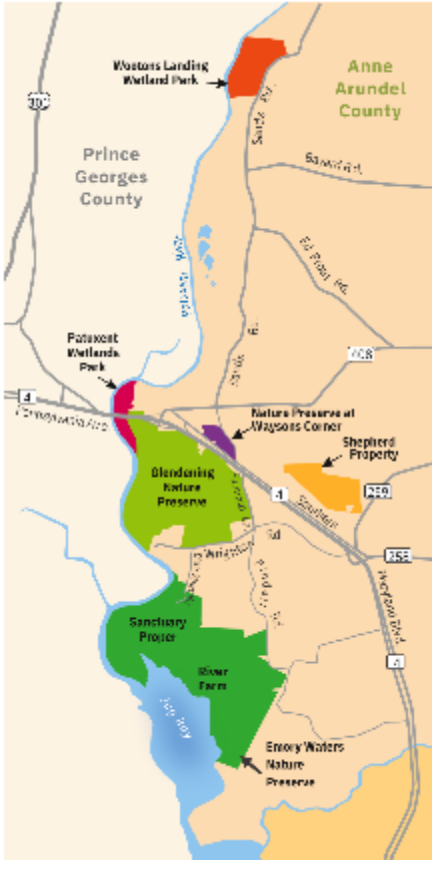
Why Did the Salamander Cross the Road?: Citizen Science and Salamander Migrations at Jug Bay Wetlands Sanctuary

Jug Bay Wetlands Sanctuary

- 1,700-acre preserve 20 miles east of DC in southern Maryland on the Patuxent River
- Operated by the Anne Arundel County Department of Recreation and Parks
- Protects unique tidal freshwater marshes, forested wetlands, upland and riparian forest, creeks, meadows, pine and sand barrens, and **vernal pools**.



What are the “Salamander Migrations”?

- Vernal Pools are ephemeral water bodies that are devoid of breeding populations of fish
  - Marbled and Spotted Salamanders require these pools for their eggs and larvae
- In the spring Spotted Salamanders move from underground in the forest to the pools
  - In southern Maryland, this is typically mid-Feb through mid-March
  - Warm (>40°F) nights
  - The ground must be saturated (persistent rain)
- In the fall Marbled Salamanders move from the forest to lay their eggs in dry pools
  - Typically, mid-Sept through late Oct
- Migrations can happen in small waves or one “Big Night”
  - A “Big Night” usually only happens when there has not been many opportune evenings but it’s late in the migration window
- This often means crossing treacherous roads- mortality can be high due to vehicles

Spotted Salamanders (*Ambystoma maculatum*)

- Genus: Mole Salamander (Ambystoma)
- Life Span:
  - Up to 32 years
  - Average 20 years
- Life Cycle:
  - Aquatic larval stage (2-4 months)
  - Terrestrial adult stage
- Size
  - Average: 4.4-7.8”
  - Record: 9.75”
- Diet:
  - Mostly insects
  - Other small invertebrates
  - Smaller salamanders
- Behavior:
  - Fossorial
  - Brumate in winter

Marbled Salamander

(*Ambystoma opacum*)

Genus: Mole Salamander (Ambystoma)

Life Span:

- 8-10 Years
- Record: 12 Years

Life Cycle:

- Aquatic larval stage (~2-6 months)
- Terrestrial adult stage

Size:

- Average: 3.5-4.5”
- Record: 5”

Diet:

- Mostly insects
- Other small invertebrates

Behavior:

- Fossorial
- Breed in fall

Other Species Documented

- Wood Frogs
- Spadefoot Toads
- Spring Peepers
- Leopard Frogs
- Pickerel Frogs
- American Toads
- Fowler's Toads
- Four-toed Salamanders
- Two-lined Salamanders
- Red Salamanders
- Eastern Newts

Salamander Migration and Road Crossing

Mission:

Save as many amphibians as possible from traffic fatalities

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Objectives

1. Reduce the number of amphibian traffic fatalities during the peak migration period
2. Quantify impact of local traffic on amphibian populations
3. Identify peak road crossing locations
4. Inspire human behavior change through **public outreach and education**
5. Serve as an annual census of Jug Bay Wetland Sanctuary mole salamanders*

*Safety concerns often prevent consistent data collection (rain pairs well with storms)

