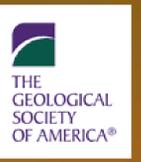


# Dragonfly Survey of Indiana Dunes National Lakeshore

Yuri Lopez, Joy Marburger, Erin Grey-Avis



## Introduction

Dragonflies are sentinels of environmental health. They serve as an indicator for other species in a freshwater habitat and they also require healthy vegetation as a source of protection. This survey was done to compare with another survey which was conducted 20 years ago and contained no repeatable protocol. For this project, we developed a method to identify dragonflies by their morphology and also developed a repeatable protocol using new techniques involving DNA and eDNA analysis. Our goal was to identify as many dragonfly species and produce a user-friendly dichotomous key for park service staff and the public.

## Objectives

- Survey dragonflies using 3 different methods:
  - Observational
  - DNA (removing tarsus from specimens)
  - Water eDNA
- Create a smartphone app for visitors.
- Create a dichotomous key and make it into a booklet.



## Accomplishments

- We gained knowledge of the biodiversity of dragonflies, and had fun while doing so.
- We learned how to identify adult dragonflies by their morphology.
- A dichotomous key was created for the park staff and public.
- A project was created through iNaturalist and Active Explorers (for Smartphone users) to use in conjunction with the dichotomous key.

## Methods

Below is a step-by-step protocol for sampling odonate diversity at a site. This protocol was developed to comprehensively sample odonate eDNA, nymphs, and adults. The objectives of the sampling are to

- Provide a baseline odonate biodiversity dataset for the site.
- Compare eDNA and traditional sampling methods
- Compare nymph versus adult diversity within a site. eDNA and nymph sampling can occur during any weather, but adult sampling is best done on warm (>75°F) sunny days when odonates are most active.

### Indiana Dunes National Lakeshore Sample Sites



West Beach

Miller Woods

### Step 1: Site Description

- Latitude and Longitude
- Water temperature
- Water pH
- Air Temperature



### Step 2: Collect eDNA samples at each site.

- Collect at least three 250mL water samples using aseptic technique.
- Samples are filtered through a micro filter.
- Filters are removed and placed in DNA storage buffer.
- A "blank" sample of distilled water will also be filtered at same time as the sample.

### Step 3: Estimate odonate nymph diversity.

- Odonate nymphs were collected with dipnets and sorted into ice cube trays for identification.
- Specimens had the tarsus removed and placed in DNA storage buffer for later genetic barcoding.

### Step 4: Estimate odonate adult diversity.

- Odonate adults were observed in flight and when perched.
- The time of each individual sighted was recorded.
- Adults were netted and photographed for correct identification.
- Unknown caught specimens had one tarsus removed and placed in DNA storage buffer for later genetic barcoding.

### Step 5: eDNA Assay Evaluation.

- eDNA samples from each site were screened for 3 specific species using an end-point PCR assay.
- Evaluate the accuracy and sensitivity of the assays by comparing their results against the presence/absence results of the traditional nymph and adult method.

## Discussion

This project entailed various accomplishments, discoveries, and obstacles. The one obstacle that we could not control was the weather. When this project started the weather was not ideal for dragonflies. It was cold, rainy, and very cloudy. Due to undesirable weather, we focused only on dragonflies (the project was aimed toward all odonates) and focused on the West side of the park. Regardless of the weather, we discovered that 6 species that were considered rare in the 1990s are now common in the sites we surveyed. We also discovered that 3 of the species that were then common in the 1990s are now rare in the sites we surveyed.

## Outreach

A group of teachers came from South Bend, IN to gain knowledge of what Indiana Dunes National Lakeshore has to offer. There were 3 projects to choose from, and one of them was Dragonfly Surveys, which I led.

The large group split into three smaller groups and chose a project. The teachers that chose the Dragonfly project came with me, and drove to Long Lake in the West Beach area. While there, my duty was to educate and inspire new ideas for future projects with their classrooms.

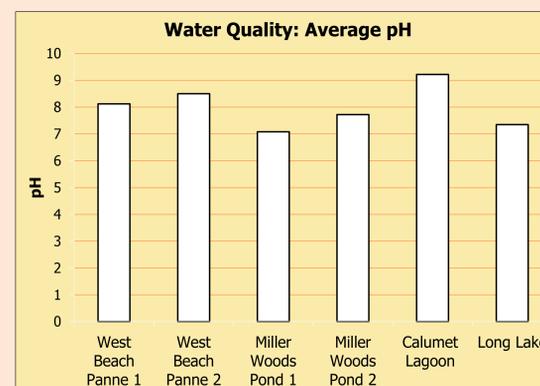
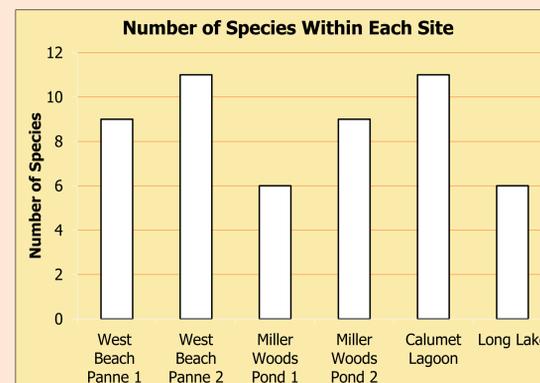
While there, we:

- Surveyed dragonfly larvae.
  - Used small dipnets and trays.
- Surveyed adult dragonflies.
  - Trained how to handle adults.
  - Used aerial nets to capture adults.
  - Used my dichotomous key to identify adults.



## Data

Species	Long Lake	Calumet Lagoon	West Beach Panne 1	West Beach Panne 2	Miller Woods Pond 1	Miller words Pond 2
12-Spotted Skimmer	x		x	x		x
4-Spotted Skimmer				x		
Black Saddlebags	x	x	x	x	x	x
Blue Dasher	x	x			x	x
Calico Pennant		x	x	x		x
Carolina Saddlebags		x	x	x		
Common Whitetail			x	x	x	x
Dot-tailed Whiteface	x					
Eastern Pondhawk	x	x		x		
Green Darner	x	x	x	x	x	x
Halloween Pennant		x	x	x		x
Ruby Meadowhawk					x	
Slaty Skimmer		x				
Variagated MeadowHawk			x	x		
Whiteface Meadowhawk		x				
Widow Skimmer		x	x	x		



## Acknowledgements

A special thanks to:  
Joy Marburger, Erin Grey, Wendy Smith, Enrique Camacho Jr., & Mary Carrington.

