Identification and Monitoring Training: Two Sensitive Dragonfly Species on National Forests

Identification

Presented for the Interagency Special Status Sensitive Species Program

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Photo: Dennis Doucet

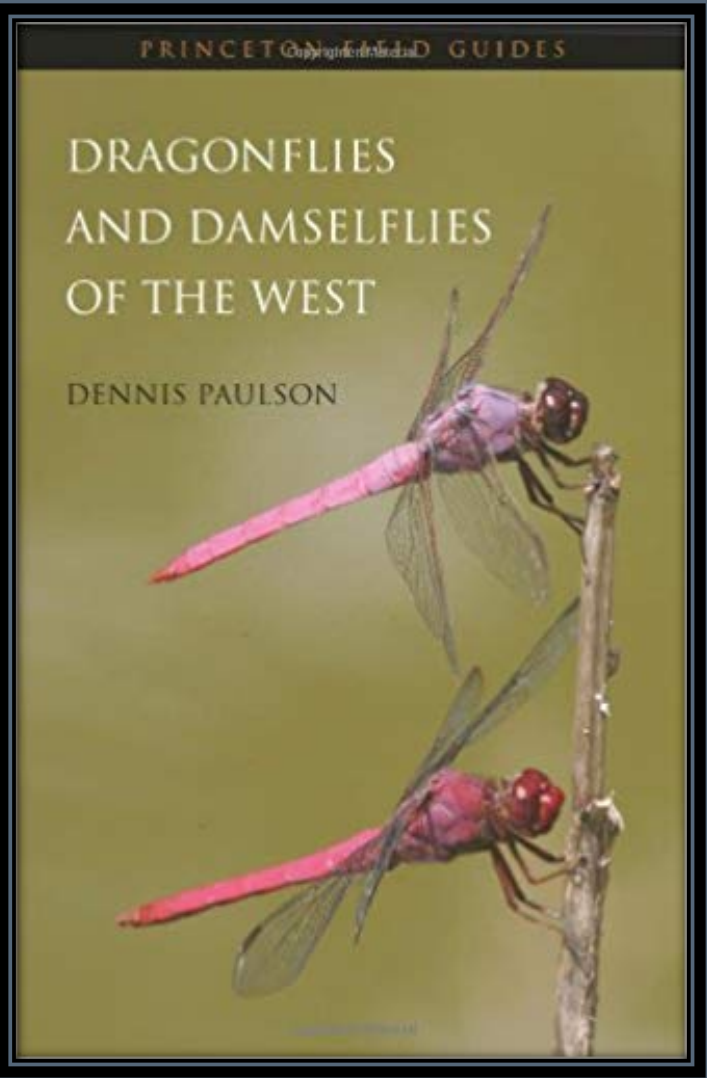
Identification Challenges

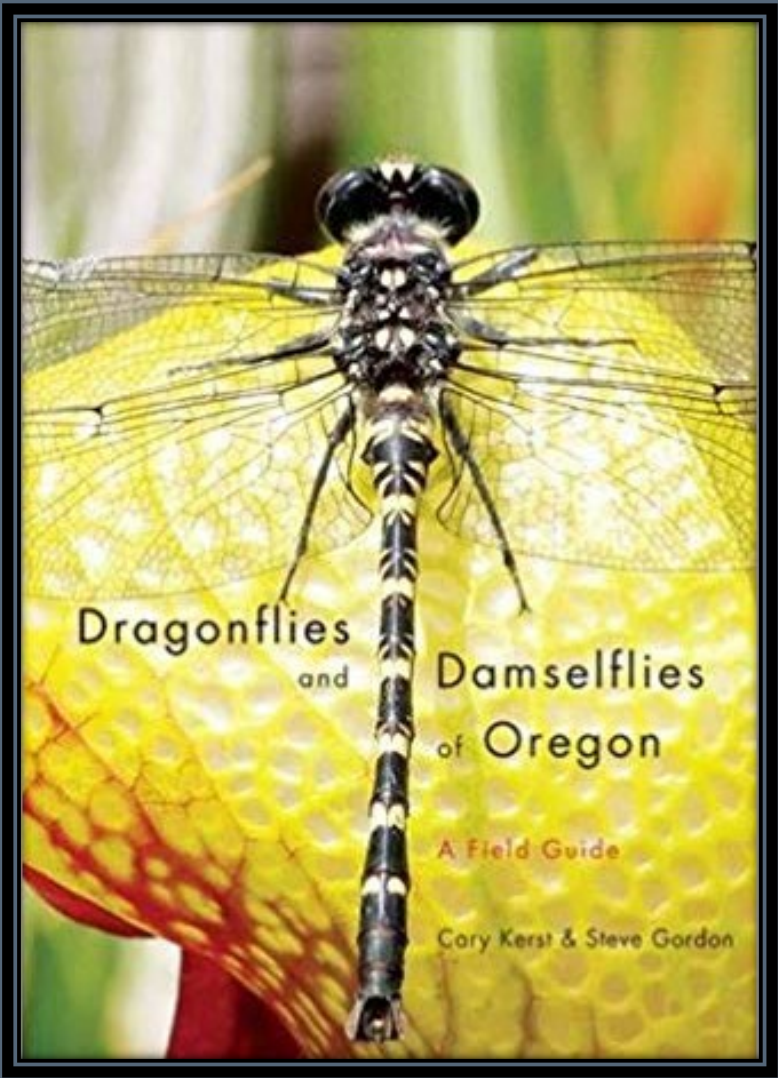
Darners

- Fast moving
- Rarely perch or land
- Hard to ID in flight
- Difficult to catch
- Variable diagnostic features

Photo: Cameron Deckert; paddle-tailed darner

Dragonfly ID Resources





Dragonfly Anatomy

Color Pattern & Anatomy

- Understanding color pattern descriptions is made easier by understanding dragonfly anatomy

Photo: Ethan Wright-Magoon, blue-eyed darner

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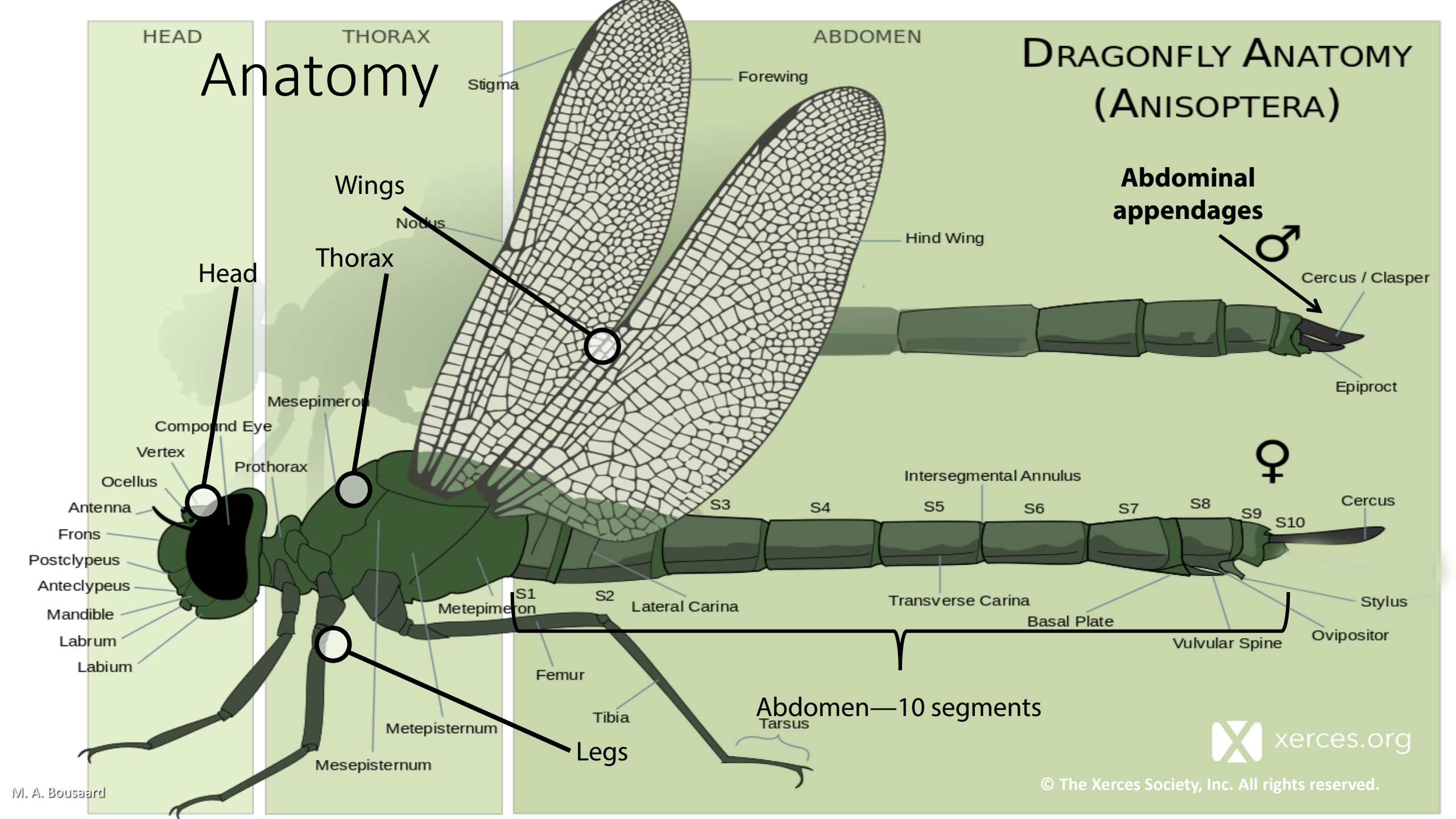
HEAD
THORAX
ABDOMEN
Anatomy
Dragonfly Anatomy
(Anisoptera)
Stigma
Forewing
Wings
Nodus
Hind Wing
Abdominal
appendages
♂
Cercus / Clasper
Epiproct
Head
Thorax
Mesepimeron
Compound Eye
Vertex
Ocellus
Prothorax
Antenna
Frons
Postclypeus
Anteclypeus
Mandible
Labrum
Labium
♀
Intersegmental Annulus
S3
S4
S5
S6
S7
S8
S9
S10
Cercus
S1
S2
Metepimeron
Lateral Carina
Transverse Carina
Basal Plate
Stylus
Ovipositor
Vulvular Spine
Femur
Tibia
Tarsus
Abdomen—10 segments
Metepisternum
Mesepisternum
Legs
M. A. Bousaard
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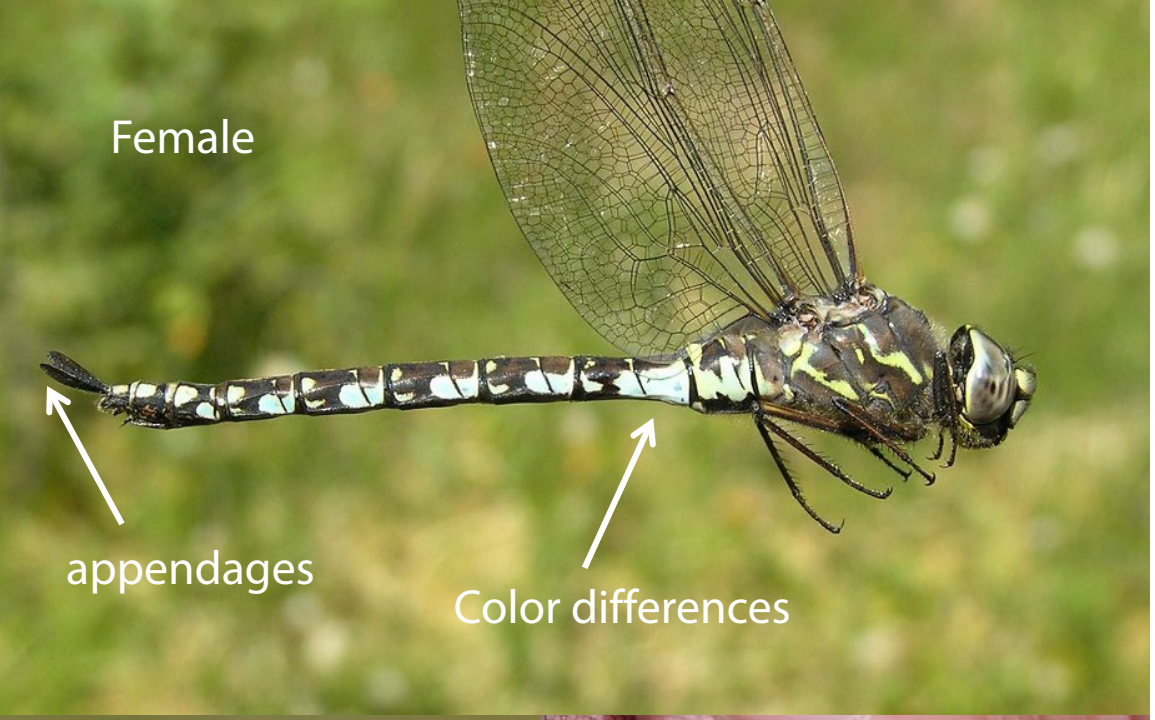

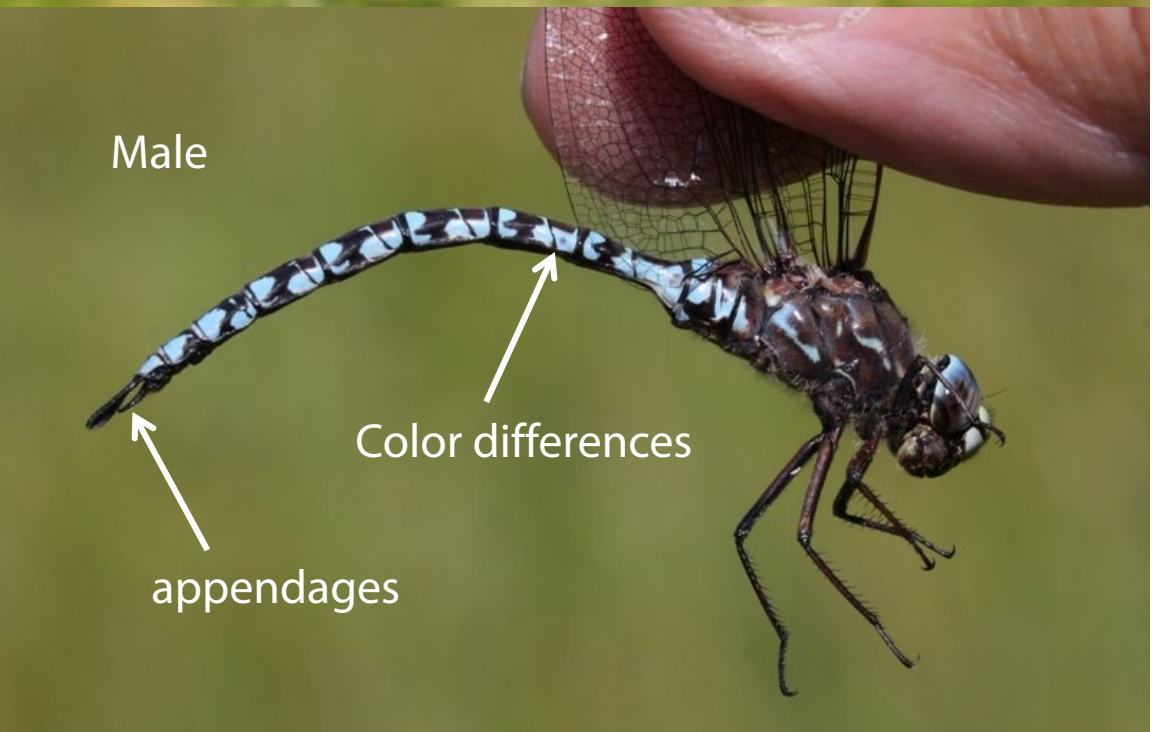

Nate Kohler: zigzag darner; Diana-Terry Hibbitts: zigzag darner

Dragonfly ID & Anatomy

- Variation: being able to distinguish the sexes is very important in ID
  - Just as in birds, dragonflies are variable—sexual variation is most obvious
    - Dimorphic in color (many)
    - Dimorphic in shape & structures (all)
  - Males of related species often differ from one another more than females
  - Females can be difficult to distinguish—mating pairs can help learn more about what females of a certain species look like

