

# SPATIOTEMPORAL ASSESSMENT OF WILDLIFE-VEHICULAR COLLISIONS IN NEW HAMPSHIRE

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**Animal-Vehicle Collision  
Avoidance Topical Discussion**





# PRESENTATION OVERVIEW

- Goals and methods for the project
- Data limitations and any lessons learned
- How to identify a 'hotspot'
- Online WVC mapper demo

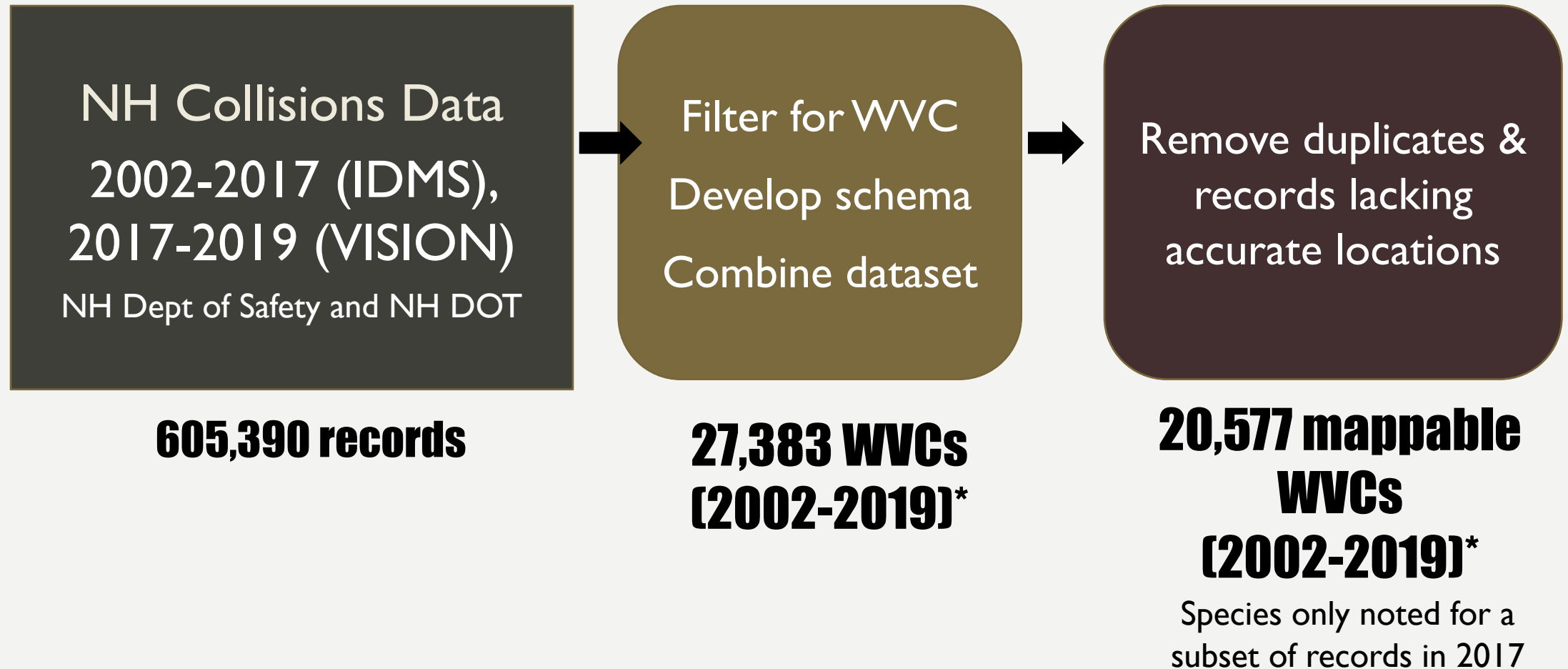


# PROJECT GOALS

- Summarize & visualize WVCs over space and time 2002-19
- Assess the effect of road, adjacent land, and wildlife habitat characteristics on probability of WVC occurrence
- Synthesize & evaluate BMPs for mitigation
- Develop decision-support tools (online mapper and StoryMap) for NH DOT, regional planning commissions, and municipalities
- Identify priority roadways maintained by NH DOT for mitigation



