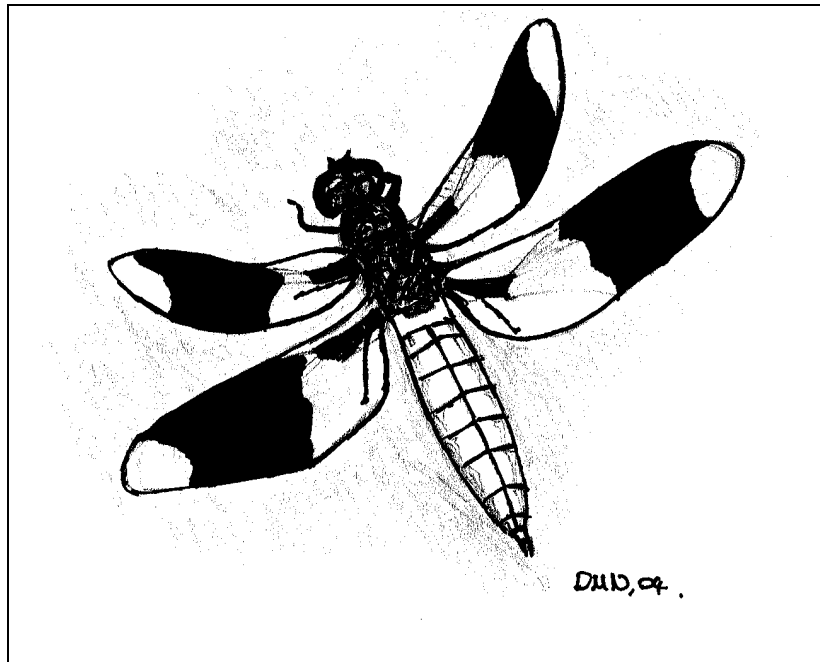


Dragonfly Monitoring Guidelines For the Chicago Region 2005, Edition



*Dragonfly Monitoring Network
DMN, 2005*

Dragonfly Monitoring Network DMN, 2005

These guidelines are based heavily on the Butterfly Monitoring Guidelines, Third Edition, many parts are taken verbatim, and have been adapted for Odonates.

As such, credit should be expressed to the authors of the Butterfly Monitoring Guidelines.

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Introduction

Dragonflies and Damselflies are in the class Insecta, subclass Pterygota (winged, and secondarily wingless insects), order Odonata. The Odonates are further broken down into three suborders, Zygoptera (damselflies), Anisozygoptera, and Anisoptera (dragonflies). Anisozygoptera are generally regarded as intermediate between the two main orders, and as a result have similar features derived from Zygopterans and Anisopterans. So, when we refer to Dragonflies and Damselflies it is easier to refer to them as the Odonates. This group of insects was discovered in the fossil record during the Carboniferous period as Protodonata, and as such is regarded as one of the more ancient group of insects. Their body plan has changed very little in the last 290 to 354 million years. Some species in the fossil record had wingspans of up to two and a half feet.

Odonata spend most of their life cycle in an aquatic nymph stage. The adult stage is spent as an aerial organism, and the eggs are then laid back in the aquatic environment. Because two life stages are based in the water, Odonates are good indicators of wetland health. Dragonfly nymphs are distinguished by a squat and stocky body. The gills are encased within the abdomen and are aerated by a pump that can also provide locomotion. Damselfly nymphs, on the other hand, are elongate and thin, have external gills on the tip of their abdomen, and move with a sinuous fish-like motion. Both groups have a labium (a set of extendable jaws), which they can fire out to catch passing prey.

In Illinois there is one federally endangered dragonfly, the Hines Emerald (*Somatochlora hineana*), and one state threatened species, the Elfin Skimmer (*Nanothemis bella*). Data on these organisms will help us track their populations in order to better protect them and may provide additional support for the protection of wetland areas.

It is very difficult to monitor actual insect population sizes, especially on larger sites. Fortunately, it is far simpler to monitor relative Odonata densities (the number of individuals recorded within an interval of space and time). One promising method of monitoring relative Odonata densities involves the establishment of permanent census routes which can help assess the relative density of an area over time (Pollard 1977). These routes called Pollard Transects were first established to effectively monitor butterflies. This technique is applicable to Odonata because, like butterflies, they are aerial organisms with relatively defined territories Odonata tend to come out on clear warm days and to some degree, range away from wetland sites. Both butterflies and dragonflies are remnant dependent; losing certain habitats would be detrimental to their populations.