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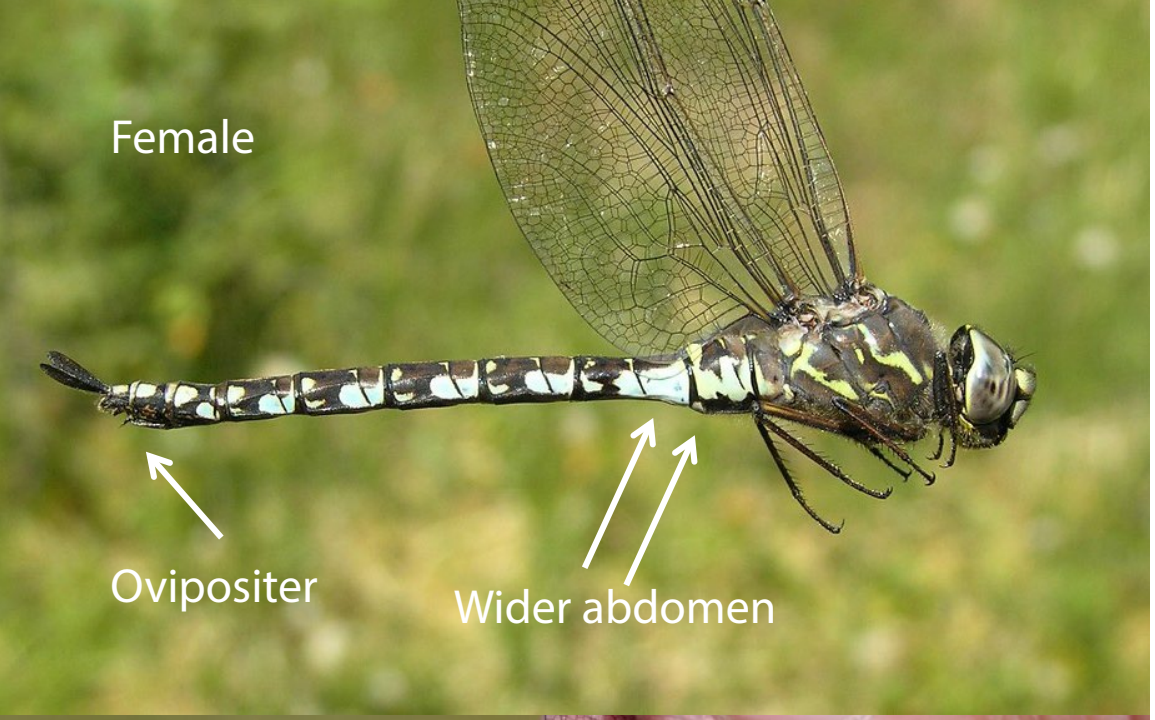

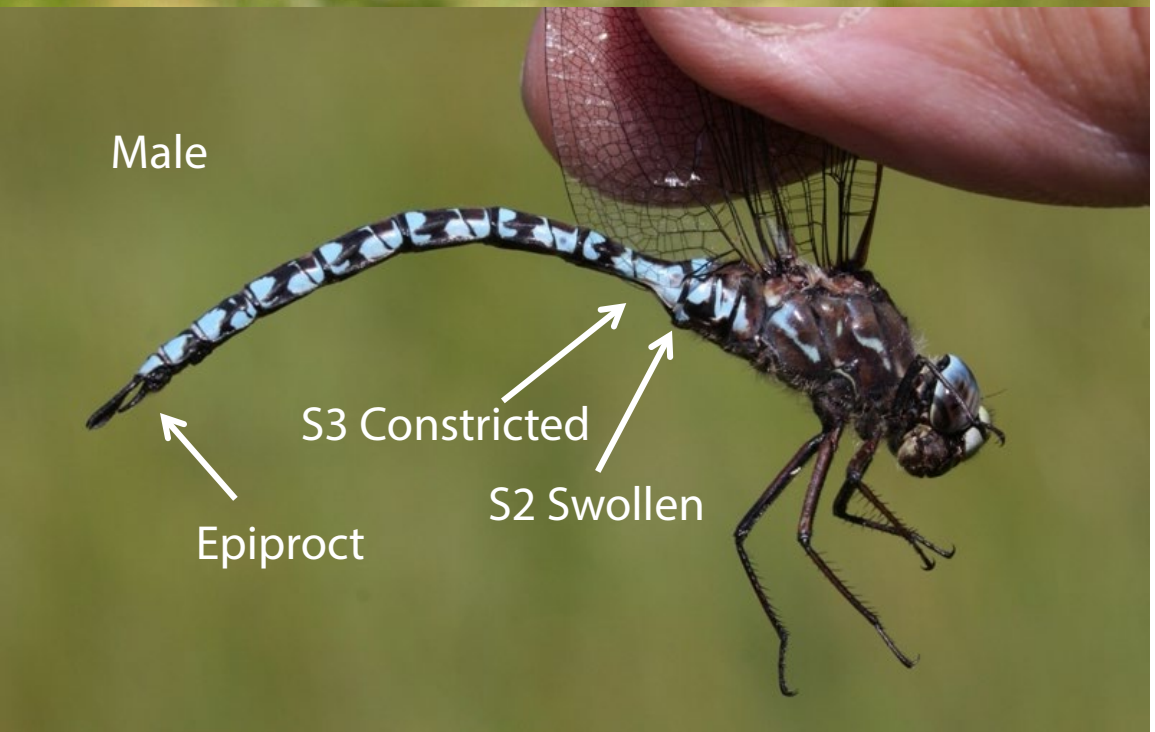

Nate Kohler: zigzag darner; Diana-Terry Hibbitts: zigzag darner

Dragonfly ID & Anatomy

- Quickest way to sex an individual is to look for swollen basal area of abdomen
- Males
  - Have a swollen area under S2 where the secondary genitalia are located—absent in females
    - Hamules—structures to hold the female abdomen in place during mating—can be seen under S2
  - S3 is relatively constricted compared to females
  - Appendages at end of abdomen: cerci (upper, paired) & epiproct (lower, single)
  - Behavior: males leave water to mature

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Owen Strictland: zigzag darner

Oregon Darners

Male vs. Female

- Females
  - Generally not as easy to identify compared to males
    - Males of similar species often differ more than females
  - Females are polymorphic, males are not
    - Heteromorph: looks different from male
    - Andromorph: looks similar to male
  - No bulge under S2, but abdomen wider here
    - Typically wider abdomens likely because they carry a load of eggs
  - S3 is relatively less constricted compared to males
  - Appendages at end of abdomen on S10: cerci, no epiproct
  - Complex ovipositor: female reproductive tract opens near S8 & 9
  - Behavior: Females leave water where they emerged to mature

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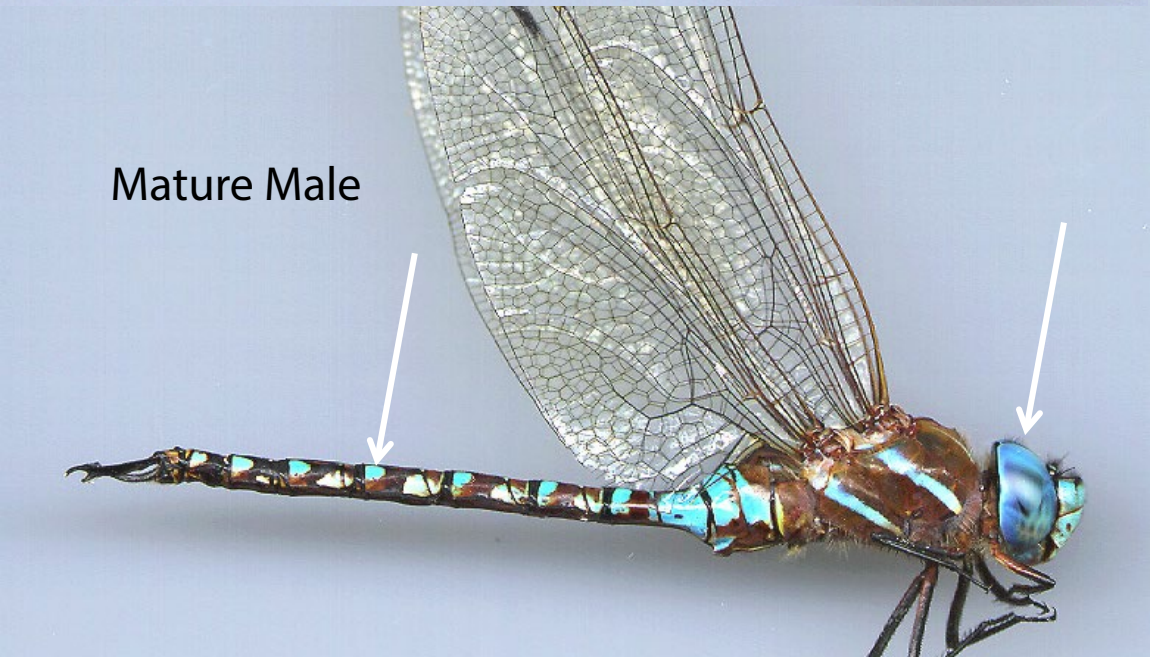

Dennis Paulson

Dragonfly ID & Anatomy

- Variation: adult odonates vary in appearance with age
  - Change colors as they move toward sexual maturation
  - Eye color will also almost always change with maturation
  - Individuals may become discolored with age

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Dragonfly ID & Anatomy

Variation: Color & Pattern

- Species, like darners that are patterned with stripes and spots, will vary in the extent of those markings
- Variation exists in coloration between individuals as well
- Both patterns and structural features can help with ID

Matt Muir, zigzag darner

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Dianna-Terry Hibbitts: western river cruiser

Identification

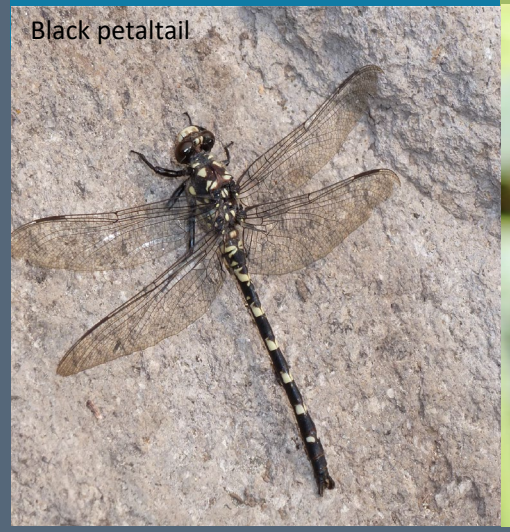
Distinguishing Darners from other OR Dragonflies

- Of the strong flying/cruising dragonflies (darners, spiketails, river cruisers, and emeralds) only darners have blue or green coloration on the body
- Eye size and coloration, the degree to which eyes touch, wing venation, and body color patterns also help distinguish darners from other dragonflies

Oregon Dragonflies

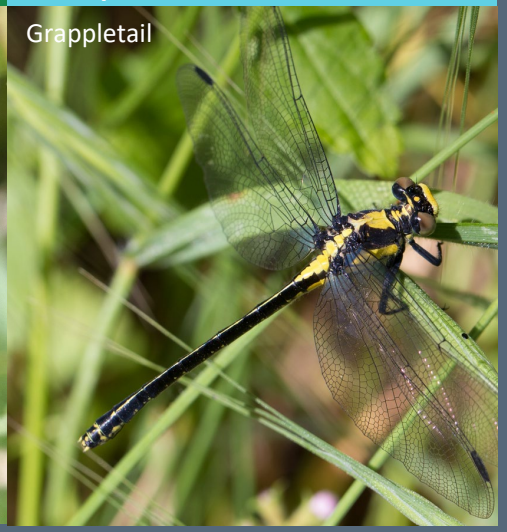
Families

Petaluridae	Cordulegastridae	Macromiidae	Gomphidae
Petaltails:	Spiketails:	Cruisers:	Clubtails/Grappletails/Snaketails:
1 species	1 species	1 species	9 species


Black petaltail


Pacific spiketail


Western river cruiser


Grappletail

Jeff S.; David Hoffman; Diana-Terry Hibbitts; Ken-ichi Ueda.

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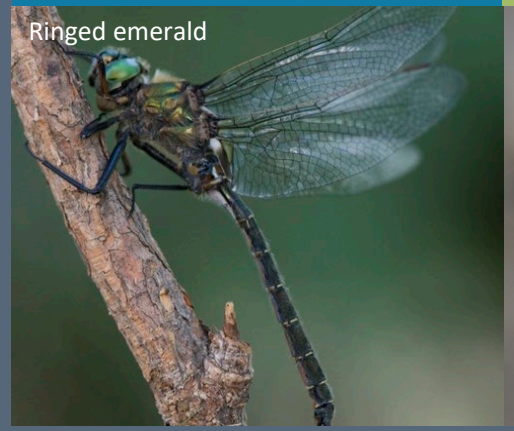
Oregon Dragonflies

Families

Corduliidae	Libellulidae	Aeshnidae
Emeralds:	Skimmers:	Darners:
7 species	31 species	13 species


Ringed emerald


Black meadowhawk


Variable darner

D. Sikes; Jakob Fahr; Cameron Deckert.

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Jeff S. iNaturalist, Black petaltail

Petaltails

Petaluridae

- Eyes separated
- Black body with yellow spots on thorax and abdomen
- Female with stout, blunt-tipped ovipositor
- Found in bogs, seeps
- 1 species in OR

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David Hoffman

Spiketails

Cordulegastridae

- Eyes touch at single point
- Large; brown or black & yellow body
- Two stripes on side of abdomen
- Lower tip of female abdomen has spike-pseudo ovipositor
- Perches at 45° angle
- Small streams
- 1 species in OR

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Cruisers

Macromiidae

- Eyes touch along seam
- Large, fast flier
- Iridescent blue thorax with one yellow stripe
- Abdomen black & ringed with yellow
- Common at fast-flowing stream habitats

Tom Benton, western river cruiser

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Clubtails

Gomphidae

- Eyes separated
- Terminal segments of abdomen expanded
- Green & brown or black body, yellow markings
- Inhabits mainly streams

Ken Ichi Ueda, grappletail

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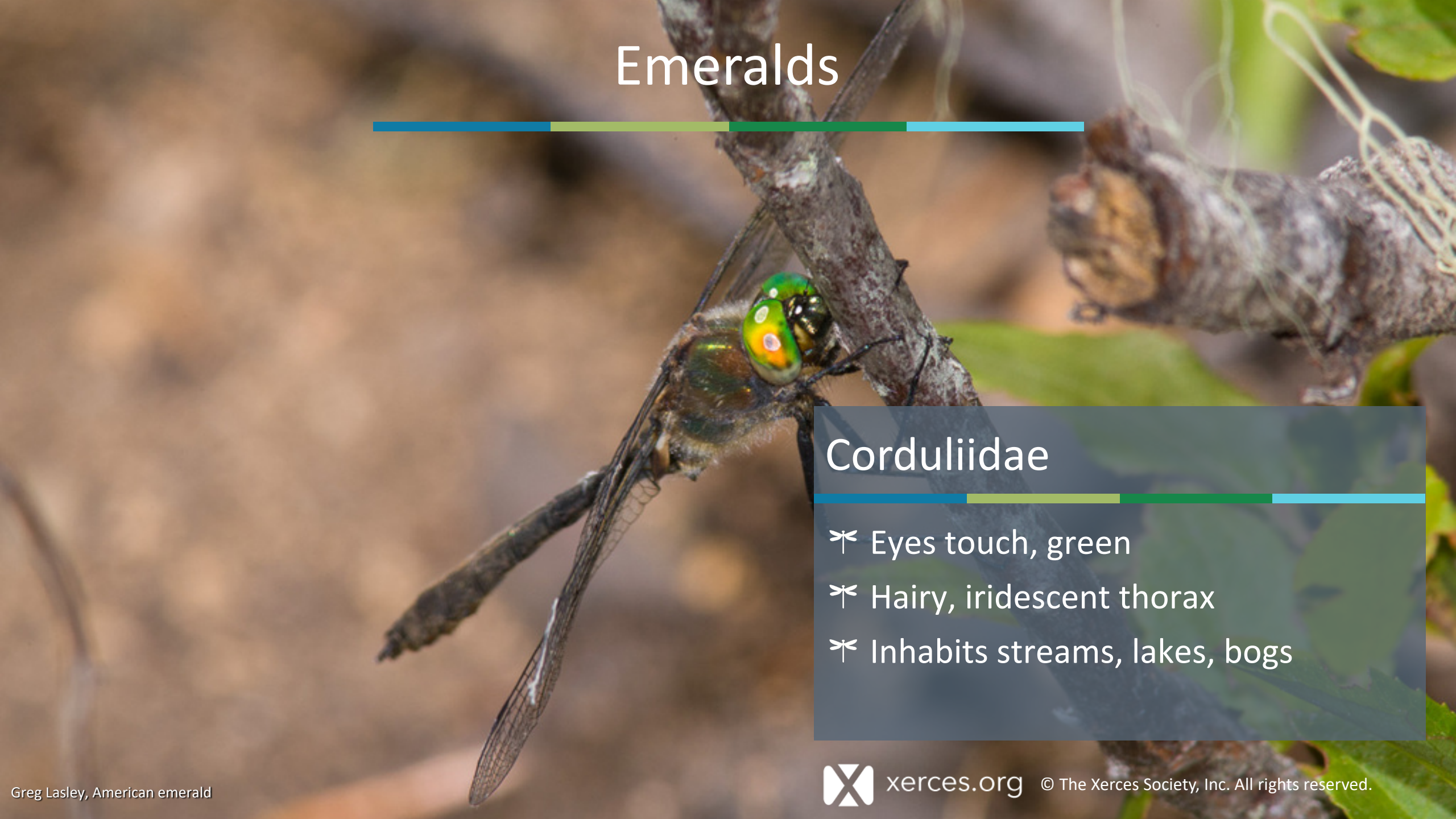
Emeralds