# Analytical Approach



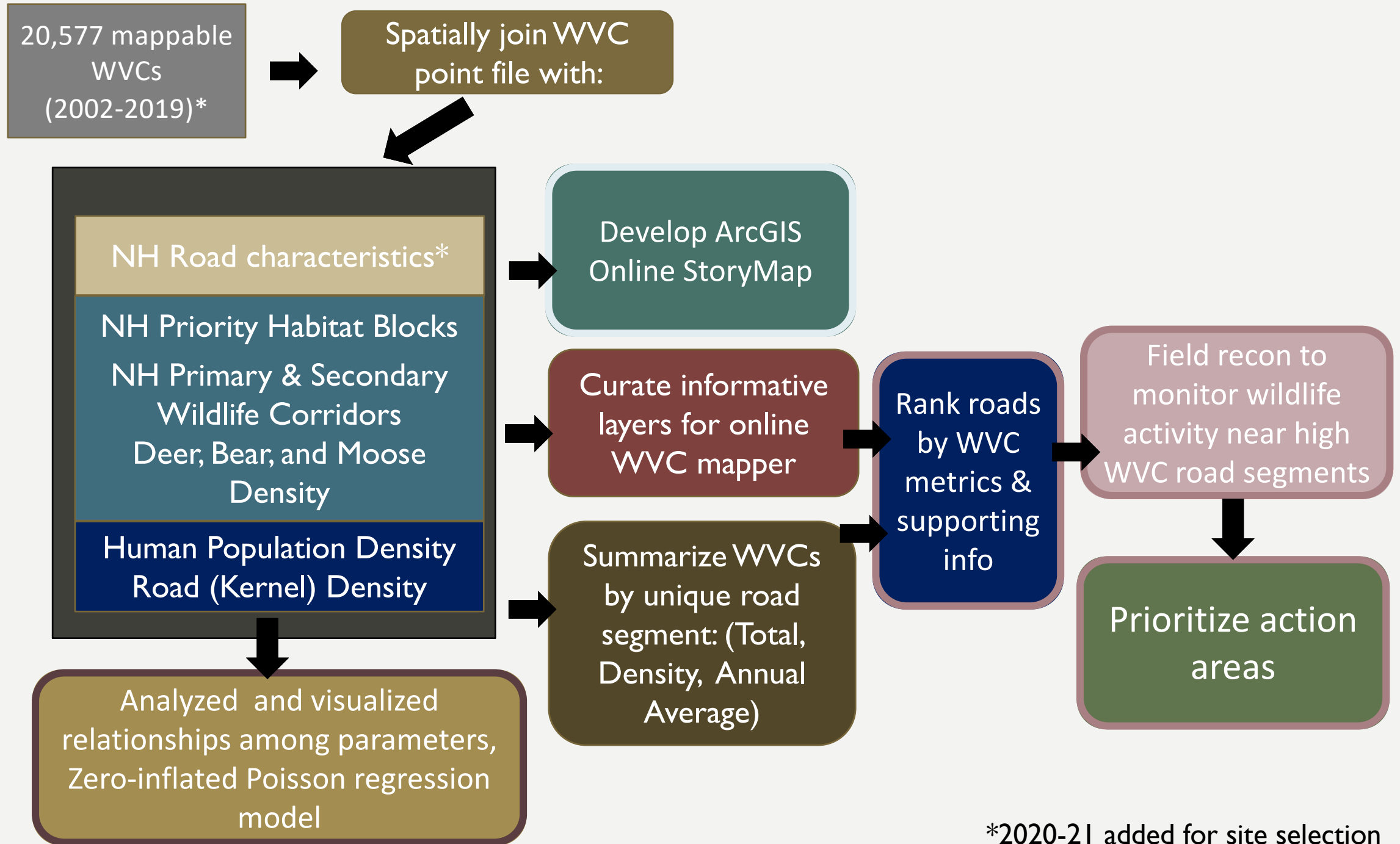
\*2020 & 2021 data added near the end of the project and processed separately.



An abstract background image featuring a collage of data visualizations. It includes a bar chart at the top left, a line graph with multiple data series in the center, and a calendar-like grid at the bottom with days of the week (Mon, Tue, Wed, Thu, Fri, Sat) labeled. The overall color scheme is dark with blue and orange accents.