By observing Odonates along a consistent route at a given time of day over a number of years, it is possible to establish relative density and population trends of these animals. It is important to remember this technique detects long-term changes. Fluctuations from one year to the next will have little significance.

Census Route Design

Census routes can be used to monitor all of the Odonates that inhabit, or visit, a site. These routes will ideally:

- transect a variety of habitat and/or management units
- take advantage of existing paths or trails wherever possible
- be easy to locate (by others) and repeat in subsequent years
- require anywhere from 1/2 hour to 2 hours to complete. (Large sites may require 2 routes.)

It should be noted that although one would think that Odonates would primarily remain around water sources, they often seek prey some way from their normal water source. So census routes do not have to remain close to wetland vegetation.

The following are wetland subdivisions in Northern Illinois:

- Fen
- Sedge meadow
- Marsh
- River
- Shrub swamp
- Bog

While monitoring on your census routes it is likely that you will walk through different vegetation types including communities more associated with dry landscapes. The following you will probably encounter when monitoring:

- Prairie- subdivided into dry, mesic and wet.
- Sand savanna- subdivided into dry, mesic and wet
- Tall grass savanna- subdivided into dry, mesic, wet or sedge meadow
- Old field- subdivided into, dry, mesic, wet or sedge meadow

Additional subdivisions might involve adjectives such as: “open”, “closed”, and “degraded”

It should be noted that sites with no wetland areas are not suitable for census.

Odonates may initially be concentrated around wetland areas; they may disperse the further from the wetland area. This could result in a lower incidence of sightings.

Census routes should be conceptualized as corridors, 12 meters (approx. 40ft) in width. This will enable census takers to meander enough to avoid serious trampling in sensitive areas, such as sedge meadows. Narrowly defined routes can result in badly trampled paths, and can entice visitors to enter wet areas, and other sensitive areas, that they might otherwise avoid.

Routes that work well on paper will often prove to be less than effective in the field. No problem. Remember that this is a long-term project. If your initial route proves to be less than adequate after the first year, change it. **However, any further changes to the route must be approved by the Dragonfly Network Coordinator.**

Census Procedure

Census data will be of real scientific value if the following criteria are met:

A single observer should take each census. This person may be accompanied by one or more “blind” assistants, which may help in record keeping, and identifications only. Only one person should be spotting the Odonates. If the observer fails to notice an Odonate, their partner should not point it out.

The census taker should:

- proceed at a uniform pace(with route map and census form in hand)
- conduct censuses, between the hours of 10am and 3pm
- conduct censuses, only on days with less than 50 % cloud cover
- conduct censuses, only on days with light to moderate winds
- record all species sighted within a detection radius of roughly 6 meters(20 feet)
- pause briefly to identify fast-moving or elusive individuals, returning to departure point to resume route.

Note: this is a binoculars only protocol, we do not support capture (for ID) and release, anyone found using a net to ID during census will be eliminated from the DMN.

Census period: censuses should ideally be taken on 6 occasions throughout the summer period, from late May through late September/early October.

Record Keeping

Census Route Field Form:

Ubiquitous species are listed to minimize the need for writing during surveys.

Monitors must fill out this form, each time they run their route. Copies of the field forms should be submitted to the Dragonfly Monitoring Network Coordinator, at the end of each season. The DMN Coordinator will then enter the data into the DMN database, and generate, and disperse all annual summaries.

Maps:

Each route should be depicted, to scale if possible, on a site map.

The plant communities, and/or management units traversed by the route should be clearly delineated, and prominent (and hopefully permanent) features, such as the telephone poles, large boulders, or official trails, should be clearly marked.

Certain types of plant will hold different species of insect for which Odonates can feed upon. So it will be important to classify the vegetation type that the Odonate is found in. As mentioned earlier, Odonates are not necessarily found exclusively near wetland areas.

Odonate Identification

Dragonflies and damselflies can be distinguished by the following characteristics. Dragonfly's adults lay their wings out flat while at rest or while perching. In contrast, most Damselflies hold their wings up, and behind them. Dragonflies tend to be stockier in build, and Damselflies are more elongate, and fragile looking. The literal translation of Anisoptera, is unequal wings, and Zygoptera is equal wings. Zygoterans wings are of similar shape, and are held closed over or alongside the abdomen. Anisoptera, (wings are of dissimilar shape), hind wings are considerably broader at the base than at the end, they are held flat or even can be drooping downwards. Dragonfly eyes tend to be very large, and often touch on top of the head. Damselflies on the other hand, have widely separated eyes. These are the basic distinctions, but there can be other factors that increase difficulty in identification. Color dimorphism (color variance between male and female) can complicate accurate identification. Males and females can look wildly different and females of many species look very similar. Added problems include teneral adults. Adult odonata that have not yet reached their full color range, they may look similar to other species or have not developed the patterns that help distinguish them from other species. Many odonates after emerging from the last nymph stage are often brown in color. Sexual maturity may take a couple of days after emergence and this would be when the color develops.