Volunteer Recruitment

- PROGRAM RUN ENTIRELY BY VOLUNTEERS
- Volunteer leads are also leads for Vernal Pool Monitoring Program
- Other volunteers are recruited through email blast to existing JBWS volunteer database, newsletter, other relevant publications
- Mandatory orientation- review methodology and safety protocols
- Volunteers sign up with general date availability to be on-call. Lead will text on-call volunteers when conditions appear right.
- No more than ~15 volunteers/night

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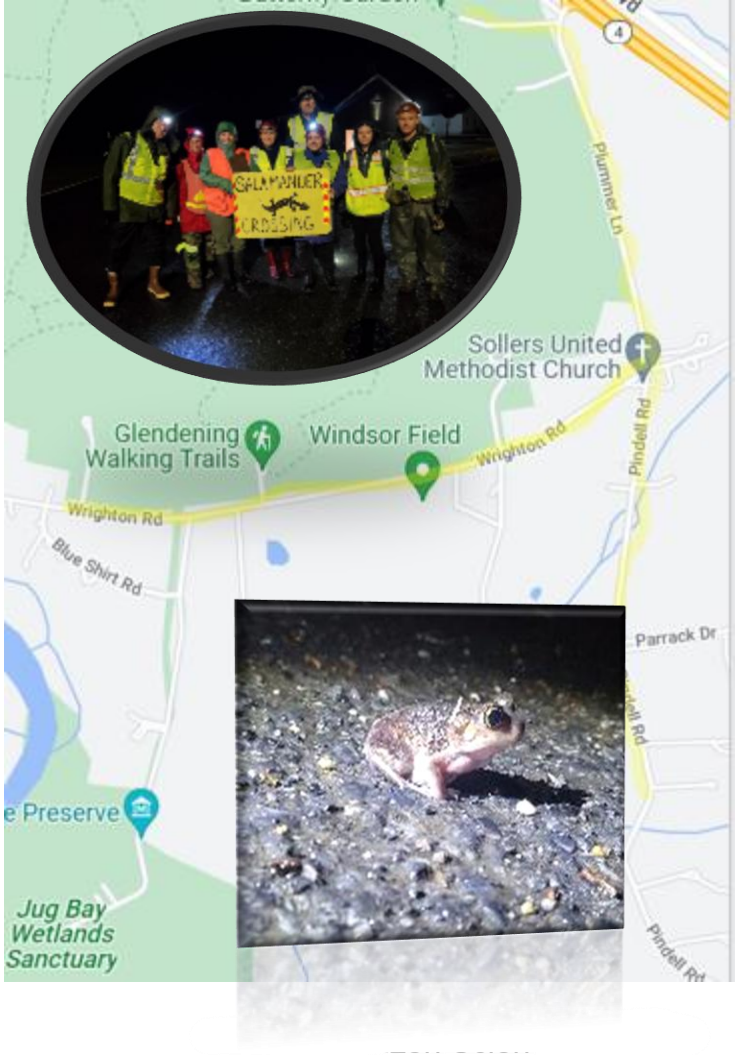
Methodology

Volunteer Roles:

- Leads – Document results, identify hazards for volunteers, handle radio communications with other teams
- Shepherds – Assist in spotting, identifying, and escorting amphibians noting their location

Data Recording:

- Metadata (rainfall, temperature, # of volunteers, date and time range)
- # of each species dead and alive
- Flagged location of observation
- # of cars