# DATA LIMITATIONS

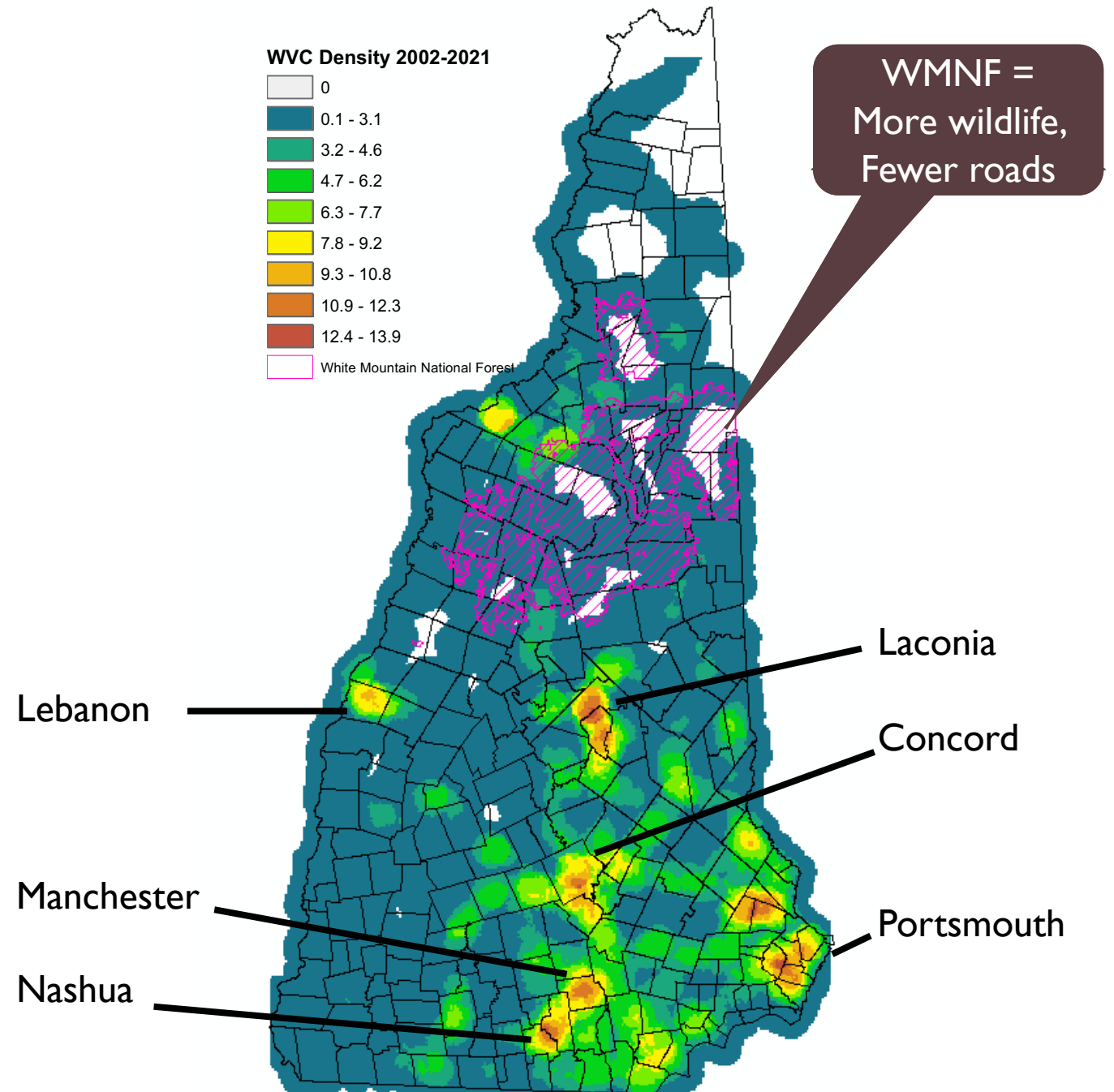
- ❖ Limited information in the collision record regarding road characteristics
- ❖ Species matter! No species recorded, except in 2017 for some of the records
- ❖ Substantial lack of specific geographic coordinates that could be linked to road network resulted in removing nearly 25% of the collision records from analysis
- ❖ No consistent, reliable source of roadkill data to reflect unreported collisions or the severity of collision for wildlife