Dragonfly and Damselfly Families of the Chicago Region

Anisoptera (Dragonfly)

Aeshnidae

This family contains the largest species you will see in the Chicago region. Eyes form a seam together across the head. Species typically are 3 inches long.

Gomphidae

Found more often around flowing water such as streams and rivers. Eyes are separated in a style vaguely reminiscent to a hammerhead shark. Also the abdomen is often flared near the final abdominal segments in to what is called a club. The eyes and club are diagnostic. This family is not on the beginner's checklist.

Cordulegastridae

Eyes meet in a single point on the top of the head, fairly large organisms, the eyes are diagnostic. This family is not on the beginner's checklist.

Macromiidae

Have a single stripe across their thorax, they often have a low rapid flight, in appearance are very similar to Corduliidae, only recently separated as a family. Eyes are bright green. This family is not on the beginner's checklist.

Corduliidae

Bright green eyes and may have a bronze or metallic sheen on their body. Have a foot shaped anal loop on the wing, they can be distinguished from skimmers by the lack of a developed toe. This family is not on the beginner's checklist.

Libellulidae

One of the more common dragonfly families, anal loop has well developed toe on its anal loop. This is the family you will see the most.

Zygoptera (Damselfly)

Calopterygidae

Large damselflies often with colored wings, butterfly like flight.

Lestidae

Called the spreadwings, when perched will hold wings partially separated

Coenagrionidae

Wings are clear and will be held together when perched

Appendix A

Basic Guidelines

- **The minimum number of site visits per year should be 6.** Visits on most sites should take place between late May, and September. If you want to go out more, and if you want to extend your season earlier or later, that's OK, as long as there are 6 visits in that season.
- **Monitoring is ideally done on sunny days with low wind and temperatures of at least 70 degrees.** It can be difficult to get completely ideal conditions, but try to time your monitoring to coincide with at least relatively appropriate weather. Very warm (over 80 degrees), cloudy days can be good monitoring days also.
- **Start your monitoring no earlier than 10.00AM. Be sure that you are done by 3.30PM.** A typical monitoring route should take 1-2 hours to complete.
- **EXTREMELY IMPORTANT: Record your starting and ending time.** Observations are translated to individuals observed per hour of observation time. If you don't tell us when you started, and stopped, we can't make this essential calculation.
- **The census route should cover all major habitats and management units within a site.** The site steward should be able to assist you with route setting. If this option is unavailable, the Dragonfly Monitoring Network can assist.
- **Walk the route at a constant pace; stopping only to identify and record Odonates seen within 6 meters (about 20 feet) of the census route.** This results in a corridor of 12 meters (about 40 feet). If you stop for a length of time in one spot, do not monitor while stopped, and record the time stopped in the comments section of your field form. Start monitoring once you resume walking.
- **The Dragonfly Monitoring Network protocol does not include collection of specimens.**
- **Identify species only as far as you can with certainty.** Many excellent reports include observations such as "2 unidentified Odonates in Transect A". Occasionally you will have to report things like "Emerald or Skimmer", if you don't get a good enough look at something. These less precise observations, are still useful data. Never guess. If you don't know, record it as unidentified.
- **Only one person should monitor at a time.** It is actually recommended to take someone else along with you, but only one person should spot the Odonates for consistency.
- **Please submit data promptly at the end of the season.** We will send a reminder when it's time to send your data in.

Appendix B

Field Forms

A field form is provided on the next page.
Make a copy of this form for each route that you run.

Fill out all of the information in the top portion at the beginning of each route (fill in the end time at the end of your route).

If more than one person goes out with you, list yourself as the monitor spotting the Odonates

Round your starting, and ending times off to the nearest 5 minutes. If you start at 10.52, list 10.50.
Get the temperature from an outside thermometer if you have one, or a weather update on the radio.
Estimate the wind conditions, and circle the appropriate choice. Note that there is no choice for very windy. If it is very windy, do not monitor.