Corduliidae

- Eyes touch, green
- Hairy, iridescent thorax
- Inhabits streams, lakes, bogs

Greg Lasley, American emerald

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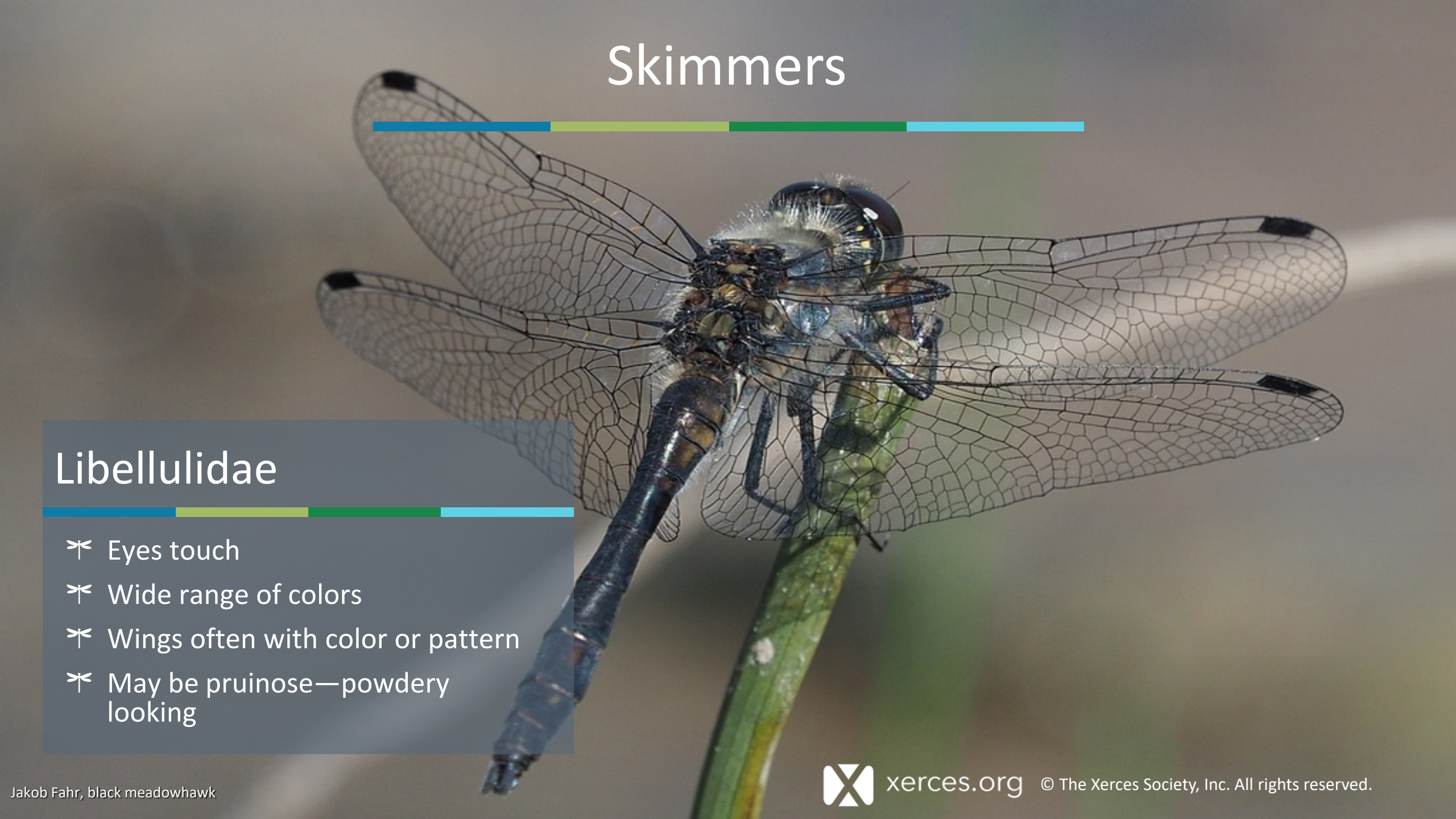
Skimmers



Libellulidae

- Eyes touch
- Wide range of colors
- Wings often with color or pattern
- May be pruinose—powdery looking

Jakob Fahr, black meadowhawk

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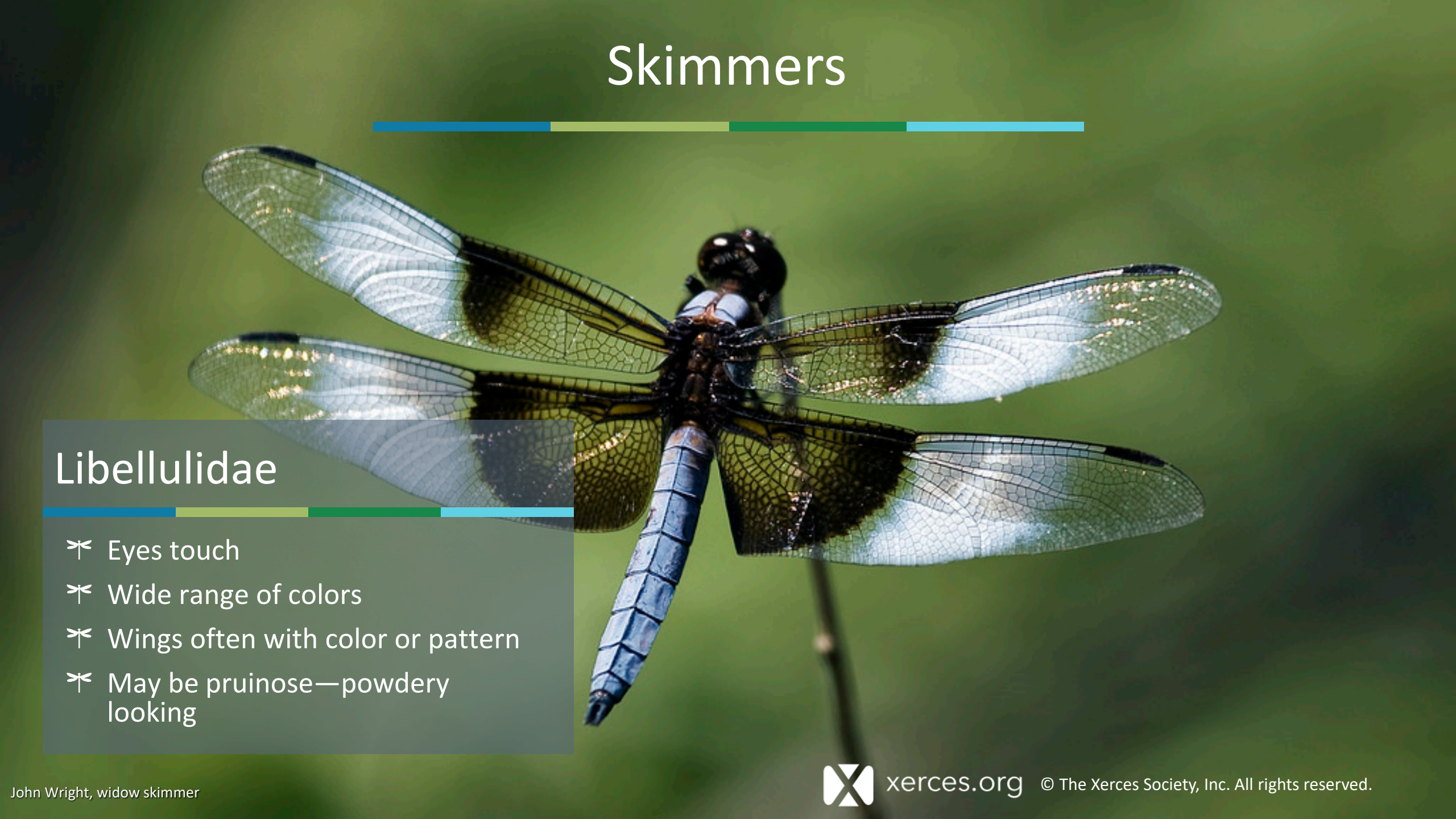
Skimmers



Libellulidae

- Eyes touch
- Wide range of colors
- Wings often with color or pattern
- May be pruinose—powdery looking

John Wright, widow skimmer

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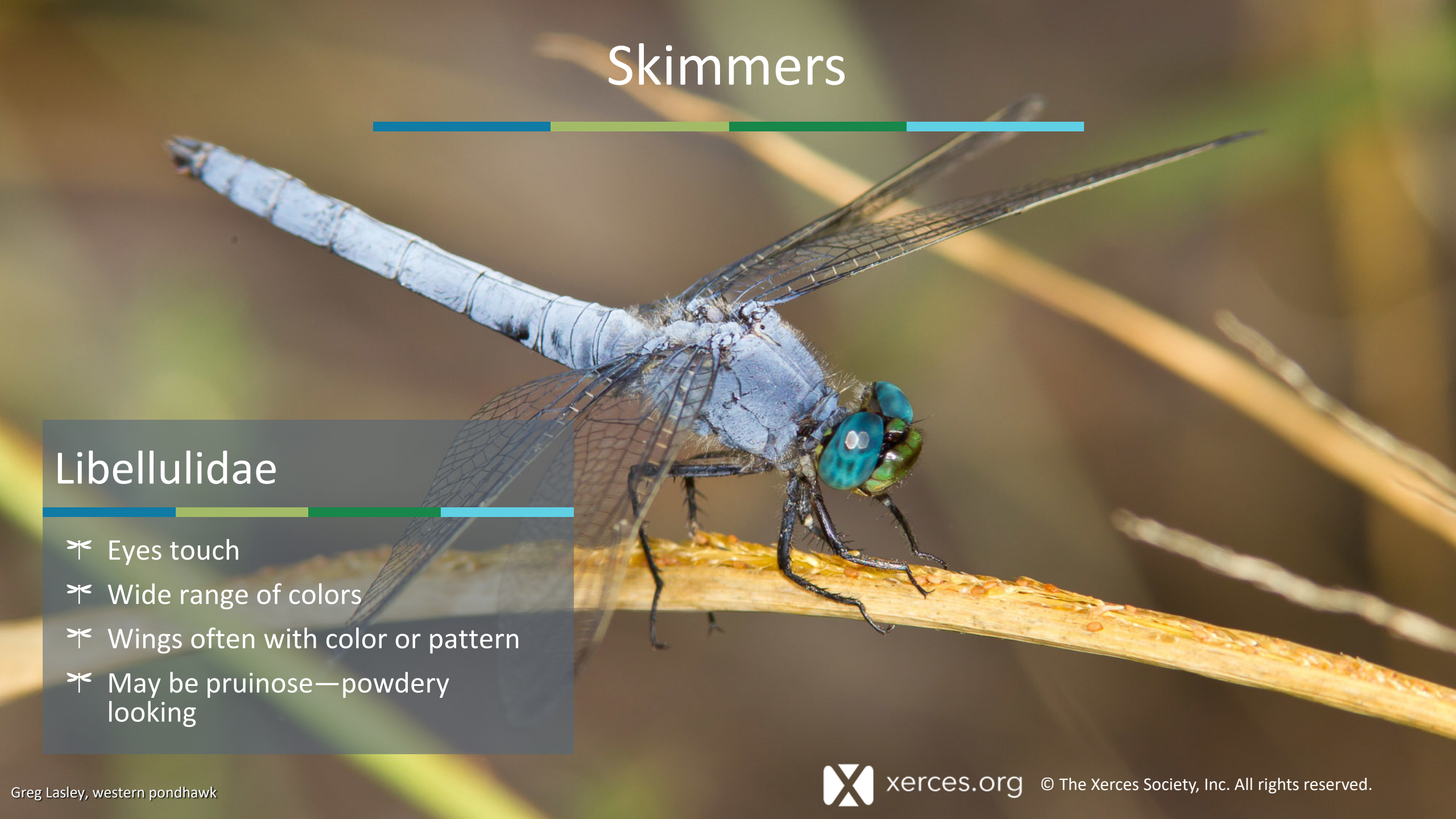
Skimmers



Libellulidae

- Eyes touch
- Wide range of colors
- Wings often with color or pattern
- May be pruinose—powdery looking

Greg Lasley, western pondhawk

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Mathesont, blue-eyed darner

Oregon Darners: Aeshnidae

Oregon has 13 Darners

- 4 restricted ranges
  - Black-tipped darner, Cascades, NE OR
  - Lance-tipped darner, Klamath County
  - Subarctic darner, Cascades—MTH NF
  - Zigzag darner, Cascades—MTH, DES, WIL
- 5 widespread
  - California darner
  - Common green darner
  - Paddle-tailed darner
  - Shadow darner
  - Variable darner
- 4 have a more complex distribution pattern
  - Blue-eyed darner: widespread, not common >4,000 ft
  - Canada darner: restricted to Cascades, can be common
  - Sedge darner: Cascades & Blue mts.
  - Walker's Darner: along the Columbia & S. OR

Cameron Deckert: Paddle-tailed darner

Oregon Darners

Male vs. Female

- Behavior: Males patrol habitats in search of females
  - In most species, the patrol site coincides with an optimal habitat for female egg laying, and therefore larvae (nymphs) too
  - Some dragonflies defend territories, however, darners do not—they fly around shore of a waterbody—aggressive to males they encounter on their patrols

John Abbott, common green darner; Syd Cannings, subarctic darner; Ethan Wright-Magoon, Michele Blackburn, blue-eyed darner

Oregon Darners

- 3 genera of darners
  - *Anax* (1 species)–green darners: no stripes on thorax
  - *Aeshna* (10 species)—mosaic darners: mosaic of blue and green patterns, stripes on thorax; no tubercle under S1
  - *Rhionaeschna* (2 species)—neotropical darners mosaic of blue and green patterns, stripes on thorax, tubercle under S1

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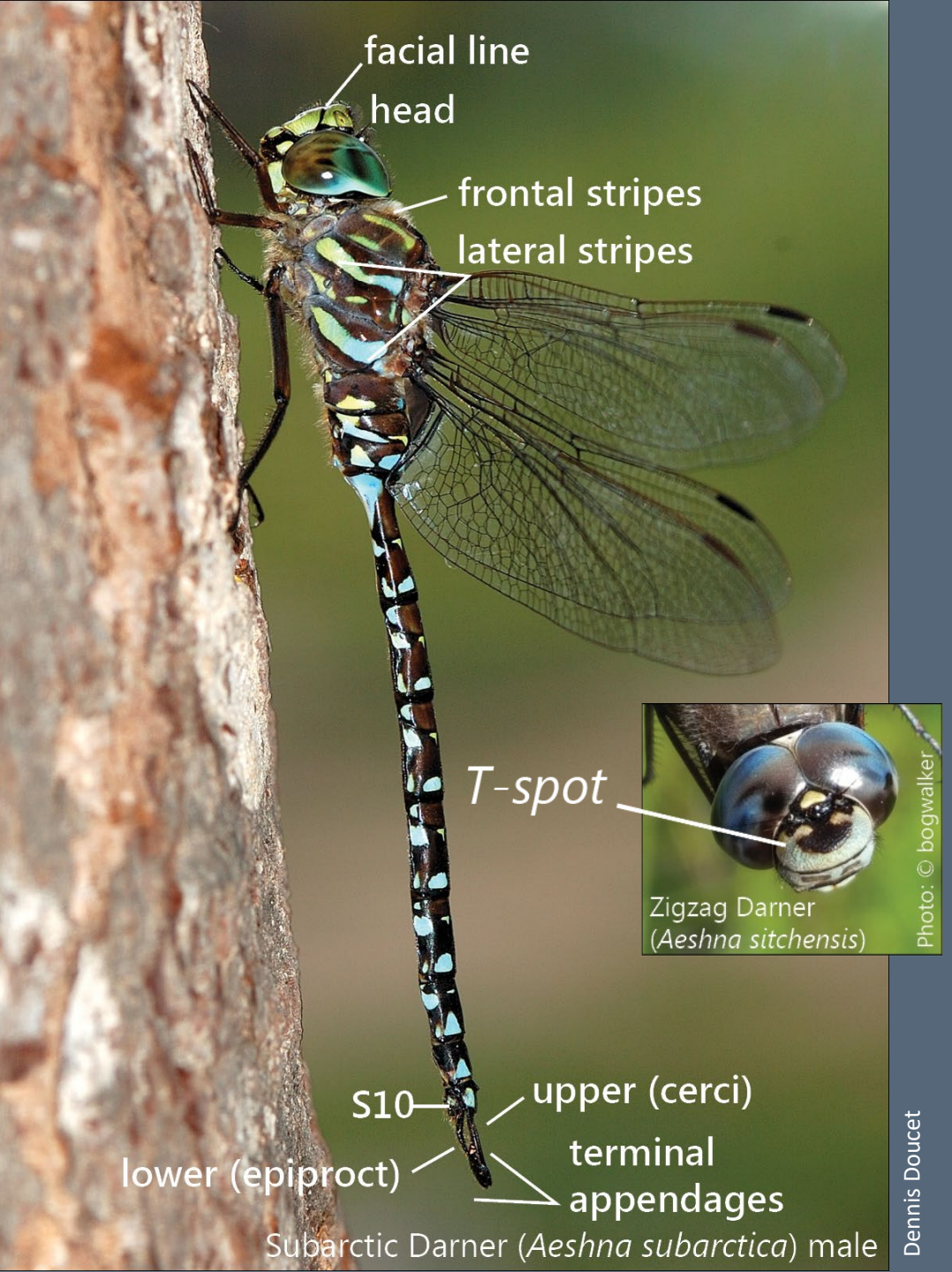
Oregon Darners