\*2020-21 added for site selection

# WVCS 2002-2021

**HOTSPOTS.**  
**COLDSPOTS.**



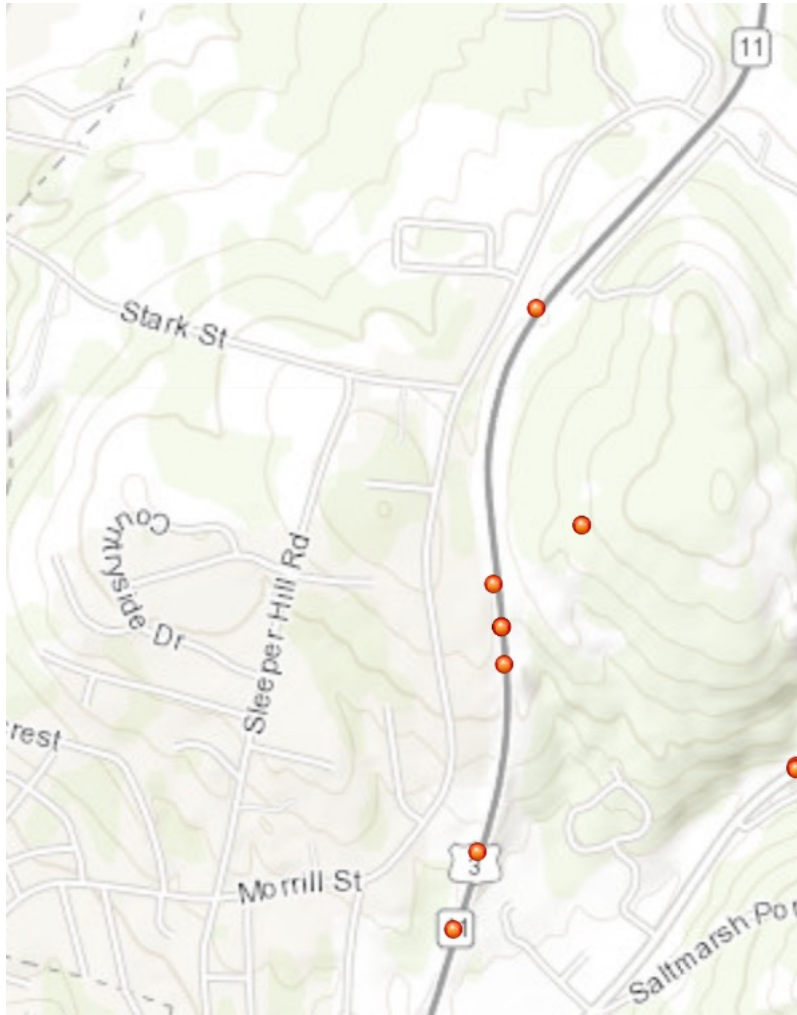


# **ROAD-LEVEL “HOTSPOT” CHALLENGES**

**What spatial unit provides the best resolution for action?**

**What is the temporal window for assessment?**

# SPATIAL AND TEMPORAL SUMMARIES

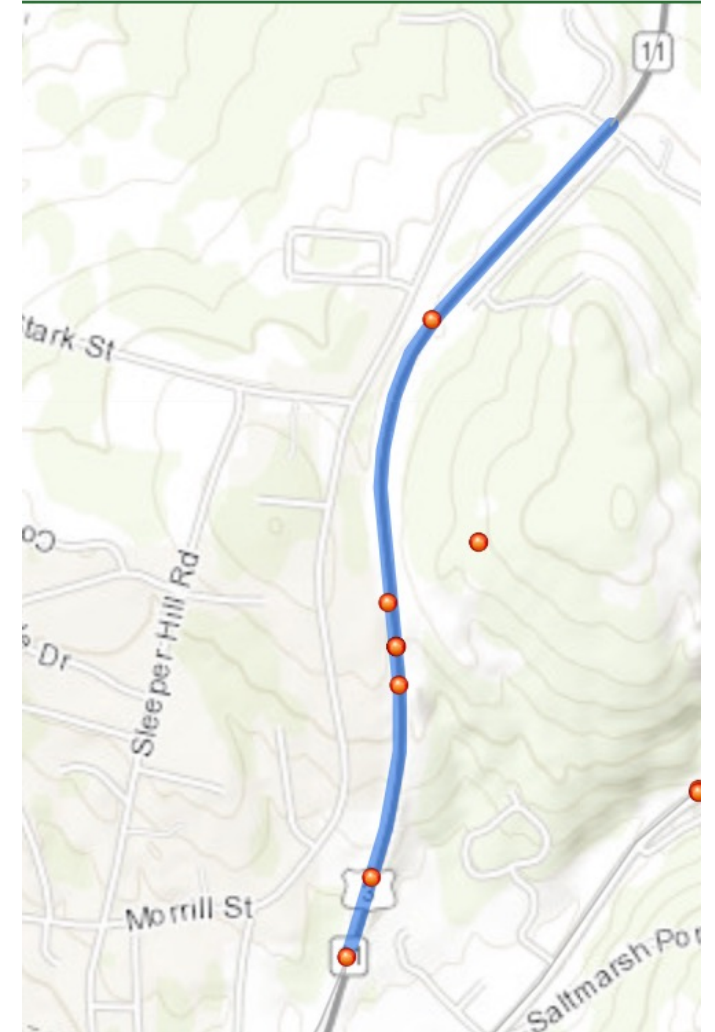


## UNIQUE ROAD SEGMENT\* METRICS

Total WVCs  
Density (WVCs per mile)  
Annual Average WVCs

## FOUR TIME PERIODS

2020-2021  
2015-2019  
2010-2014  
2002-2009



Unique road segments are NOT equal in length

# ROAD-LEVEL SUMMARIES OVER TIME

2020-21

2015-19

2010-14

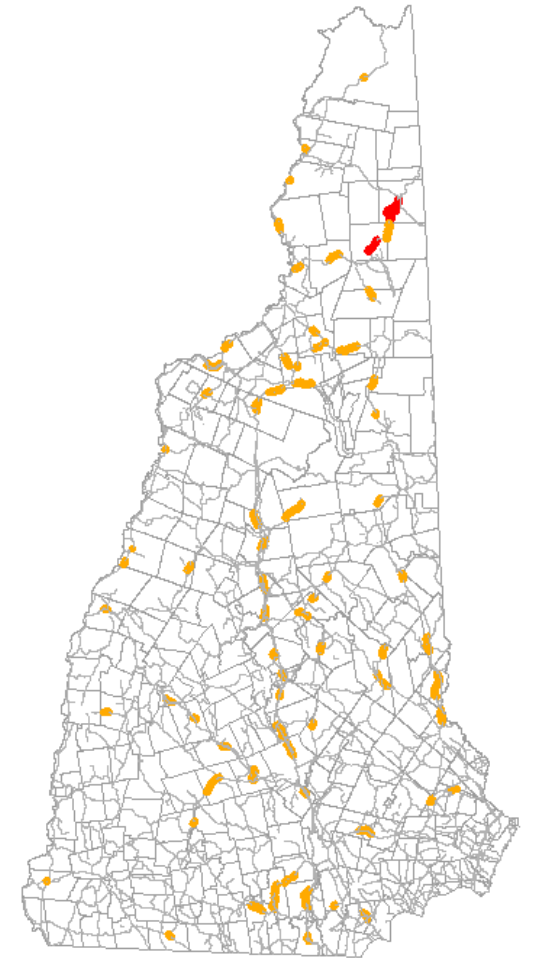
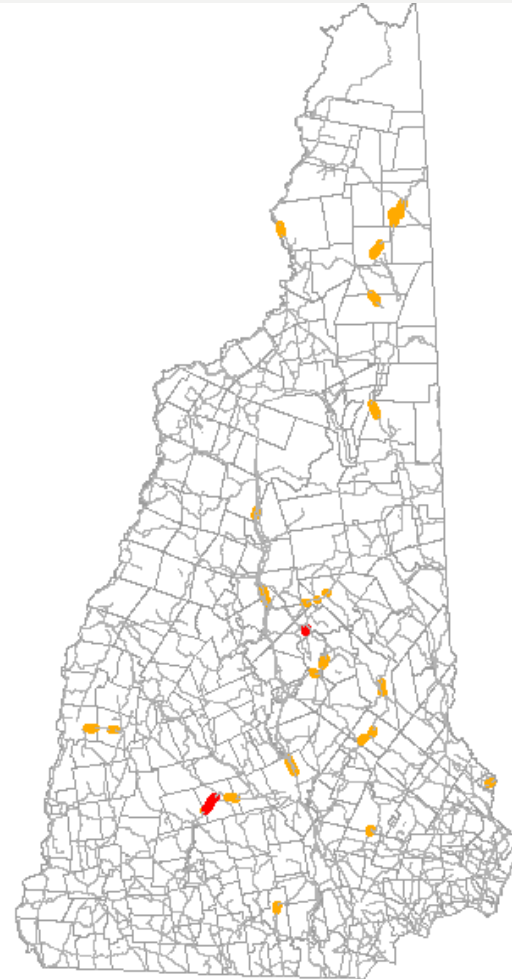
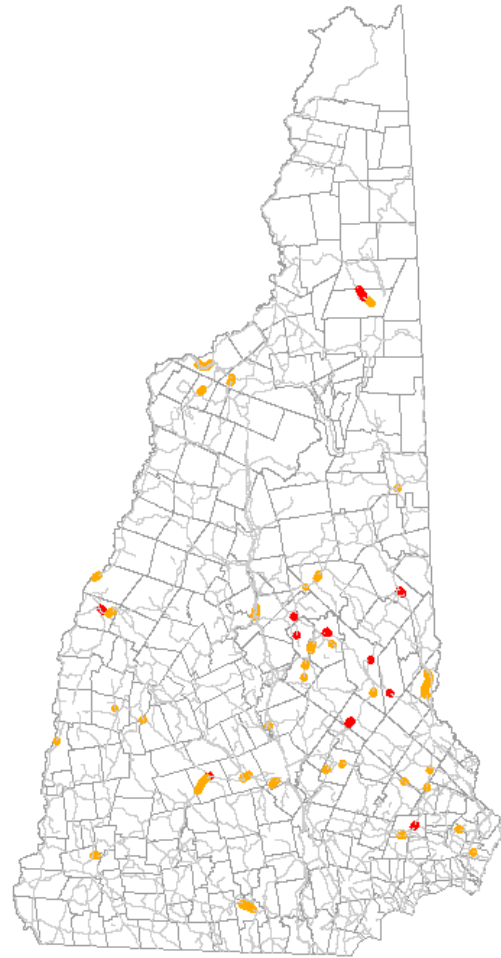
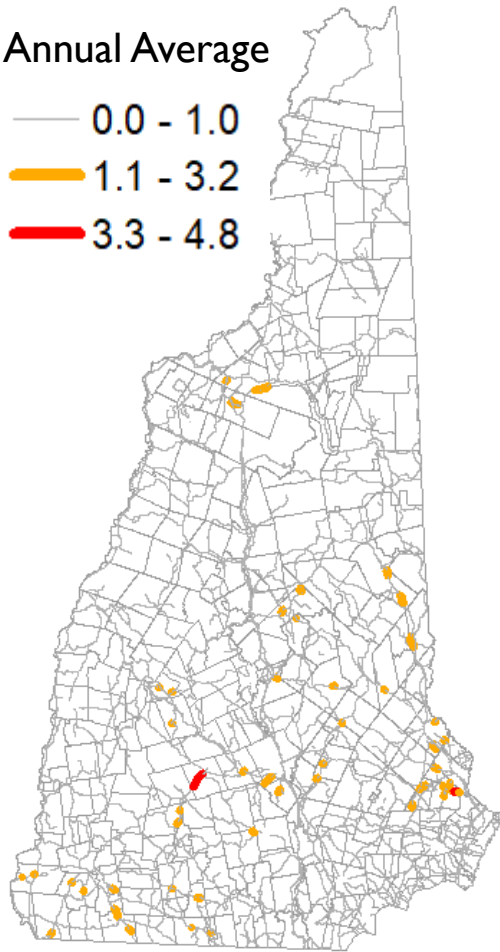
2002-09

Annual Average

— 0.0 - 1.0

— 1.1 - 3.2

— 3.3 - 4.8





# ROAD-LEVEL “HOTSPOT” CHALLENGES

**Given no national threshold or guidance...**

**What constitutes a problem?**

**Which metric(s) best reflect(s) this problem?**

**What is the threshold for action?**

# INFORMATIONAL TRADE-OFFS METRICS

Total WVCs per period

Annual average per period

Density per period

**Depends on defined time period (which can feel arbitrary)**

**Influenced by length of road segment**

**Total WVCs:** longer roads may look like problems even when WVC distribution is widely dispersed; shorter roads will likely have lower values

**Density:** shorter roads may have high density values, despite low WVC frequency

**Annual Average (over 5 years):** roads with one year of high frequency may look the same as five years with consistent but low frequency.