Estimate the cloudiness of the sky, and circle the appropriate box. Note there is no choice for very cloudy (more than 50%). If it is very cloudy, do not monitor.

List each habitat type next to the appropriate transect letter, corresponding to that column. For example, if your first area on your route is a wet prairie, list transect A as “wet prairie,” and record all individuals seen in that habitat, in column A.

During monitoring, fill out the following information:

If something is unusual or you feel needs explanation, use the comment section. For example, if you stop for more than two or three minutes for a rest, or to identify an Odonate, note the length of time you stopped monitoring, in the comment section. If there is a disturbance to an area along your route, you can also note that, in the comment section. Anything that you believe might influence your data should be noted here. Please do not use this section for personal notes.

Use one line for each species of Odonate seen along your route (some people prefer to use a separate sheet of paper on the route, then transcribe their counts to the field form). Make a hatch mark for each individual of a species, in the column that represents that plant habitat, in which the individual was seen. For example, if you see a Green Darner in the wet prairie, make one hatch mark in a column A on the row for Green Darner. As you see more Green Darners in that habitat, make additional hatch marks for each individual. Once you move into habitat B, mark any Darners seen in that area in Column B, on the same row.

If a species that you see is not already listed on the field form fill in the name in, on any one of the blank lines provided. Note that the field form groups similar species together. You do not need to do this when adding species.

After monitoring, fill out the following information

Fill in the your ending time in the top portion of the form, round off to the nearest 5 minutes.

Total each species, in each row, in the right column

Room has been left at the bottom of the form, to allow additional sightings of other species to be recorded. Use Dragonflies through binoculars, as the key identification guide.

Census Route Field Form: Site: _____ Date: _____

Monitor: _____ Time: _____ to: _____

Temperature: _____ Wind Conditions (circle one): relatively still, moderately windy

Sky (circle one): clear (80-100% cloudless), partial clouds (50-80% cloudless)

Comments: _____

Species:	Transect:	A	B	C	D	Totals
Common Green Darner <i>Anax junius</i>						
Calico Pennant <i>Celithemis elisa</i>						
Halloween Pennant <i>Celithemis eponina</i>						
White Faced Meadowhawk <i>Sympetrum obtrusum</i>						
Eastern Forktail <i>Ischnura verticalis</i>						
Eastern Pondhawk <i>Erythemis simplicicollis</i>						
Common Whitetail <i>Libellula lydia</i>						
Widow Skimmer <i>Libellula luctuosa</i>						
Carolina Saddlebags <i>Tamea carolina</i>						
Black Saddlebags <i>Tamea lacerata</i>						
Blue Dasher <i>Pachydiplax longipennis</i>						
Wandering Glider <i>Pantala flavescens</i>						
Eastern Amberwing <i>Perithemis tenera</i>						
Ebony Jewelwing <i>Calopteryx maculata</i>						
Twelve Spotted Skimmer <i>Libellula pulchella</i>						

Appendix C

Chicagoland Species List

Anisoptera 57 spp in the Chicago area

Aeshnidae 8 recorded spp in Chicago area

Canada Darner (*Aeshna canadensis*)
Mottled Darner (*Aeshna clepsydra*)
Lance-tipped Darner (*Aeshna constricta*)
Green-striped Darner (*Aeshna verticalis*)
Common Green Darner (*Anax junius*)
Fawn Darner (*Boyeria vinosa*)
Swamp Darner (*Epiaeschna heros*)
Cyrano Darner (*Nasiaeschna pentacantha*)

Gomphidae 15 recorded spp in Chicago area

Horned Clubtail (*Arigomphus cornutus*)
Lilypad Clubtail (*Arigomphus furcifer*)
Jade Clubtail (*Arigomphus submedianus*)
Unicorn Clubtail (*Arigomphus villosipes*)
Black-shouldered Spinyleg (*Dromogomphus spinosus*)
Flag-tailed Spinyleg (*Dromogomphus spoliatus*)
Eastern Ringtail (*Erpetogomphus designatus*)
Plains Clubtail (*Gomphus externus*)
Midland Clubtail (*Gomphus fraternus*)
Cobra Clubtail (*Gomphus vastus*)
Pronghorn Clubtail (*Gomphus graslinellus*)
Dusky Clubtail (*Gomphus spicatus*)
Elusive Clubtail (*Stylurus notatus*)
Russet-tipped Clubtail (*Stylurus plagiatus*)
Arrow Clubtail (*Stylurus spiniceps*)