- Males: brilliant blue and/or green with brown
- Females: polymorphic—2 color forms
  - Andromorph: look like males
  - Heteromorph: green and/or yellow instead of blue color
- Habitats: ponds, fens, bogs, lakes, creeks, rivers, fields
- Behaviors:
  - Usually seen in flight; patrol waterways but also often seen catching insects over fields
  - Perch by hanging vertically—zigzag is the exception
  - Oviposit into vegetation
  - Some swarm, some migrate

Owen Strictland, zigzag darner & Dennis Doucet, subarctic darner

Darner Diagnostic Features



- Most notable feature of darners is their size—among the largest dragonflies
- Large compound eyes that touch at the top of the head along a seam
- Facial line or “seam”; some are black and distinct, others are less distinct
- “T-spot” on top of the head
- Thorax has lateral stripes—blue, green, &/or yellow
- Long slender abdomen with colorful patterns—blue, green, or yellow
- Female with ovipositor
- Terminal appendages that may be simple or shaped like a paddle or a petal; some are forked

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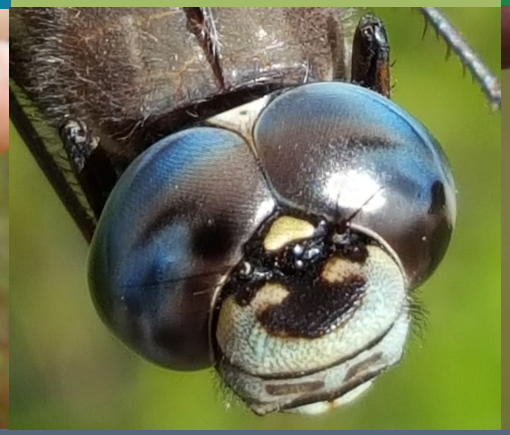
Darners: Key Features

Face:

Presence or absence of a facial line

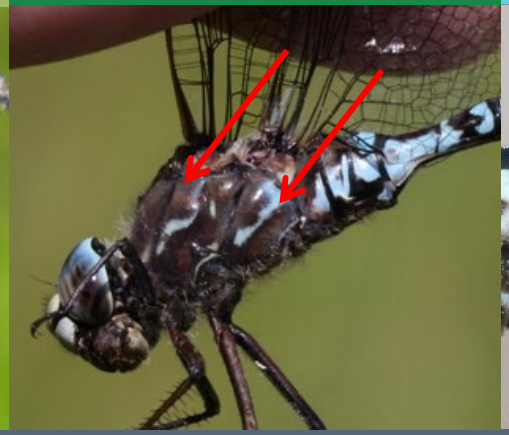
Head:

T-spot



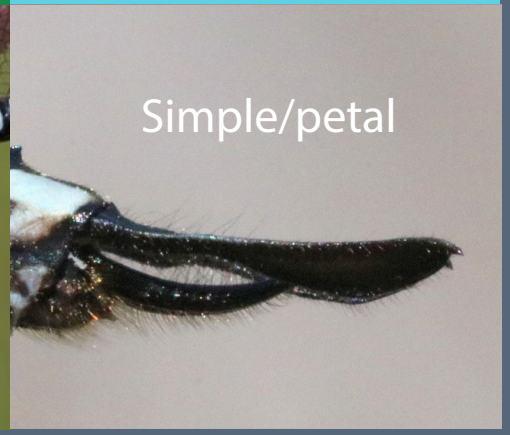
Thorax:

Lateral or side stripes



Abdominal appendages:

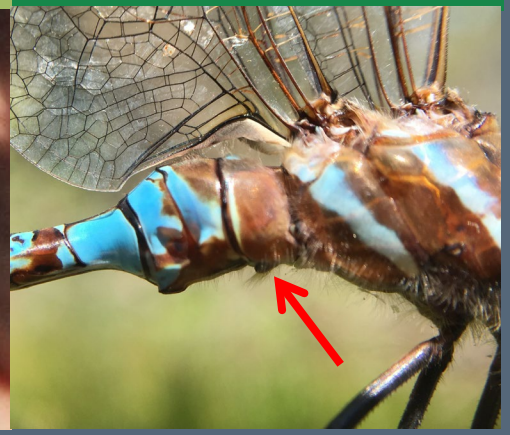
Shape of terminal appendages



Louis Imbeau: subarctic darner; Bog walker: zigzag darner; Diana-Terry Hibbits: zigzag darner; appendages: Michele Blackburn, Paul G. Johnson, A_Anctil.

Darners: Key Features

Abdomen

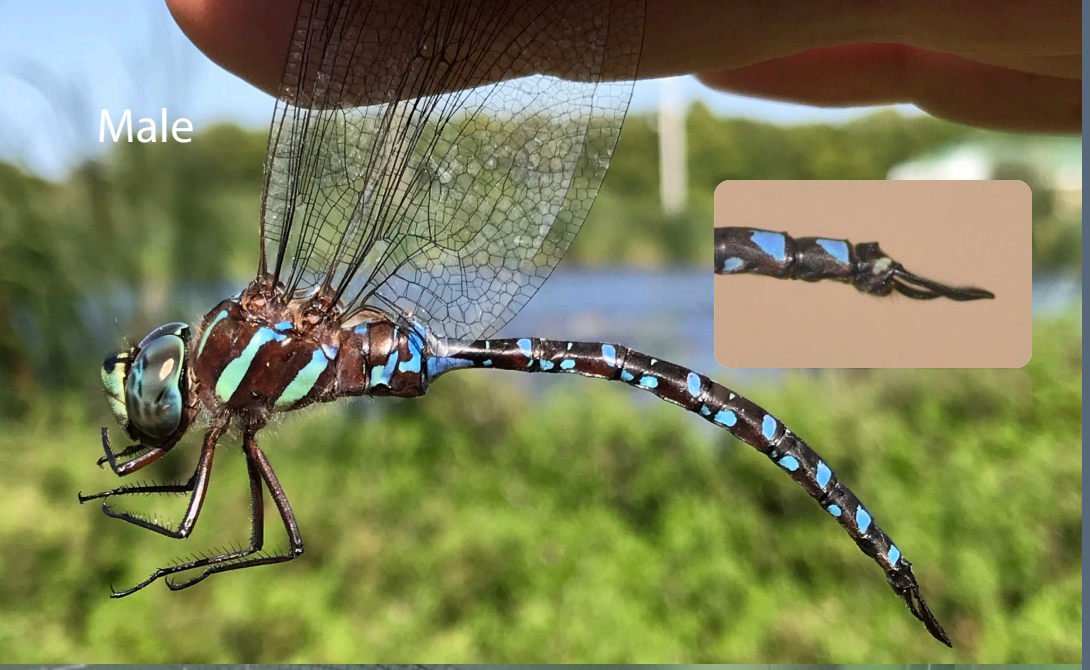
Presence or absence of spots under abdomen	Presence or absence of spot on top of S10	Tubercle only in *Rhionaeschna* spp.
		

Dennis Paulson, Michele Blackburn

Diana-Terry Hibbitts: sedge darner; Dennis Doucet: subarctic darner; Riley Walsh: zigzag darner.

Mosaic Darners: Genus *Aeshna*

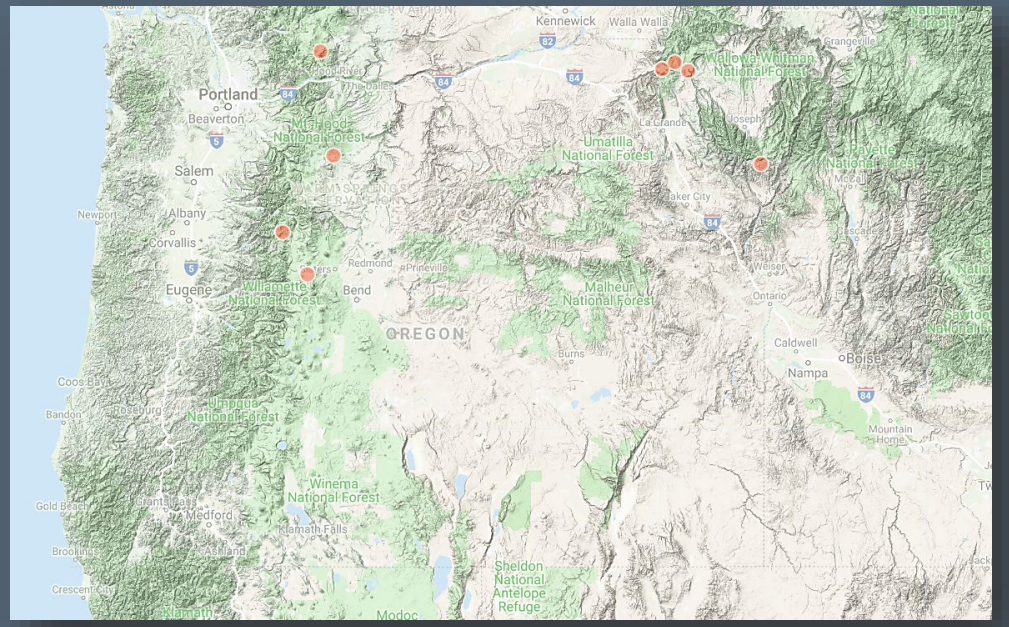
- 10 Oregon species
- Typically have blue or green thoracic stripes and blue or green spots on top of the dark abdomen
- Named after markings colored like mosaic tiles
- Often with late season flight periods
- Lentic, few on streams
- T-spot on top of head



Michael Butler; Mark Dennis; Mark Oliver; Map: iNaturalist.

Black-tipped Darner: *Aeshna tuberculifera*

- Northern US south to North Carolina, & into Canada
- In OR it is found in the Cascades, also documented in E. OR
- Clean mountain lakes, bogs, & wet prairies
- Lacks distinct facial line
- Front stripe broad, reward extension
- Simple cerci; tubercle on underside of cerci; no spot on top of S10; no pale spots under abdomen



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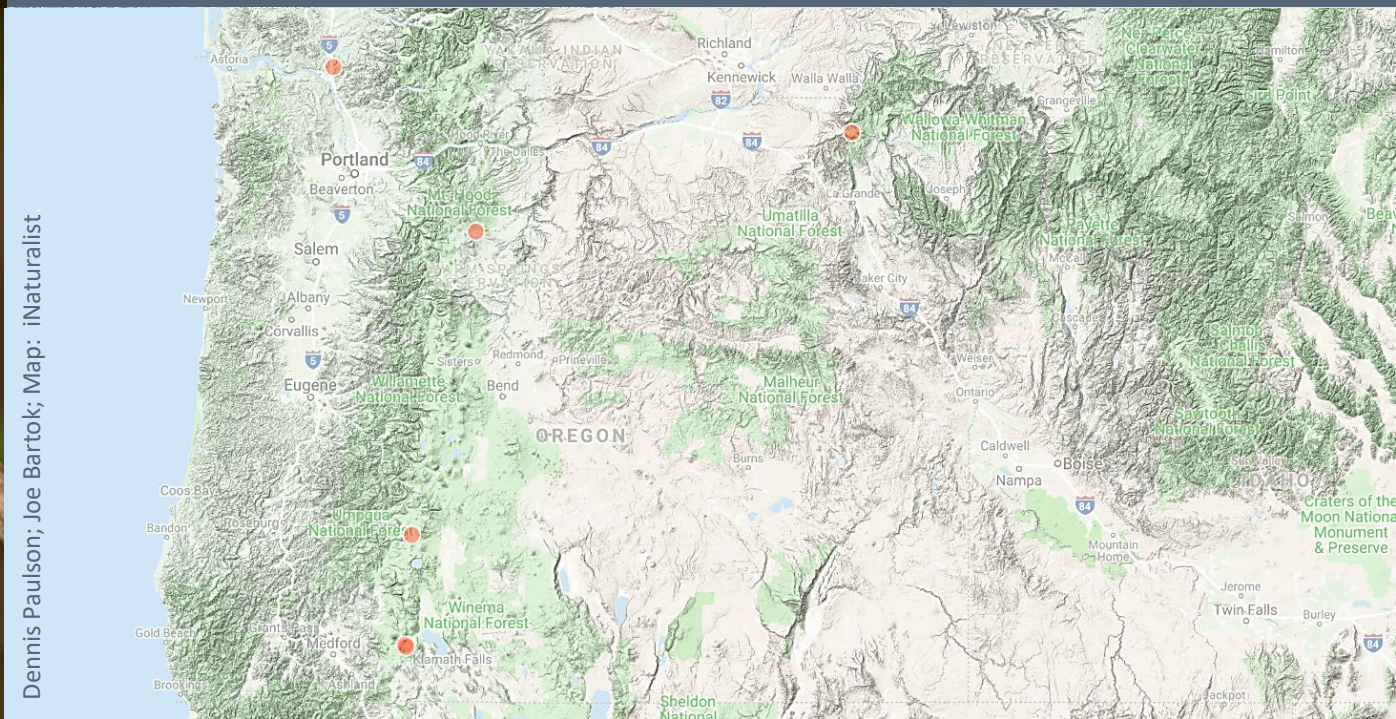
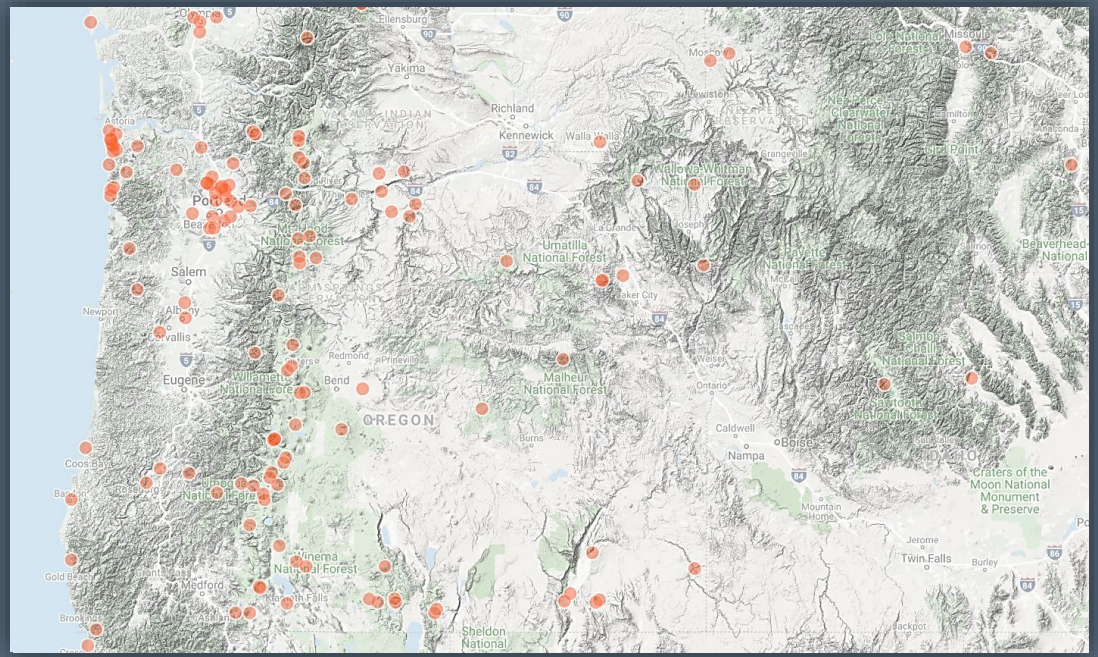
Canada Darner: *Aeshna canadensis*

- Northern US, south to CA & into Canada
- In OR it is a Cascade mountain species; found above 3,000 ft in elevation
- Clean mountain lakes, bogs, streams, & wet prairies
- Lacks distinct facial line
- Anterior thoracic stripe notched and flagged
- Simple cerci; spot on top of S10; pale spots under abdomen



Paddle-tailed Darner: *Aeshna palmata*

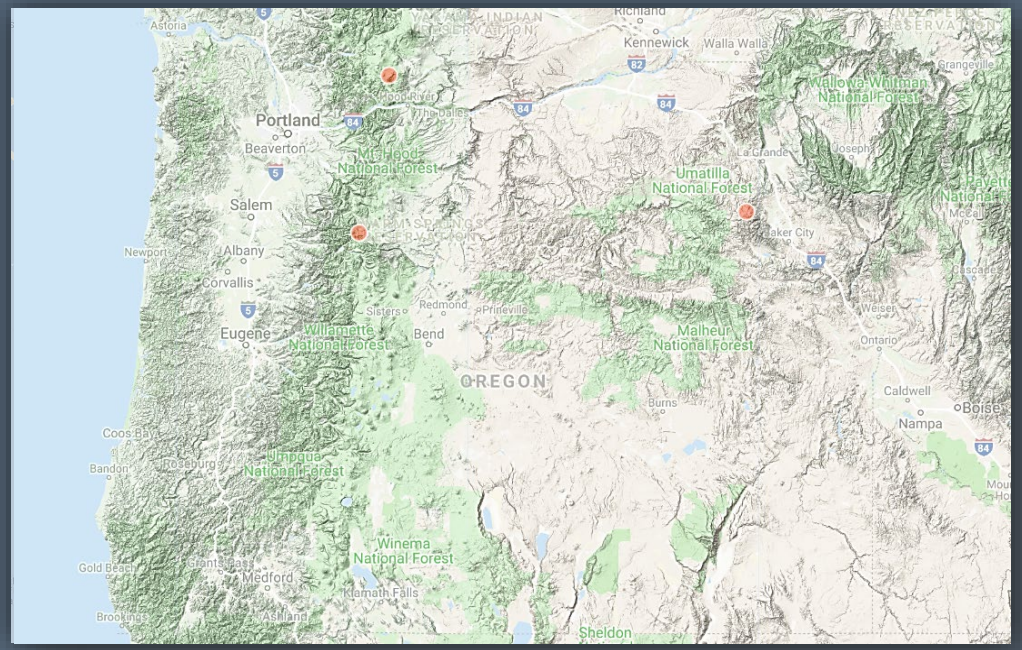
- A western species found from Alaska to California east to Nebraska
- Common throughout OR. One of the most abundant darners in OR even in urban areas
- Black line on face
- Straight, slightly wavy thoracic stripes; posterior stripe broad at top
- Large blue abdominal spots, including S10; no spots under abdomen
- Paddle-shaped cerci
- Lakes, ponds, all types of still waters up to 7,500 ft elevation



Dennis Paulson; Paul G. Johnson; Map: iNaturalist.