# HOTSPOT IDENTIFICATION CRITERIA

**GOAL:** Identify 30-40 unique road segments that are potential sites for WVC reduction

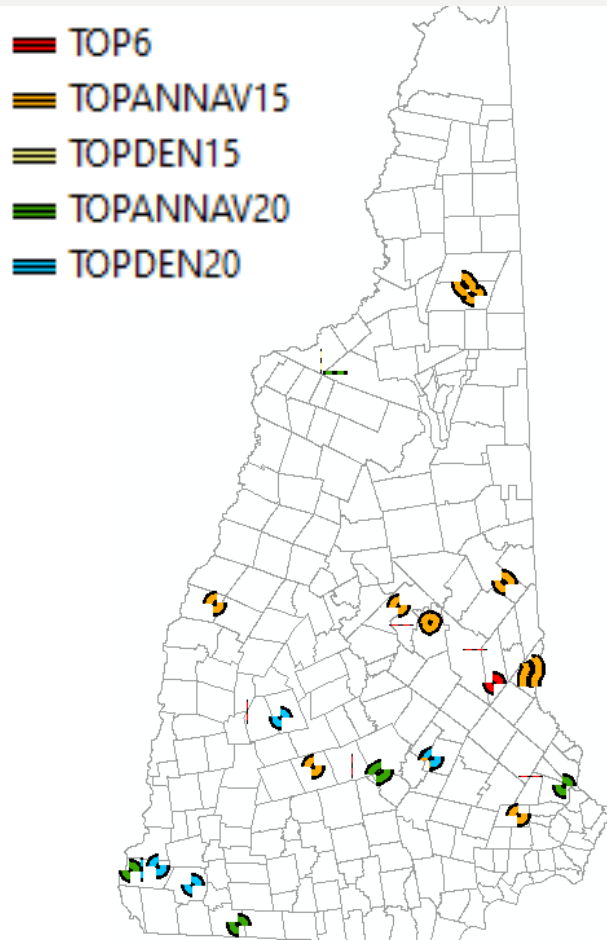
2015-19 annual average WVCs	2015-19 average WVC density	2020-21 annual average WVCs	2020-21 average WVC density	# Unique Road Segments
Y	Y	Y	Y	0
Y	Y	Y	N	1
Y	Y	N	Y	1
Y	Y	N	N	3
Y	N	Y	Y	1
Y	N	N	N	22
N	Y	N	N	14
N	N	Y	N	22
N	N	N	Y	17

\*high density values must also meet minimum WVC criteria: 2020-2021  $\geq 1$  per year; 2015-19  $\geq 0.6$  per year



# HOTSPOT IDENTIFICATION CRITERIA

**GOAL:** Identify 30-40 unique road segments that are potential sites for WVC reduction



36 Road  
Segments

## WVC Criteria (high to low importance)

- 6 roads that are priorities for both 2015-19 criteria or at least 1 of the 2015-19 criteria and a 2020-21 criteria TOP6
- 10 highest roads not already included for 2015-19 avg WVCs (n=10) TOP1ANNAV15
- 10 highest roads not already included for 2015-19 density (n=10) TOPDEN15
- 5 from the 2020-21 avg WVCs (n=5) TOPANNAV20
- 5 from the 2020-21 density, \*with Ann Avg WVCs  $\geq 2$  (n=5) TOPDEN20

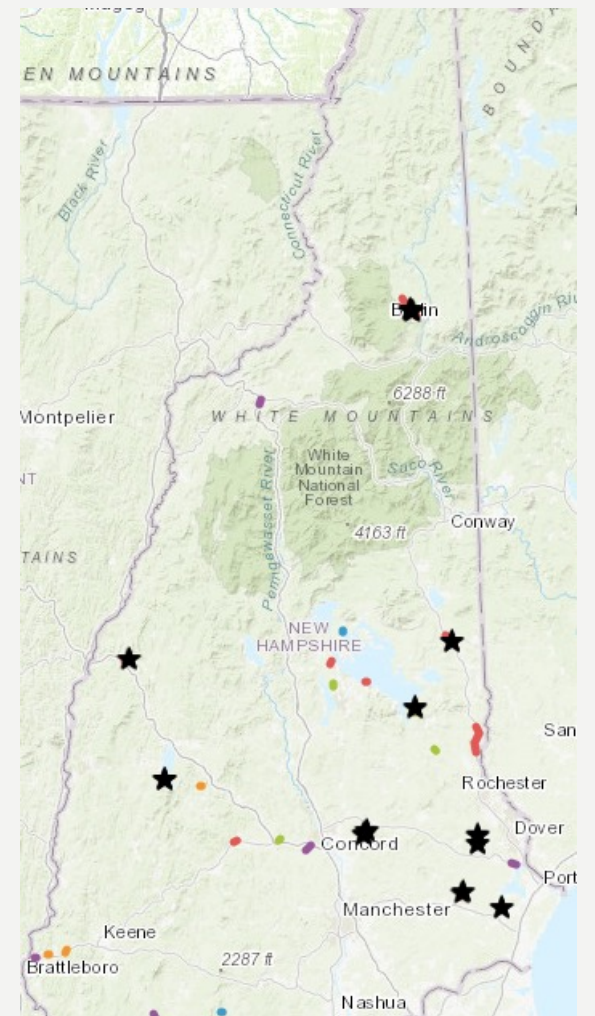
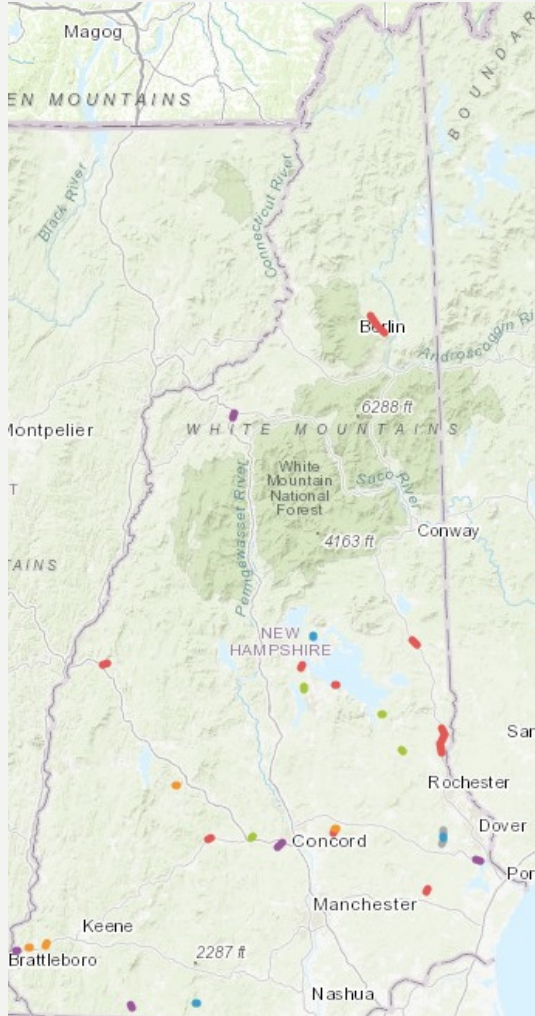
# HOTSPOT IDENTIFICATION CRITERIA