Cordulegastridae 1 recorded spp in Chicago area

Delta-spotted Spiketail (*Cordulegaster diastatops*)

Macromiidae 1 recorded spp in Chicago area

Illinois River Cruiser (*Macromia illinoensis*)

Corduliidae 6 recorded spp in Chicago area

Prince Baskettail (*Epitheca princeps*)
Stripe-winged Baskettail (*Epitheca costalis*)
Common Baskettail (*Epitheca cynosura*)
Spiny Baskettail (*Epitheca spinigera*)
Hine's Emerald (*Somatochlora hineana*)
Mocha Emerald (*Somatochlora linearis*)

Libellulidae 26 recorded spp in Chicago area

Calico Pennant (*Celithemis elisa*)
Halloween Pennant (*Celithemis eponina*)
Eastern Pondhawk (*Erythemis simplicicollis*)
Dot-tailed Whiteface (*Leucorrhinia intacta*)
Chalk-fronted Corporal (*Libellula julia*)
Widow Skimmer (*Libellula luctuosa*)
Common Whitetail (*Libellula lydia*)
Twelve-spotted Skimmer (*Libellula pulchella*)
Four-spotted Skimmer (*Libellula quadrimaculata*)
Painted Skimmer (*Libellula semifasciata*)
Great Blue Skimmer (*Libellula vibrans*)
Elfin Skimmer (*Nannothemis bella*)
Blue Dasher (*Pachydiplax longipennis*)
Wandering Glider (*Pantala flavescens*)
Spot-winged Glider (*Pantala hymenaea*)
Eastern Amberwing (*Perithemis tenera*)
Variegated Meadowhawk (*Sympetrum corruptum*)
Saffron-winged Meadowhawk (*Sympetrum costiferum*)
Cherry-faced Meadowhawk (*Sympetrum internum*)
White-faced Meadowhawk (*Sympetrum obtrusum*)
Ruby Meadowhawk (*Sympetrum rubicundulum*)
Band-winged Meadowhawk (*Sympetrum semicinctum*)
Yellow-legged Meadowhawk (*Sympetrum vicinum*)
Carolina Saddlebags (*Tramea carolina*)
Black Saddlebags (*Tramea lacerata*)
Red-mantled Saddlebags (*Tramea onusta*)

Zygoptera 30 spp in Chicago Area
Calopterygidae

Ebony Jewelwing (*Calopteryx maculata*)
American Rubyspot (*Hetaerina americana*)

Lestidae 7 spp in Chicago area

Great Spreadwing (*Archilestes grandis*)
Spotted Spreadwing (*Lestes congener*)
Common Spreadwing (*Lestes disjunctus*)
Emerald Spreadwing (*Lestes dryas*)
Sweetflag Spreadwing (*Lestes forcipatus*)
Slender Spreadwing (*Lestes rectangularis*)
Lyre-tipped Spreadwing (*Lestes unguiculatus*)
Swamp Spreadwing (*Lestes vigilax*)

Coenagrionidae 21 spp in Chicago area

Eastern Red Damsel (*Amphiagrion saucium*)
Blue-fronted Dancer (*Argia apicalis*)
Variable Dancer (*Argia fumipennis*)
Powdered Dancer (*Argia moesta*)
Blue-ringed Dancer (*Argia sedula*)
Blue-tipped Dancer (*Argia tibialis*)
River Bluet (*Enallagma anna*)
Rainbow Bluet (*Enallagma antennatum*)
Double-striped Bluet (*Enallagma basidens*)
Familiar Bluet (*Enallagma civile*)
Marsh Bluet (*Enallagma ebrium*)
Stream Bluet (*Enallagma exsulans*)
Skimming Bluet (*Enallagma geminatum*)
Hagen's Bluet (*Enallagma hageni*)
Orange Bluet (*Enallagma signatum*)
Slender Bluet (*Enallagma traviatum*)
Citrine Forktail (*Ischnura hastata*)
Fragile Forktail (*Ischnura posita*)
Eastern Forktail (*Ischnura verticalis*)
Sphagnum Sprite (*Nehalennia gracilis*)
Sedge Sprite (*Nehalennia irene*)

Appendix D

Supplies/Sources

Binoculars

A good pair of binoculars is essential. The following are requirements of binoculars for watching Odonata, taken from the Butterfly Guidelines.

Binoculars: Any reliable brand is acceptable. Several factors make a lot of difference; others are personal preference. The main factors to consider are listed as follows.