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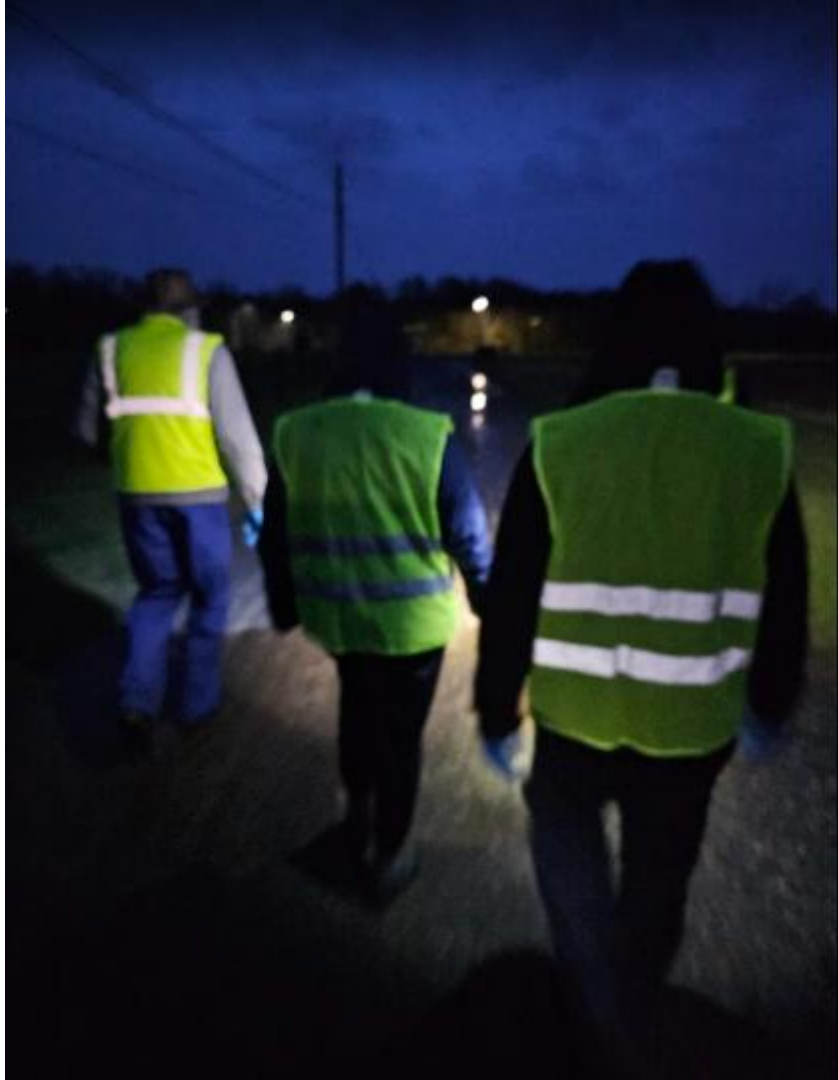
Methodology (cont.)

Volunteers will split up into 2-3 groups and walk assigned routes on the road.
Leads help with identification, keep an eye out for oncoming vehicles & notify volunteers to move over, use radios to let other groups know that vehicle is coming their way.
Groups typically stay out until amphibian and/or vehicular traffic dies down (typically no later than midnight)



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Preparation

Equipment:

- Road signs indicating salamanders and volunteers ahead
- 6 handheld radios
- Reflective vests
- Several mechanical tally counters
- Nitrile gloves

Flagging the roads to help identify most popular crossing areas- every 25 meters

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Priorities

1. **Safety of volunteers**
2. Safety of amphibians
3. Accuracy of data
4. Preservation of equipment

Remember: If one volunteer gets hit by a car saving a salamander, NO volunteers will be able to save salamanders in the future

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Results

Highlights (2022-2024):

- >1400 amphibians assisted!
- >750 mole salamanders assisted!
- > 500 volunteer hours
- >30 volunteers participated

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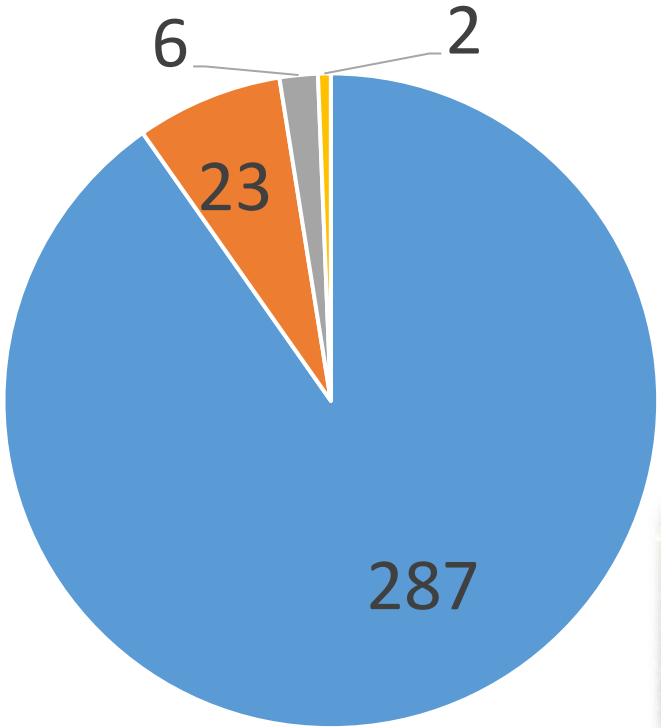
Fall 2022 The “Big Night” Total Salamanders