Sedge Darner: *Aeshna juncea*

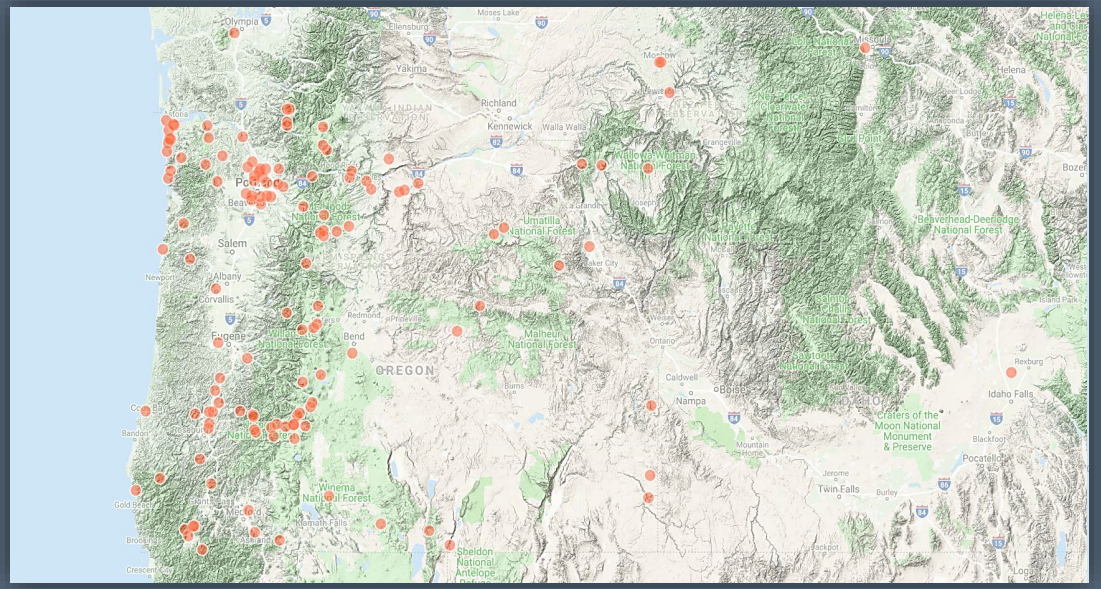
- Northern species in NA, N to Alaska
- Not common where found, except sites in eastern OR
- Sedge-lined shores of mountain lakes, bogs at 2,500-7,500 ft
- Green eyes in male; black facial line
- Wide, straight lateral thoracic stripes with in-between stripe
- Simple cerci; spot well developed on S10; pale spots under abdomen



Terry Hibbits; Guy Lemelin; A. Anctil; Map: iNaturalist.

Shadow Darner: *Aeshna umbrosa*

- Widely distributed across NA—OR found up to 6,000 ft
- Common throughout OR. One of the most abundant darners even in urban areas
- No dark facial stripe
- Straight side thoracic stripes; yellow to green at bottom, blue at top —both rearward extension at top
- Sparse blue abdominal spots, none on S10; spots under abdomen
- Paddle-shaped cerci—most similar to paddle-tailed darner
- Patrols shaded areas along the banks of streams, lakes, ponds
- May be seen flying late into December

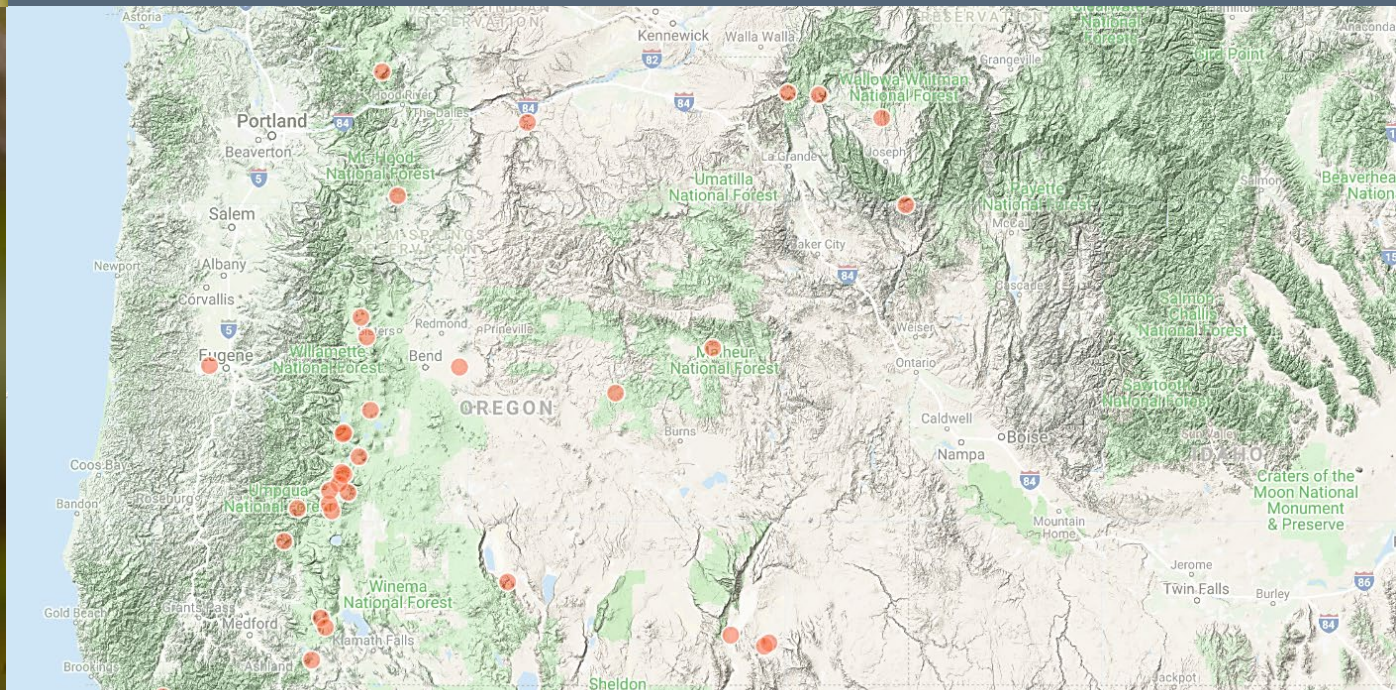


Nick Block; Map: iNaturalist.

Variable Darner: *Aeshna interrupta*

- Distribution across NA north into Alaska
- In OR it is found at still waters mainly above 3,000ft elevation; rare in lowlands; common where found
- Found at mountain lakes, ponds, bogs; one of most common darners found in mountains in Oregon
- Black facial line
- Variable patterning of thoracic stripes, usually narrow; interrupted thoracic stripes Cascades & west
- Simple cerci; spot on S10; no spots below abdomen

Dennis Paulson; Michael Butler; Mark Oliver; Map: iNaturalist



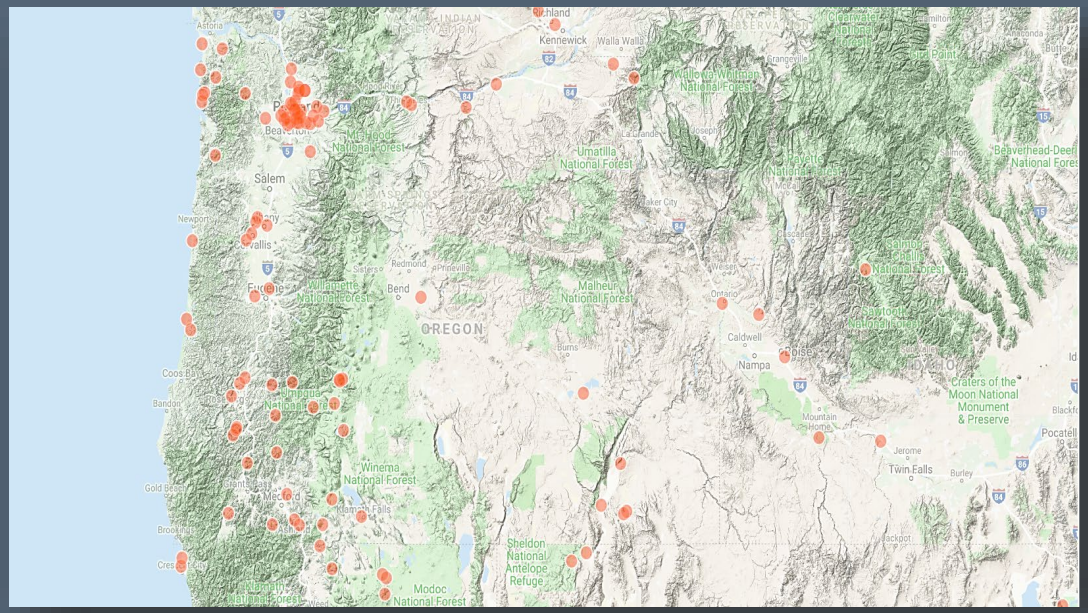
Ethan Wright-Magoon: blue-eyed darner.

Neotropical Darners: *Rhionaeschna*

- 2 Oregon species
- Superficially similar to *Aeshna*
- Tubercle under abdominal segment 1 (distinguishes them from mosaic darners)
- Bluer eyes than most *Aeshna*
- Tropical origin, but both species reach Canada

Blue-eyed Darner: *Rhionaeschna multicolor*

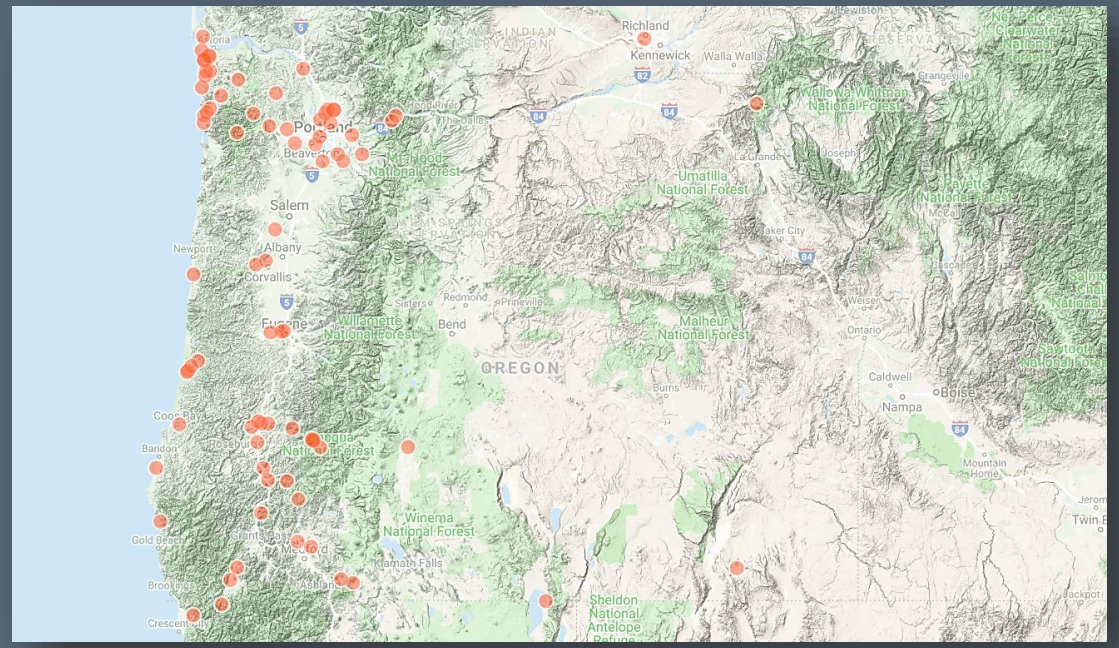
- From Midwest to west coast into British Columbia
- Male bright blue eyes & face w/brown line
- Straight thoracic stripes
- Tubercle under S1 in both males and females (distinguishes them from ALL mosaic darners)
- Blue abdominal spots, including S10; none under abdomen
- Fork-tipped cerci—only OR darner w/this feature
- One of OR's most common darners—even in urban areas
- Common at ponds, lakes, & slow-moving streams across OR up to 6,000 ft elevation—less common above 4,000 ft



Mathesont; Guy Lemelin; Michele Blackburn (appendage close-up); Map: iNaturalist.

California Darner: *Rhionaeschna californica*

- Across US and into Canada—spring flight season
- Small size—smallest OR darner
- Male bluish eyes, bluish-white face w/black line
- Slanted thoracic stripes w/ black borders (distinguishes female from blue-eyed); anterior stripe narrowed at top
- Tubercle under S1
- Blue abdominal spots, including S10; none under abdomen
- Simple cerci
- Common at ponds, lakes, & slow-moving streams across OR up to 7,300 ft elevation



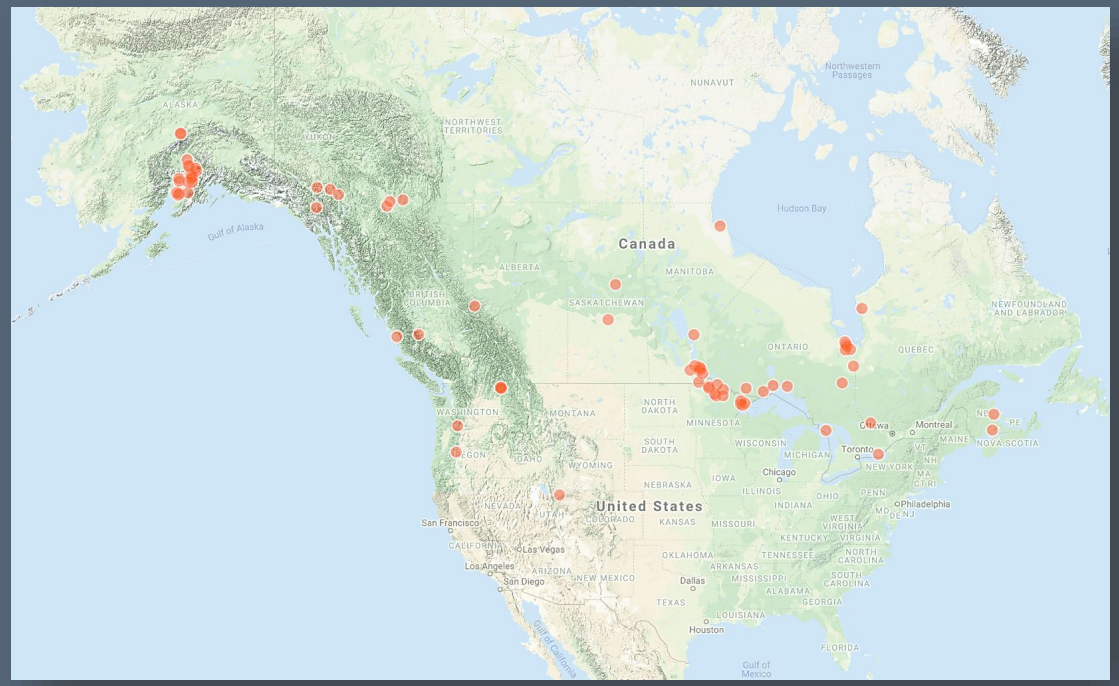
Mike Patterson; Paul G. Johnson; Colin Jones; Map: iNaturalist.