GOAL: Prioritize Hotspots based on Supporting Information

## NON-WVC CRITERIA

Predicted wildlife corridors  
between wildlife habitat  
blocks > 50 acres

Proximity to existing crossing  
structures



# HOTSPOT IDENTIFICATION CRITERIA

**GOAL:** Identify 10-15 **PRIORITY** unique road segments for attainable modification (i.e., those with existing under-road crossings – culverts & bridges)

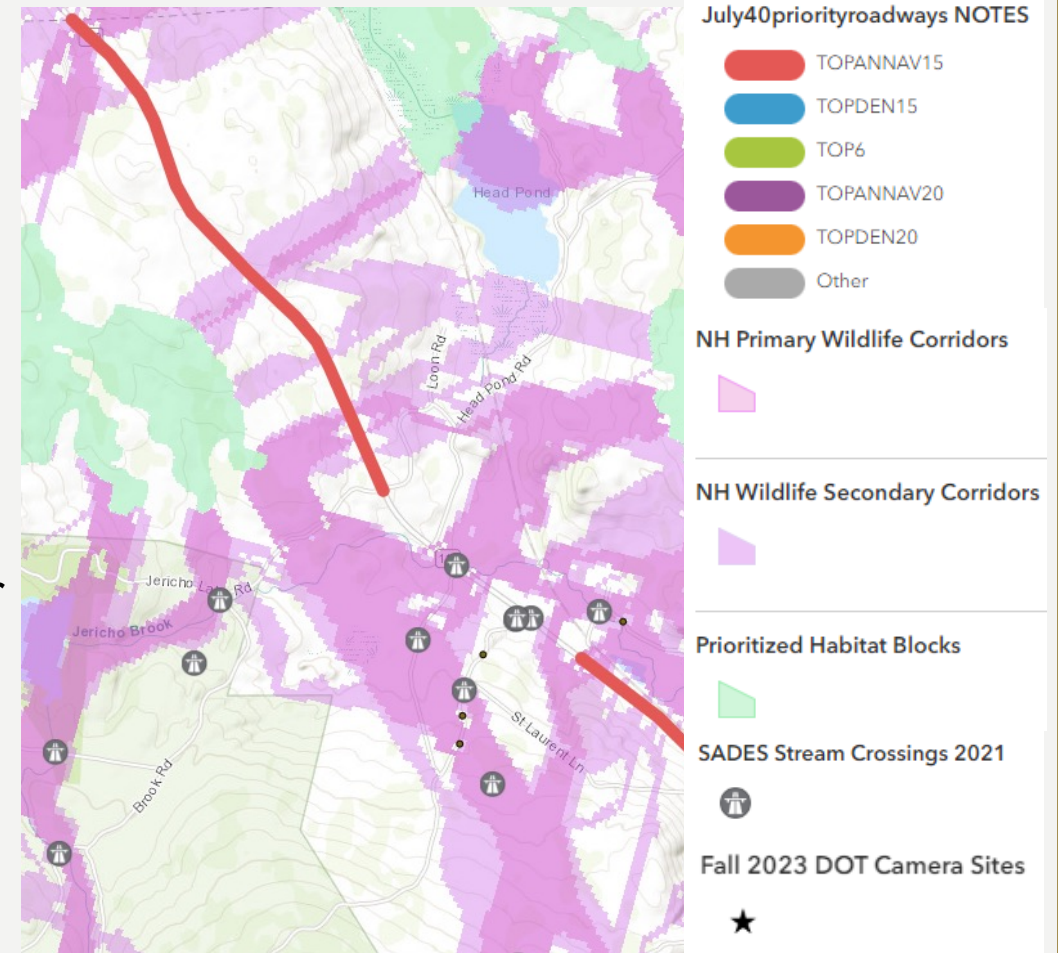
42 Road  
Segments\*

22 Road  
Segments with  
crossing

12 Road Segments  
with crossing for  
activity monitoring

Filtered for existing  
infrastructure for  
remediation

Individually assessed and ranked based  
on proximity to wildlife corridors or  
habitat blocks and with crossings under  
area of concern and good logistics for  
monitoring