Drought conditions in the fall of 2022 followed by big rain, lead to over 300 Marbled Salamanders moving in one night!

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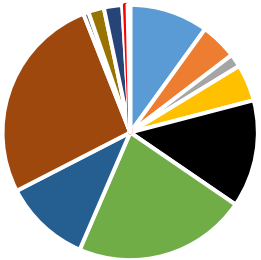
Total Salamander Fatality Rate: 7.9%
(7.4% Marbled Salamanders)

Spring 2024 Spotted Salamander Migration

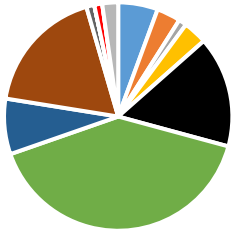
Metadata		
Date Range	02/27-03/09	
Volunteers	30	
Volunteer Hours	164.25	
Amphibians	**Alive**	**Dead**
Spotted Salamanders	30	5
Marbled Salamanders	14	3
Eastern Spadefoot	5	1
Wood Frogs	14	3
Spring Peepers	41	14
Pickerel Frogs	66	36
Leopard Frogs	33	7
American Toads	80	16
Fowlers Toads	2	1
Green Frog	6	0
Two Lined	7	0
Red Salamander	1	0
Gray Treefrog	1	1
Bullfrog	1	0
Unknown Frog	0	2
Total	301	89

Fatality Rate
Total: 30%
Salamander: 18%

Amphibians Alive



Amphibians Dead



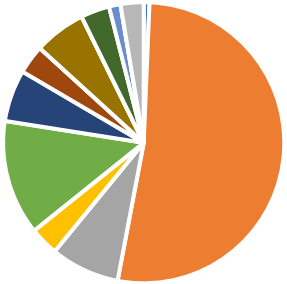
- Spotted Salamanders
- Marbled Salamanders
- Eastern Spadefoot
- Wood Frogs
- Spring Peepers
- Pickerel Frogs
- Leopard Frogs
- American Toads
- Fowlers Toads
- Green Frog

Fall 2024 Marbled Salamander Migration

Metadata		
Date Range	09/12-11/10	
Volunteers	26	
Volunteer Hours	78.5	Hrs
Amphibians	**Alive**	**Dead**
Spotted Salamanders	1	0
Marbled Salamanders	79	15
Eastern Spadefoot	12	1
Wood Frogs	5	0
Spring Peepers	0	0
Pickerel Frogs	20	10
Leopard Frogs	9	8
American Toads	5	3
Fowlers Toads	0	0
Green Frog	9	6
Two Lined	0	0
Eastern Newt	5	0
Grey Tree Frog	2	0
Bullfrog	0	0
Unknown Frog	4	8
Total	151	51

Fatality Rate
Total: 34%
Salamander: 19%

Amphibians Saved



Amphibians Killed

- Spotted Salamanders
- Marbled Salamanders
- Eastern Spadefoot
- Wood Frogs
- Pickerel Frogs
- Leopard Frogs
- American Toads
- Green Frog
- Eastern Newt
- Grey Tree Frog
- Unknown Frog

Major Takeaways

Consistent scientific data collection is a challenge due to several variables outside of our control (weather conditions, volunteer availability, etc.)

BUT

Program has been great for outreach and education on several fronts:

- Local news articles about the project
- New volunteer advocates for salamanders
- Letting community know that salamanders are moving through on rainy nights- best to avoid the backroads!

Future Goals

- Petition AA County to install salamander crossing on Plummer Road or Wrighton Road (or both)
- Investigate pattern matching image processing software for identifying individual salamanders- see if we find the same individuals passing through multiple times
- Connect with other similar programs to see how we can improve

QUESTIONS?

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