Eamon C. Corbett; Map: iNaturalist

Zigzag Darner: *Aeshna sitchensis*

Restricted to NA

- NA Distribution: Northern US, across Canada into Alaska
- In the west: Cascades of OR and WA; Rockies to Utah
- In the east: Maine, south to New York



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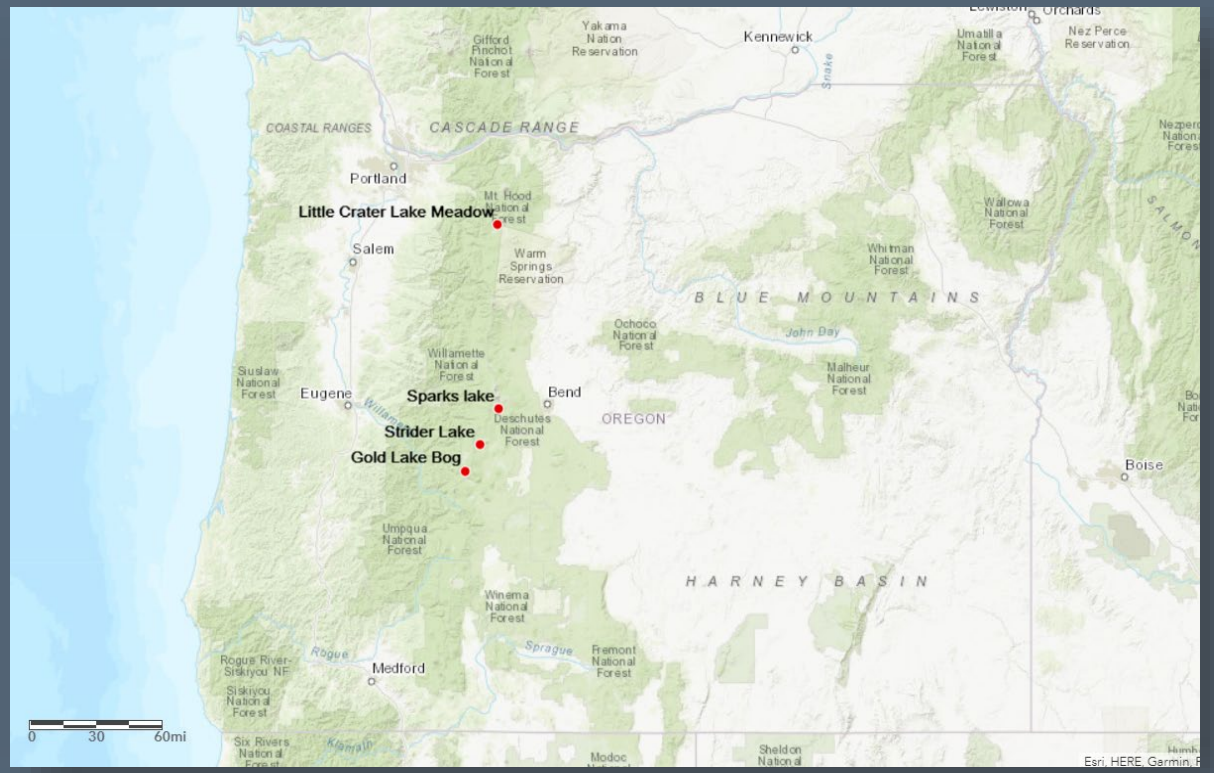
Zigzag Darner

Forest Service Lands

- Oregon Distribution: Gold Lake Bog (WIL), Sparks Lake (DES),Strider lake (DES), & Little Crater Lake Meadow (MTH)



Rob Van Epps; Nick Block; Map: iNaturalist

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Nick Block; Nate Kohler

Zigzag Darner

Field Marks

- Small compared to most darners (2.1-2.7 inches); California is similar in size (2.2-2.4 inches)
- Eyes brown mixed with blue around the edges
- Face yellow-green w/black line
- The base of the T-spot is convex—DIAGNOSTIC
- Lateral thoracic stripes are narrow and strongly notched and extended, forming a zigzag shape
- Lateral thoracic stripes often broken and may have a spot or streak in between
- Abdomen w/extensive blue; S10 has blue spots
- No markings on underside of the abdomen
- Males have simple cerci
- Females polymorphic

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Zigzag Darner

Key Features

Face

Facial line black

Head

T-spot: Base convex upward (diagnostic)

Thorax

Lateral stripes: front zig-zag shape, rear “T-bone”-shaped (diagnostic)

Abdomen

Simple petal-shaped upper appendages




Nick Block (3 pics); David Bree (appendages).

Nick Block; Paul G. Johnson

Zigzag Darner

Look-a-likes

- Common name refers to the zigzag pattern of the narrow thoracic side stripes
- It is small compared to other Oregon darners; similar in size to California darner
- Range overlaps with similar California darner
  - California darner is usually smaller, has tubercle under S1
  - Flight season of California is earlier—less common as other darners are just emerging
  - Has different habitat preferences and behaviors
  - California flies over open water and perches on vegetation—zigzag tends to fly over mountain meadows and perches on the ground or tree trunks—however, zigzag also found hanging on sedges

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Michele Blackburn, Gold Lake Bog

Zigzag Darner

Habitat

- Found in wet sedge meadows, fens, bogs, and shallow peaty ponds
  - Typically found in wet, boggy habitat like GLB & wet sedge meadow at Sparks Lake
- Females oviposit in moss beds, algal mats, and mud at edge of open water or into vegetation at water level
- Nymphs may survive dry periods in seasonal wetlands (nymph found to have molted beneath a stone in a summer dry pond (Corbet 1999)

eamonccorbett

Zigzag Darner

Conservation Status

- IUCN:
  - Least Concern (Paulson 2017)
- Natureserve:
  - Widely distributed in Canada and northern US; G5: globally secure (2016)
  - Oregon S2: Imperiled—At high risk of extinction due to very restricted range and very few populations
- Known populations in OR are all on Forest Service land
  - Possible that additional populations will be discovered in similar habitat within the Cascades
  - Remote areas are not often searched compared to easily accessible sites like Sparks Lake and GLB

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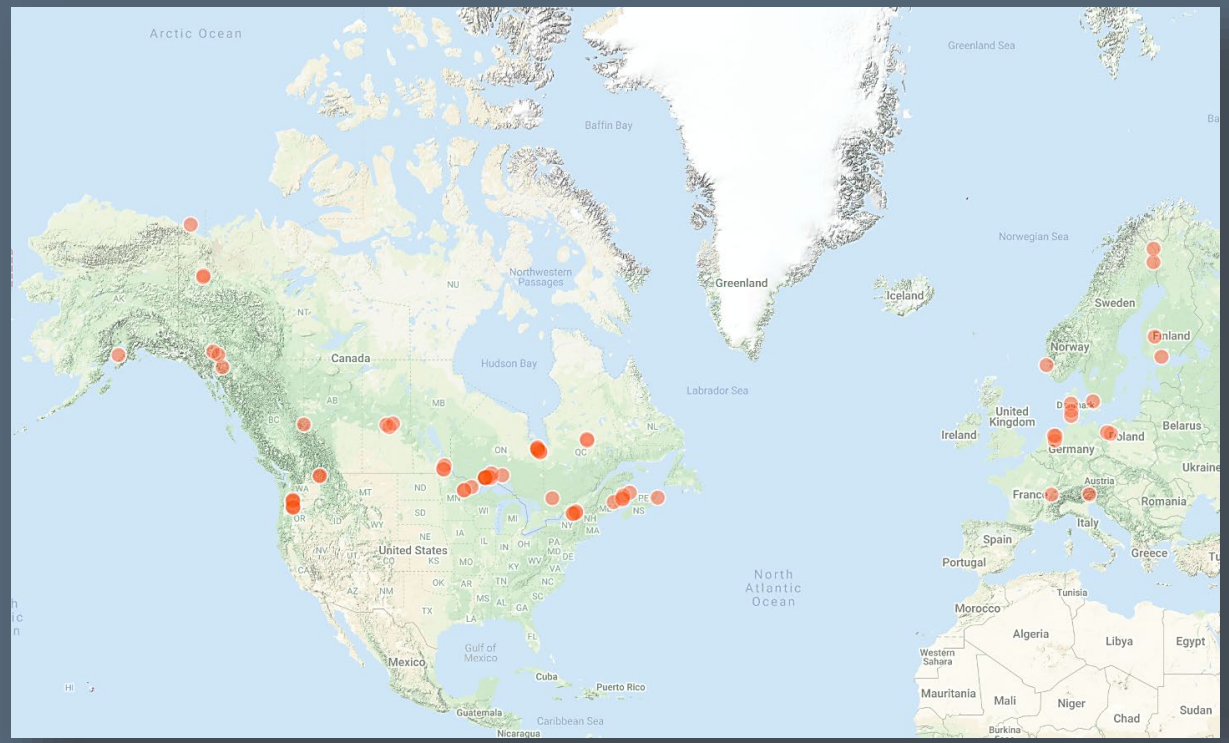
Dennis Doucet; Map: iNaturalist

Subarctic Darner: *Aeshna subarctica*

Holarctic—not restricted to NA

- World Distribution: NA and Europe



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Tyler H.; Map: iNaturalist

Subarctic Darner

- Oregon Distribution: Mt Hood NF
  - Considered rare in Oregon
  - Wasco & Clackamas Counties
  - Camas Prairie, Little Crater Lake, & Clackamas Lake

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Dennis Doucet, Jakedragonslayer3

Subarctic Darner

Field Marks

- Relatively short; average adult size is ~ 2.8 inches
- Male eyes greenish blue and brown
- Face greenish-yellow with a bold crossline
- Thoracic stripes are blue at the top and yellowish-green at the bottom
- Front thoracic stripe bends forward at the top, towards the eyes; has a rearward flag/extension
- Thin line between the thoracic stripes and often one before the front stripe
- Pale spots underneath middle of the abdomen—though not conspicuous
- Simple petal-shaped cerci
- Females polymorphic

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Subarctic Darner

Key Features

Face

Bold, black facial line

Head

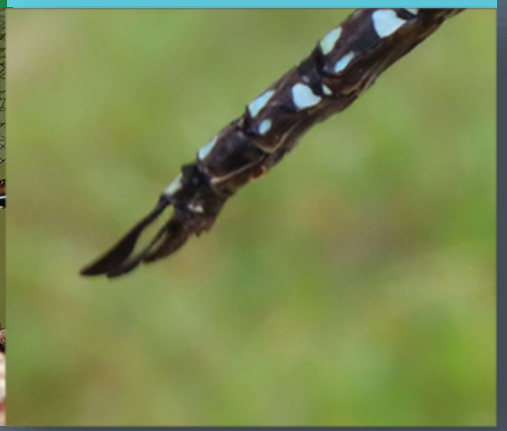
T-spot: narrow stem widens near base

Thorax

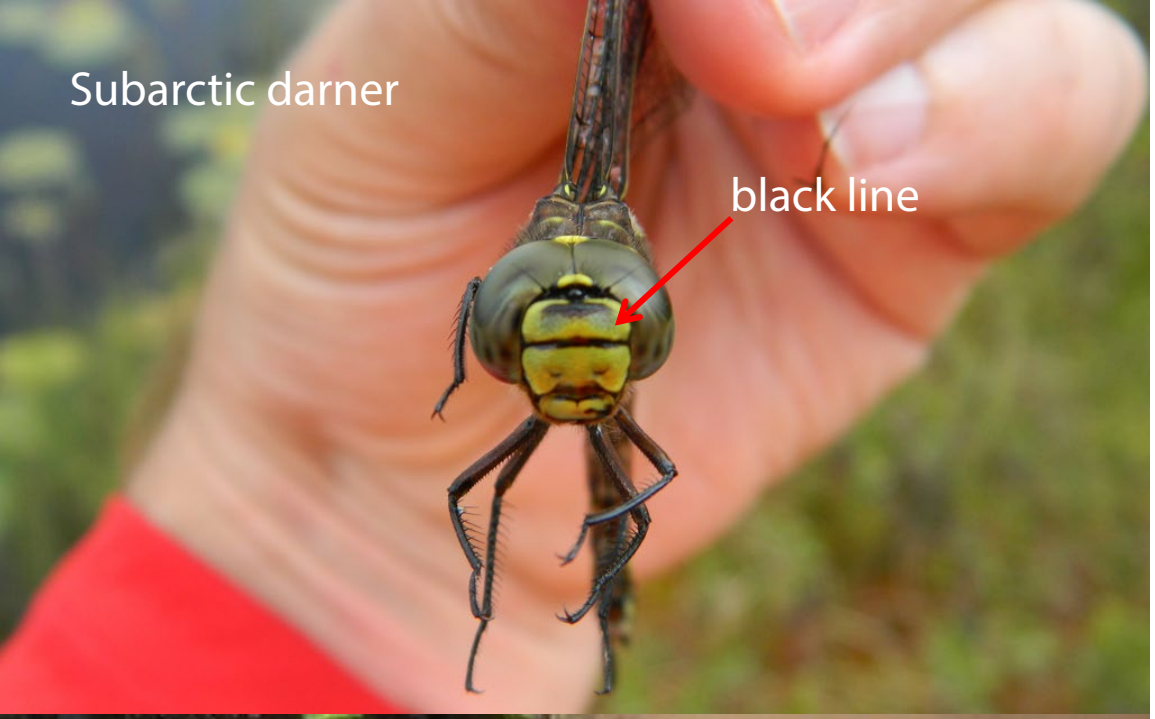
Lateral stripes: both bent in middle; front stripe rearward extension

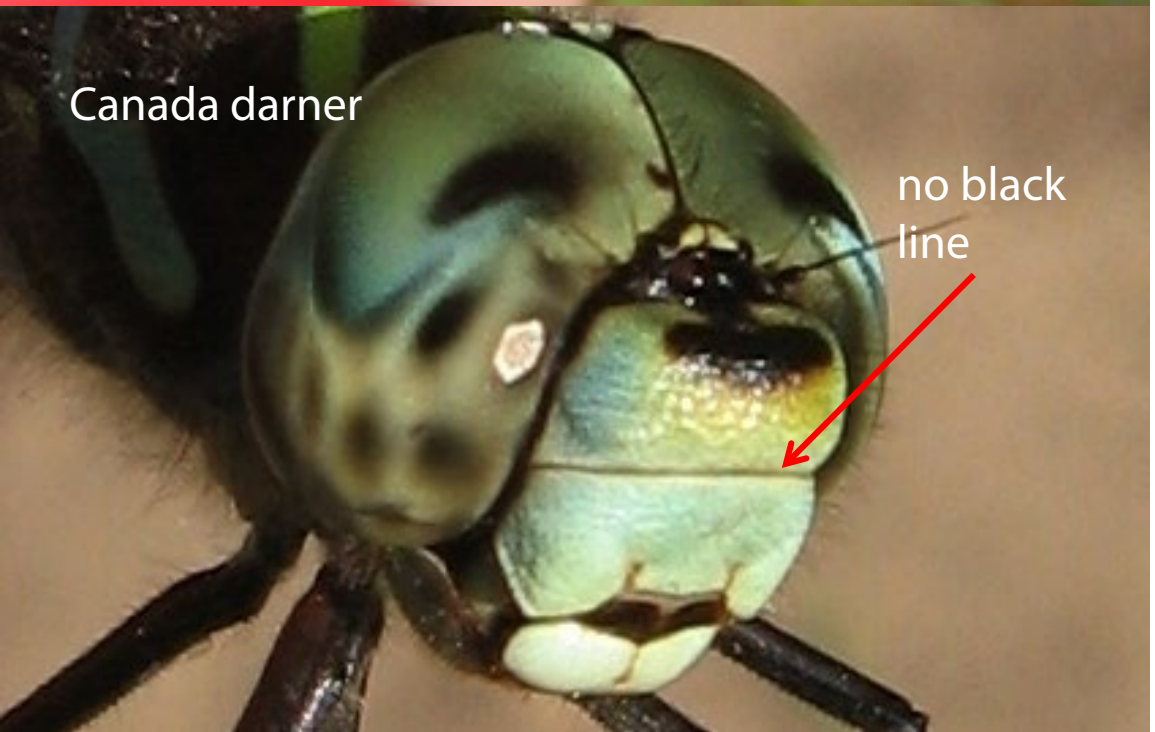
Upper Appendages

Simple petal-shaped; very hairy; tip pointed downward



Louis Imbeau; Jeff Fischer; Dennis Doucet; Cameron Deckert.