Close focusing: maximum is the 6 to 8 foot range. Jeffrey Gassberg warns that the close focus can vary greatly from pair to pair, even in the same model, so try out an individual pair before buying.

Power: between 7 and 10. This number is the first number in the binocular description (e.g. 7 in 7x42) and means that the object will appear that many times closer to you than it actually is. Try out various powers. In this range, personal preference is the main factor.

Brightness: This is not all that important, unless you are looking for species on the savanna. The second number in the binocular description (i.e. 42 in 7x42) is the diameter of the lens in millimeters (mm). The larger the diameter the more light will be admitted. Other factors can also impact how much light is transmitted, but this is a good starting guide.

Weight: Remember, the binoculars may not feel all that heavy when you first hang them around your neck, but after some time in the field, they can feel like they weigh a ton. When deciding between two similar pair, go with the lighter one

Cameras

Many people use photography, to document identification. We encourage this practice however we urge monitors to minimize photography during data collection. If possible, photograph before or after your route. **Do not remove any Odonate from the site to photograph it.**

Monitors for the butterfly network have asked for recommendations for equipment. Any 35mm SLR camera will work. The most widely suggested lens is a 90mm or 100mm macro lens. If a zoom lens is used, it should have a macro feature. Get a lens with as short a close focus range as possible. Even 5 feet can sometimes be too far a distance to get a good shot of a smaller Odonate. The best lens for identification are side shots showing both the forwing and the hindwing for the underside and top shots showing the full wing spread for the upper side. Unlike Butterfly monitoring, the bodies of Odonates can be critical in identification.

Books

Stokes Beginners Guide to Dragonflies

Sold for \$8.95 is the cheapest, smallest and most convenient guide for new monitors. Not all the species in Chicagoland are covered, however all the species on the beginners list are covered, plus some damselflies are covered to a degree.

Dragonflies of Indiana by James R Curry.

Currently out of print, however an excellent book for clear descriptions of dragonflies in Indiana. Many of the species are the same that are found within Illinois. Sells for \$32 and is published by the Indiana Academy of Sciences. Can be ordered through Amazon.com. My favorite dragonfly book, does not cover damselfly identification.

Dragonflies through Binoculars by Sidney Dunkle

A comprehensive field guide to North American Dragonflies, not as clear as Curry's book, one would argue more comprehensive, again damselflies are not covered. It retails for \$29.95, and can be found in Borders or can be bought online.

Damselflies of Florida, Bermuda and the Bahamas by Sidney Dunkle

Can only be bought used on line for \$19.95. Many of the damselflies covered can be found in Illinois. As its title suggests doesn't comprehensively cover damselflies in North America. Should only be bought if really interested.

There are other books for dragonflies and damselflies that can be ordered online. Some of these I have not seen so cannot make comment on the usefulness of them.

Two comprehensive books are "**Dragonflies of North America**" and "**Damselflies of North America**" by Needham and Westfall; and Westfall and May respectively. The retail for these books is usually around \$125 each, second hand prices have been seen for around \$80. These are only for the really interested monitor with a scientific background.

Websites and Organizations

Dragonfly Society of the Americas
Dr and Mrs T.W. Donnelly
2091 Partridge Lane
Binghamton, NY 13903
USA

International Odonata Research Institute
P.O. Box 1269
Gainesville, Florida 32602-1269

Worldwide Dragonfly Association
Jill Silsby
1 Haydn Avenue
Purley
Surrey, CR8 4AG
United Kingdom

Dragonflies and Damselflies (Odonata Information Network), one of the most useful links.
<http://www.afn.org/~iori/>

Dragonfly Premier Resources
<http://gloriamundipress.com/dragonflies/id45.htm>

Entomology Index Societies
<http://www.ent.iastate.edu/list/societies.html>

Illinois Department of Natural Resources, Illinois Endangered Species Protection Board
<http://dnr.state.il.us/espbd/datelist.htm>

Illinois State Museum. Checklist of Illinois dragonflies and damselflies

http://www.educationplanet.com/search/redirect?id=57641&mfcats=/search/environment/animals/zoology/insects/flies/dragonflies_and_damselflies/&mfcount=17

The Oregon Dragonfly and Damselfly Survey, Odonata Lists on the www.

http://www.ent.orst.edu/ore_dfly/links.html

There are lots more links, but these sites offer a start for online research.

Check out the DMN web-site www.anisoptera.org (currently under construction) for more information about our program.

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