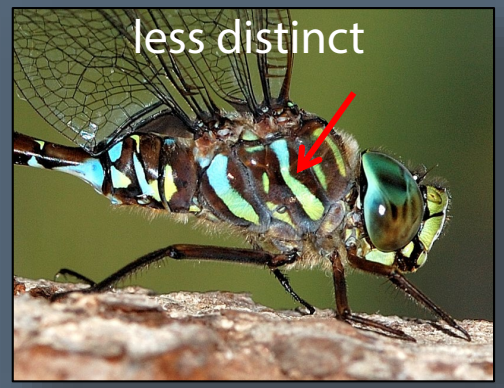




Subarctic Darner

Look-a-likes

- Range overlaps with similar Canada darner
- Distinguished from Canada by black line across face
- Less distinct notch on 1st lateral thoracic stripe



Subarctic darner

Canada darner

Louis Imbeau; Joe Bartok; Dennis Doucet; Michele Blackburn

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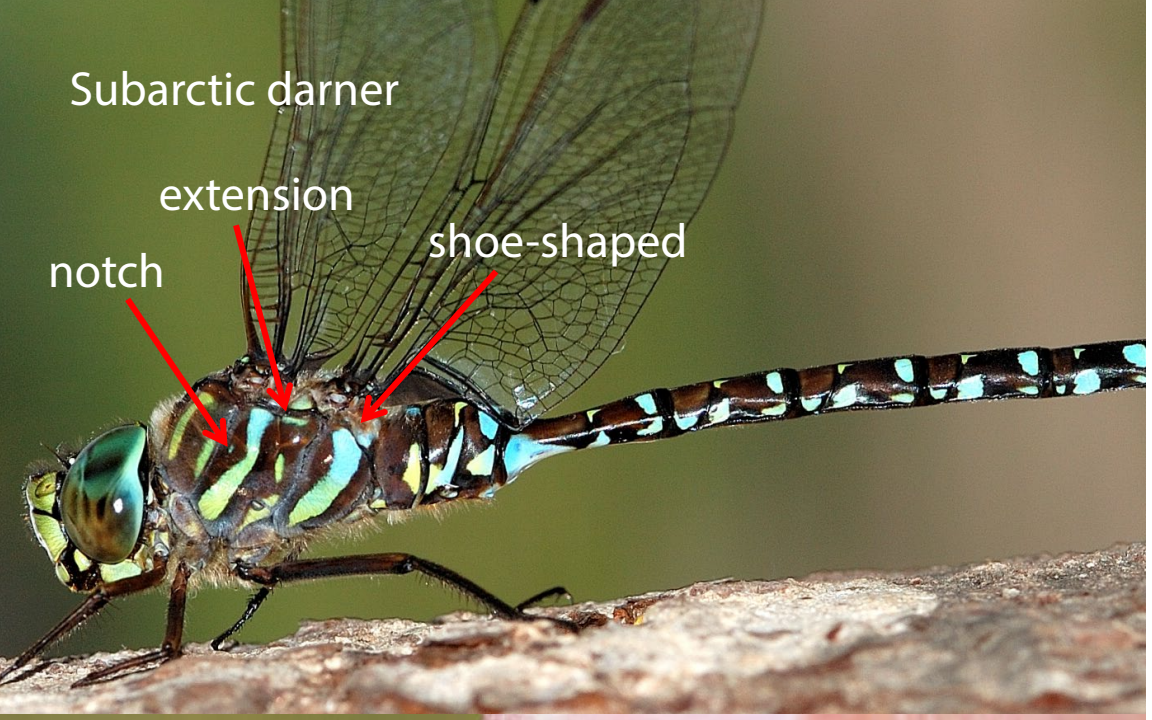

Subarctic Darner

Look-a-likes

- Range overlaps with similar sedge darner
- Distinguished from sedge by careful look at thoracic side stripes
  - Side stripes of subarctic are narrower with slight notch in front and extension to the rear
  - Rear stripe “shoe”-shaped

Dennis Doucet; Terry Hibbitts

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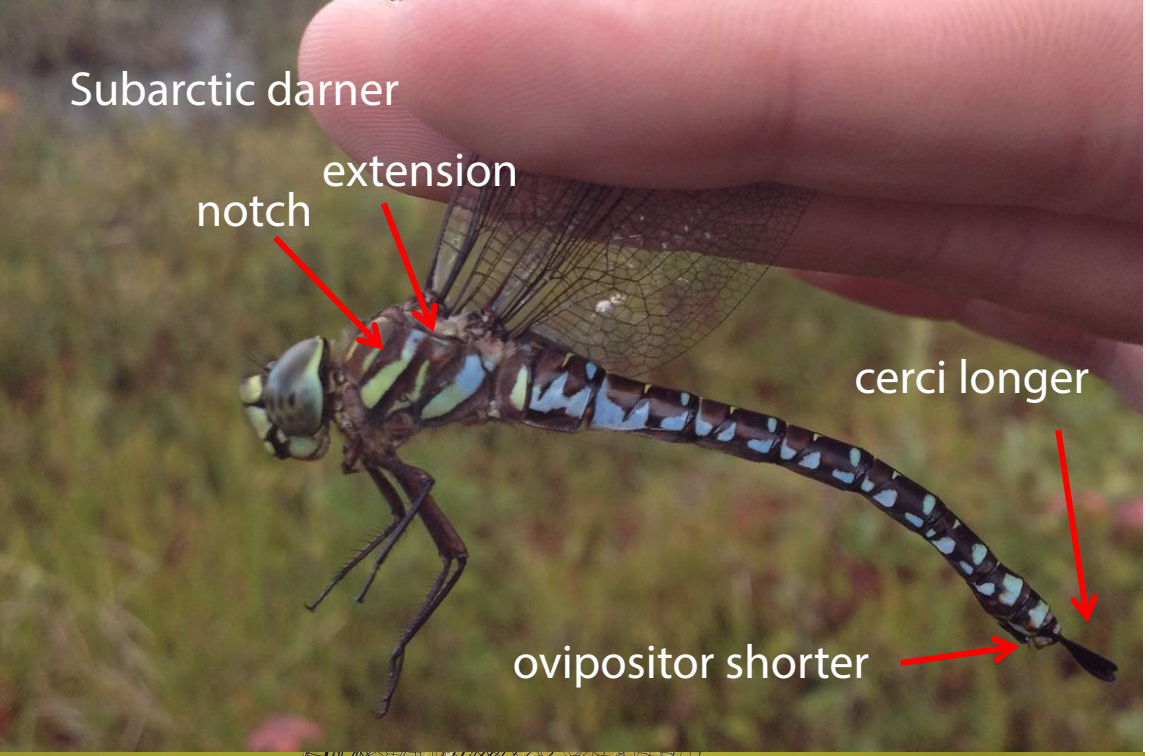

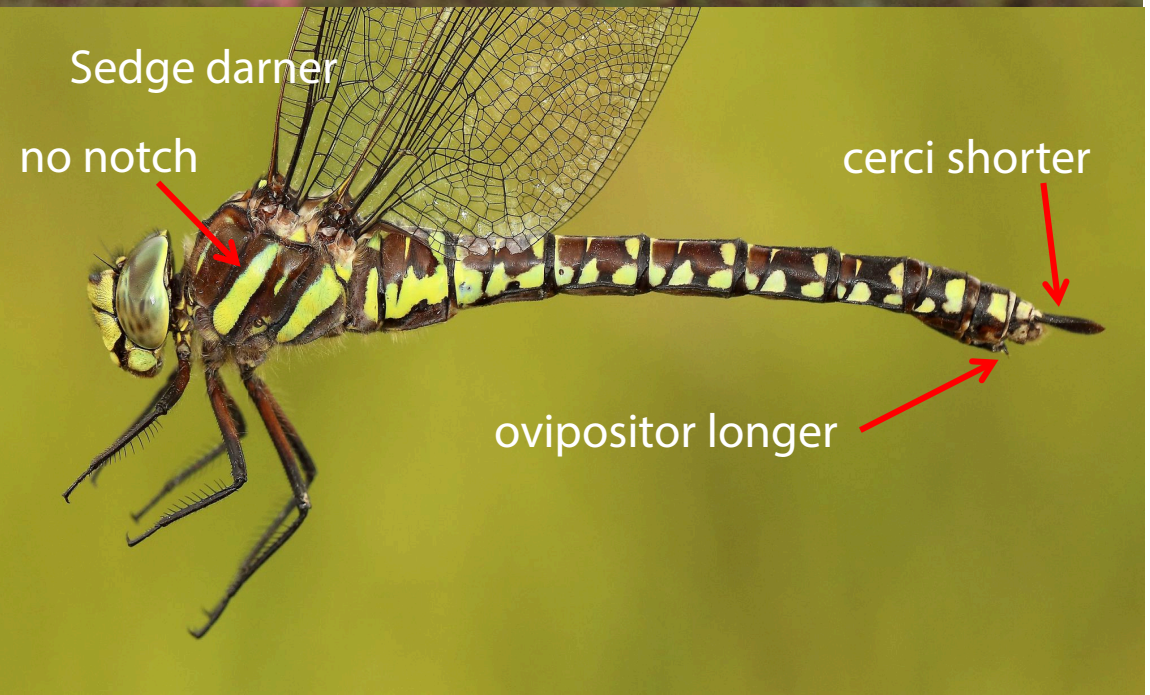

Subarctic Darner

Look-a-likes

- Females
  - Close look at side thoracic stripes
  - Females have longer cerci (6-7 mm) than those of sedge darner (4-5 mm)
  - Subarctic has shorter ovipositer—only reaches end of S9, but extends further in sedge

Jakedragonslayer3; Guy Lemelin

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Brian Shepard

Subarctic Darner

Habitat

- Typically found in fens, wet meadows, and bogs with abundant sphagnum and other mosses
  - Seem to prefer bog pools with cottonsedge (*Eriophorum* spp.) growing out of floating mats
- Found from 3,000 to 3,500 feet of elevation in OR
- Camas Prairie in the MTH appears to be excellent habitat, with well-vegetated pools
- Nymphs require submerged vegetation for clinging-type predation behavior
- Upland bogs may be hotspots for high-altitude dragonflies—offer warm microclimate in cool surroundings

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Syd Cannings

Subarctic Darner

Conservation Status

- IUCN:
  - Least Concern (Paulson 2017)
- Natureserve:
  - Widely distributed in Canada and globally secure (G5)
  - Oregon S2? (inexact numeric rank): Imperiled—at high risk of extinction due to very restricted range and very few populations

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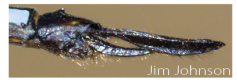
Michael Butler, zigzag darner

Sensitive Darners

Conservation Status

- Additional survey efforts
  - Identify new sites—current known sites are easily accessible
  - Better understand their conservation status
- Climate change may affect conditions at wetlands
  - Wetlands at higher elevations and latitudes may experience the greatest changes and impacts in hydrology
  - Survey efforts can capture potential range and phenology shifts

IDENTIFICATION CHART FOR OREGON DARNERS

Species (size)	Face	Head (top view) T-spot	Thoracic Stripes (side view)	Appendages ♂ (side view); Abdomen Notes	Distribution; habitat; behavior	Flight Period
Blue-eyed Darner (*Rhionaeschna multicolor*) Short 62-69 mm	No black facial line—often light brown; Bright blue eyes	Very thin, straight crossbar 	Bright blue; broad and straight 	Forked (2-pronged at tip) diagnostic; S10 spot on top; no spots under abdomen 	MTH, WIL, & DES; widespread, common throughout OR even in urban areas; up to 6,000 ft; ponds, lakes, & slow-moving waters	Mid-May to Mid-October
California Darner (*Rhionaeschna californica*) Very short 57-60 mm	Thin black line on face	Very thick; stem widens at base 	Narrow and pale blue 	Simple, leaf like; S10 blue spot on top; no spots under abdomen 	MTH, WIL, & DES; common in urban areas & found in Cascades up to 7,300 ft. Ponds, lakes, slow moving streams across OR	Mid-April to early September
Black-tipped Darner (*Aeshna tuberculifera*) Very long 71-78mm	No distinct black facial line	Ends of crossbar pointed down 		Simple; tubercle on underside of cerci, near base; no spot on S10 	MTH, WIL; found in Cascades at lakes and ponds often with associated bog vegetation. Also documented in NE OR.	Late July to early September
Canada Darner (*Aeshna canadensis*) Long 66-73mm	No black or brown facial line	Widens at base 	Front stripe deeply notched in middle; rear "shoe"-shaped 	Simple cerci; S10 spot on top; paired spots beneath abdomen 	MTH, WIL, & DES; Cascade mtn. species above 3,000 ft; lakes, bogs, streams, wet prairies; females oviposit in moss, sedges	Late June to early October
Paddle-tailed Darner (*Aeshna palmata*) Long 64-77 mm	Black facial line	Narrow stem & straight-edged crossbar 	Usually straight, extended 	Paddle-shaped, long spike; S10 spot on top; no spots under abdomen 	MTH, WIL, & DES; common; one of most abundant darners, even in urban areas; frequents ponds, lakes, & all still waters up to 7,300 ft	Late June to mid-November
Sedge Darner (*Aeshna juncea*) Medium 66-71 mm	Thick black facial line	Crossbar with blurred front edge 	Straight, broad, bordered in black 	Narrow, pointed; S10 spot on top; paired spots under abdomen 	MTH, WIL, & DES; not common; Cascades species in OR; frequents sedge-lined shores of mountain lakes & wetlands from 2,500-7,500 ft.	Mid-July to early October
Shadow Darner (*Aeshna umbrosa*) Long 65-73 mm	Black or brown facial line	Short stem & straight-edged crossbar 	Straight-sided; both with rear extension 	Paddle-shaped, long spike; S10 no spot; spots below abdomen 	MTH, WIL, & DES; common throughout OR up to 6,000 ft; mountains and urban areas; patrols shaded banks of streams, lakes, & ponds	Late May to mid-December
Subarctic Darner (*Aeshna subarctica*) Short 63-69 mm	Black facial line	Narrow, straight stem 	Both bent in middle; front stripe rearward extension 	Petal-shaped, hairy, tip pointed down; S10 spot on top; paired spots under abdomen 	MTH (3 localities); rare; fens & bogs w/sphagnum & other mosses; 3,000-3,500 ft; males fly waist height; females oviposit in mosses, sedges usually at edge of water	Late June to early October
Variable Darner (*Aeshna interrupta*) Medium 66-71 mm	Black facial line	Stem & crossbar, angled, thick; wide at base 	Dashes; very thin or broken  thin broken 	Simple, upturned lobe; S10 spot on top; no spots under abdomen 	MTH, WIL, & DES; common at still waters above 3,000 ft; rare in lowlands; most often encountered darners in the mountains	Late May to early October
Zigzag Darner (*Aeshna sitchensis*) Short 55-68 mm	Black facial line	Base convex upward: diagnostic 	Front thin, "zigzag"; rear "T-bone"-shaped: diagnostic 	Petal-shaped; S10 spot on top, no spots under abdomen 	MTH, WIL, & DES; rare, up to 3-5,000 ft; oviposit in algal beds, moss, mud, vegetation	Late August to late September

Kerst & Gordon (2011); Paulson (2009); iNaturalist; OdonataCentral; t-spot drawings and variable darner side stripe drawings by the Xerces Society.

Identification and Monitoring Training: Two Sensitive Dragonfly Species on National Forests

Surveys & Monitoring

Presented for the Interagency Special Status Sensitive Species Program

Michele Blackburn
Conservation Biologist
The Xerces Society for Invertebrate Conservation

Anonymous ebirder

xerces.org

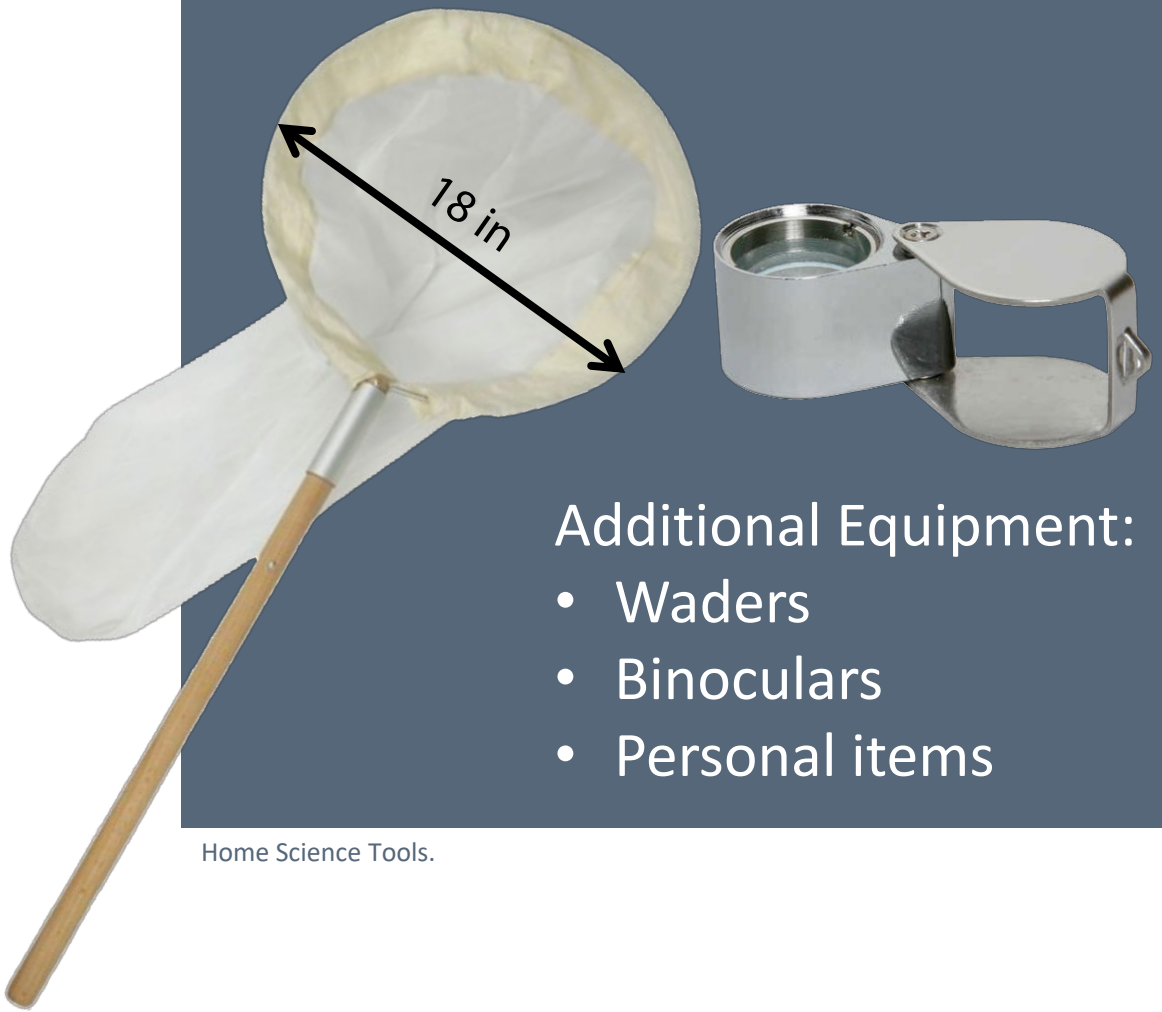
Why Look?

- Odonates are among the better-known insects, but much can still be learned about their distribution, ecology, and life history
  - Surveys can help document new sites
  - Baseline surveys document population trends
  - Document habitat associations at new sites and habitat changes at current sites
  - Extensive surveys can greatly improve our understanding of habitat requirements and conservation status
- Habitat indicators
  - Appropriate subjects to study the impacts of drought, wildfires, or habitat stressors
- Climate change
  - Appropriate subjects to study the long-term impacts of climate change
    - Climate-related changes have been observed in early and late flight dates for some species
    - Long-term monitoring can document changes in phenology and geographical shifts

Michael Butler

How to Look: Field Equipment

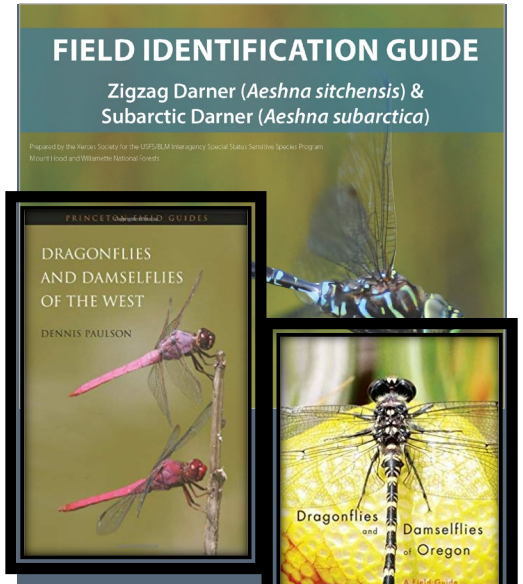
Insect Net & Hand Lens



Home Science Tools.

Additional Equipment:

- Waders
- Binoculars
- Personal items



Field guide & Notebook

Camera/phone

xerces.org

Equipment

Nets & Hand Lenses

- Rose Entomology: http://roseentomology.com/
- Bioquip: https://www.bioquip.com/

Michele Blackburn

xerces.org

Time Range	10:00 AM – 4:00 PM			9:30 AM – 4:30 PM	
Temperature	<59F (15C)	59-65F (15-18C)	65-75F (18-24C)	>75F (24C)	>88F (31C)
Cloud cover >60%	No	No	**Yes**	**Yes**	No
Cloud cover <60%	No	**Yes**	**Yes**	**Yes**	No
Windy >18mph (small tree branches swaying)	No	No	No	No	No
Rain	No	No	No	No	No

Greater Manchester Ecology Unit; Anonymous ebirder

Surveys

Basics: When & How to Look

- Survey sites throughout the documented flight season
- Early and late flight dates are frequently being documented
  - Consider surveying buffers on either end of the flight season to detect changes in phenology
- Like all insects, dragonflies are cold-blooded
  - They will be most active on relatively warm, sunny, calm days
- Length of time needed to survey
  - Varies depending on goals of project and site size
  - No set time, but at least 60-90 minutes to ensure adequate search effort
- Number of visits
  - Conduct several visits during the flight period to determine presence of target species at a site

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Michele Blackburn, Canada darner

How to Look

Overview of Survey Techniques

- Identify appropriate habitat for target species
- Approach sites carefully
  - Dragonflies are very wary and have excellent eye site
- Look for darners patrolling, hanging on vegetation, mating, ovipositing
- Attempt to net each darner you see
  - Darners will be the only blue or green fliers—fliers fly almost continuously with some hovering; compared to perchers
    - Other fliers include spiketails, river cruisers, and emeralds
  - Careful not to capture teneral dragonflies—these are recently emerged dragonflies—wings have not hardened (appear shiny), so can be easily damaged

Michele Blackburn, blue-eyed darner

How to Look

Overview of Survey Techniques

- Observe patrolling dragonflies before attempting to catch
- They usually patrol the same beat, so you can choose a concealed spot along that route
- Keep net as inconspicuous as possible until you are ready to swing it for capture
- Fast-flying, agile species should be swung at from behind as they fly by—they will dodge a net swung head-on
- Remove dragonfly from the net by the wings and photograph diagnostic features
- Collect data and photograph each specimen for ID

Data Collection

Habitat & Location Information

- Record detailed information when you capture and photograph specimens
  - Location
  - Species
  - Male/female/pairs
  - Behavior notes: ovipositing, flying, perching, mating
  - Habitat notes

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Matt Muir, zigzag darner

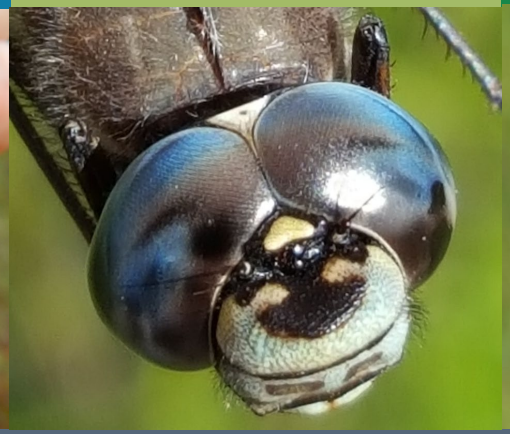
Darners: Key Features

Face:

Presence or absence of a facial line

Head:

T-spot



Thorax:

Lateral or side stripes

Abdominal appendages:

Shape of terminal appendages

Louis Imbeau: subarctic darner; Bog walker: zigzag darner; Nick Block: zigzag darner; appendages: Michele Blackburn, Paul G. Johnson, A_Anctil.

Darners: Key Features

Diagnostic Photos for Vouchering: Abdomen

Presence or absence of spots under abdomen	Presence or absence of spot on top of S10	Tubercle on S1 only in *Rhionaeschna* spp.

Dennis Paulson, Michele Blackburn

When to Look—Species-Specific Surveys

Subarctic Darner

Flight period Late June to early October

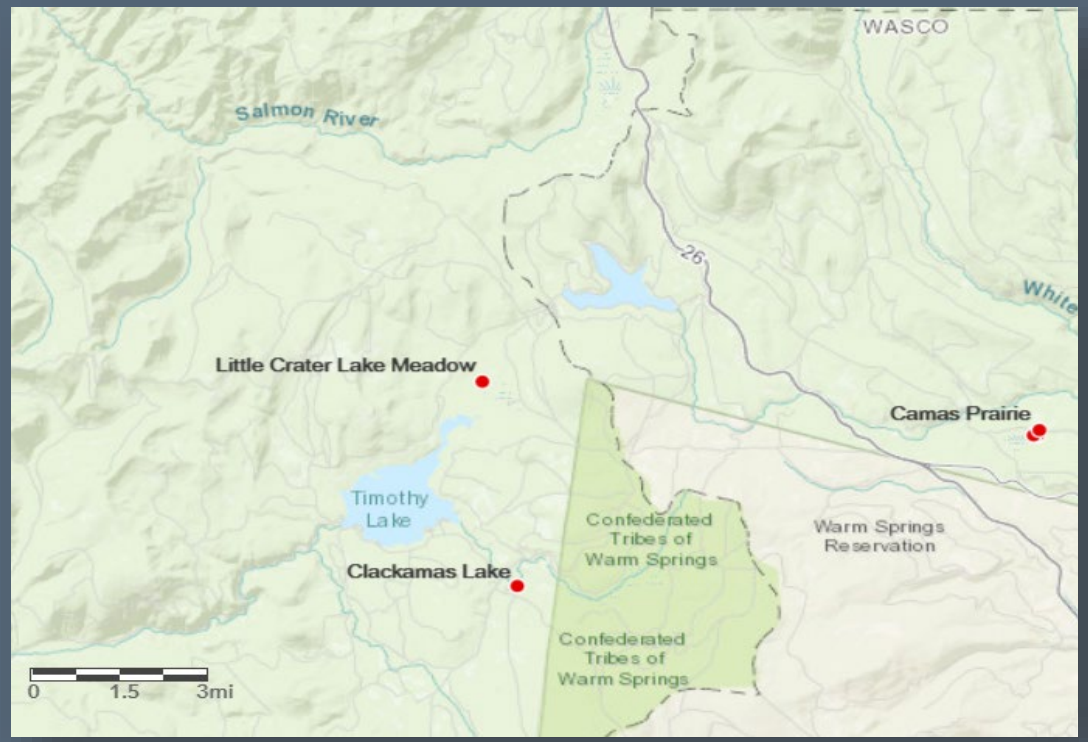
Paul Cools

Dennis Doucet; Map: iNaturalist

Subarctic Darner

Where to Look

- Survey known sites for populations
  - Camas Prairie, Little Crater Lake, & Clackamas Lake
- Identify new sites based on appropriate habitat



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Michele Blackburn

Subarctic Darner

Where to Look

- Identify new sites based on habitat at known sites
  - Camas Prairie in the MTH appears to be excellent habitat, with well-vegetated pools (documented 2018)
- Typically found in upland fens, wet meadows, and bogs with abundant mosses, including *Sphagnum*
- Found at mid-elevations (3,000-3,500 ft)
- Use well-vegetated pools for ovipositing
  - Seem to prefer bog pools with cottonsedge (*Eriophorum* spp.) growing out of floating mats of moss
- Nymphs require submerged/emergent vegetation for clinging-type predation behavior

Subarctic Darner

How to Look

Look for adults at breeding sites….

- Patrolling males—floating beds, shallow pools
  - Look for males flying back and forth over floating beds of sphagnum or other mosses in lakes, wet prairies, or bog/fen pools
  - They may hover in one spot before moving to another
- Perched adults
  - This species rarely perches
    - They must be captured with a net and ID'ed in hand
    - OR—your camera has good zoom capabilities
- Ovipositing females—floating beds, shallow pools
  - Look for females ovipositing in mosses and sedges at the edge of open water
- Mating pairs—flying or on vegetation
  - Look for mating pairs on vegetation
  - They may flush from vegetation

Amanda Layng

Subarctic Darner

Diagnostic Photos for ID

Face

Facial line

Head

T-spot

Thorax & Upper Appendages

Side view of lateral stripes & appendages

Abdomen

Top of abdomen: S10

Louis Imbeau; Jeff Fischer; Dennis Doucet.

When to Look

Zigzag Darner

Flight period late August to late September

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
							▬	▬			

Owen Strictland

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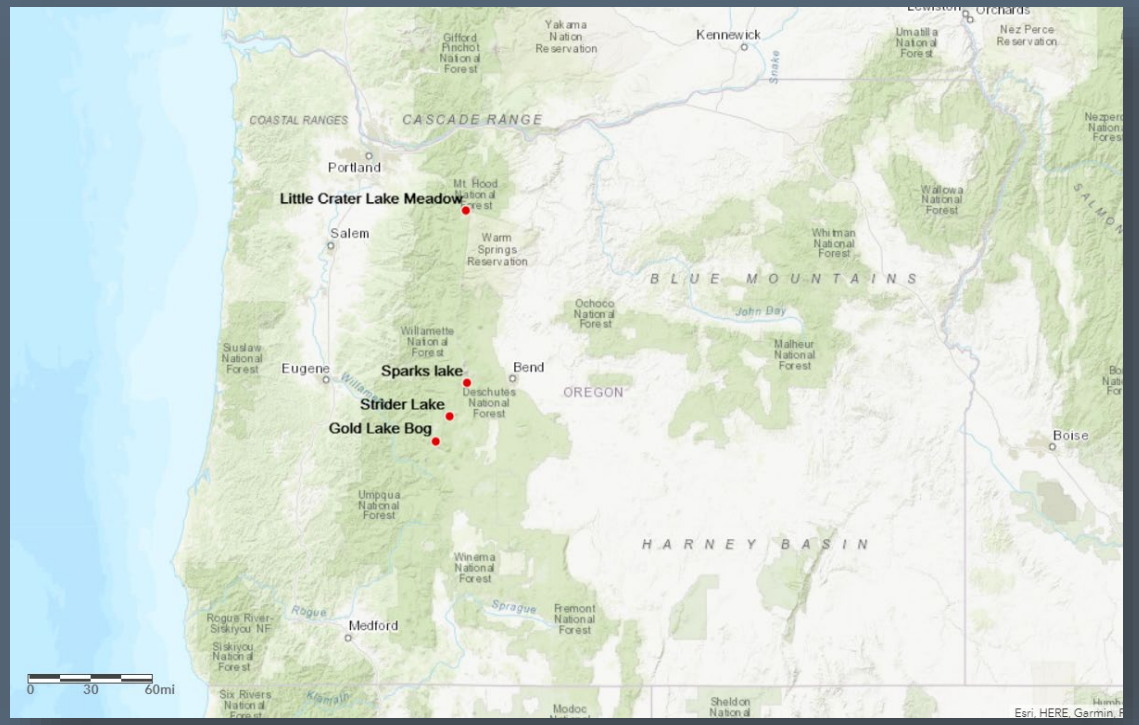
J. M. Klodzen; Map: iNaturalist

Zigzag Darner

Where to Look

- Oregon Distribution: Gold Lake Bog (WIL), Sparks Lake (DES),Strider lake (DES), & Little Crater Lake Meadow (MTH)



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Kees Marijnissen; Bobcat: Camas Prairie

Zigzag Darner

Where to Look?

- Records are at southernmost edge of range—climate change may threaten southern populations
- Typically found in fens, bogs, and wet meadows with seasonal and permanent pools
  - Generally shallow, cool-water pool habitat with little open water & low sedges and moss near shrublands or woodlands
- Found at mid-elevations (3,000-3,500 ft)
- Nymphs require submerged/emergent vegetation for clinging-type predation behavior
- Reported sites
  - Sparks lake: reported as only numerous at Sparks Lake (DES) sedge meadow (documented 2002)
  - Gold Lake Bog (WIL) documented 2004
  - Little Crater Lake Meadow (MTH) documented 1999
- Identify new sites based on habitat associations at current known sites

Zigzag Darner

How to Look?

At breeding sites look for….

- Patrolling males—near shallow pools
  - Look for males flying low—1-2 ft from the ground
  - They may fly less swiftly than others in the genus
- Perched adults—on ground or vegetation
  - Unlike most darners, this species may perch horizontally on ground or logs
  - Adults also found hanging in clumps of sedges
  - This species has been approached hanging on bark of trees
- Feeding adults—in open clearings
  - Look for males and females hunting for prey on the wing
- Ovipositing females—shallow pools
  - Look for females ovipositing in moss beds, algal mats, and mud at the edge of shallow pools
- Mating pairs—flying or on vegetation
  - Look for mating pairs on trees or other vegetation
  - They may flush from vegetation

Ron Van Epps

Zigzag Darner

Diagnostic Photos: Key Features

Face

Facial line

Head

T-spot: Base convex upward (diagnostic)

Thorax & Upper Appendages

Side view of lateral stripes: front zig-zag shape, rear “T-bone”-shaped (diagnostic) and upper appendages

Abdomen

Top of abdomen including S10; bottom of abdomen

Nick Block; Colin Jones

Data Collection

Specimen & Habitat Data: Along with regular ISSSSP data on location, etc., be sure to collect additional info on behaviors, sex of individual, habitat notes of interest—vegetation characteristics, and egg laying substrate.

Species & Sex

Male/Female/Pairs?

Reproductive Stage/Behavior

Wheel, Tandem, Ovipositing, Teneral Adult

Habitat Features

Vegetation assemblages

Notes

Additional habitat notes, e.g., substrate female seen ovipositing into

Diana-Terry Hibbitts; Michael Butler; Dennis Paulson; Stuart Tingley; Colin D. Jones; Brain Shepard; Douglas Tate.

Upload Observations to Online Databases

Share your observations

- OdonataCentral
- iNaturalist

Mike Rollinger

xerces.org

Thank You!

- Sincere thanks go to all the photographers
- Content informed by and made possible with the help of the following resources and dragonfly experts: iNaturalist (2019); Johnson. J., Kerst and Gordon (2011); Kohler, N.; OdonataCentral (2019); Paulson (2009).

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Cameron Deckert, variable darner