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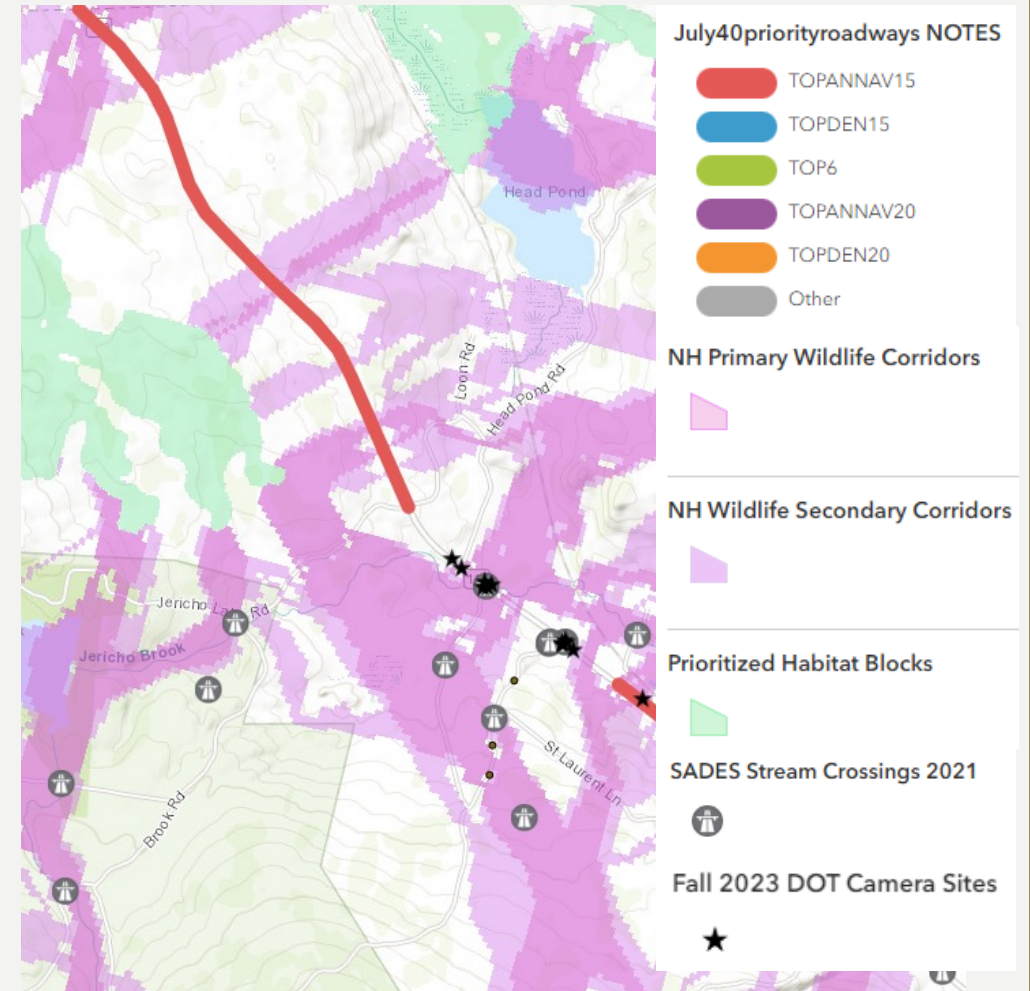
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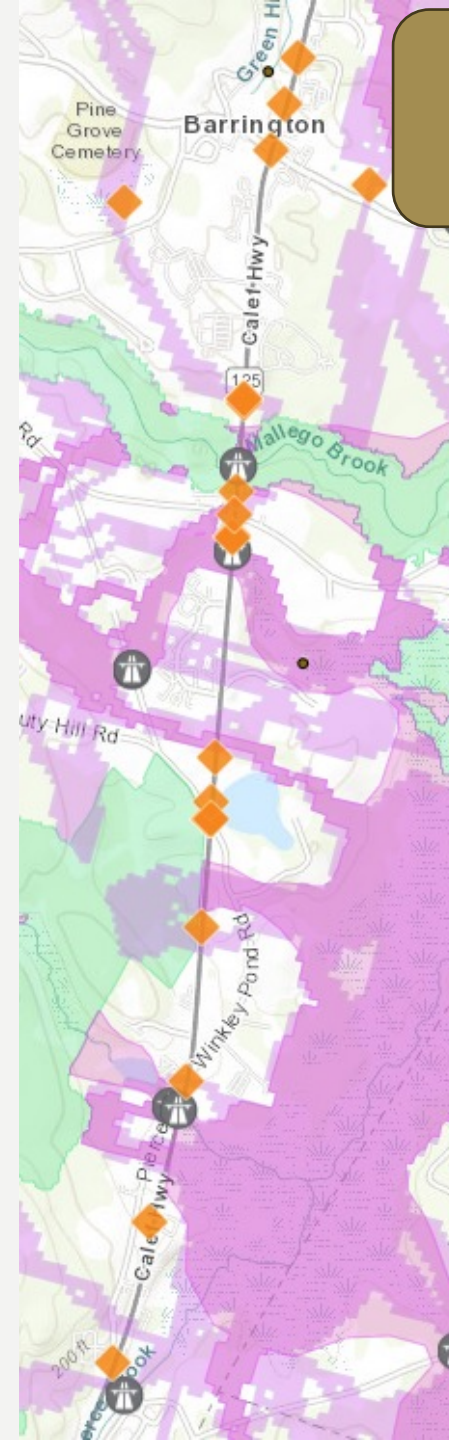
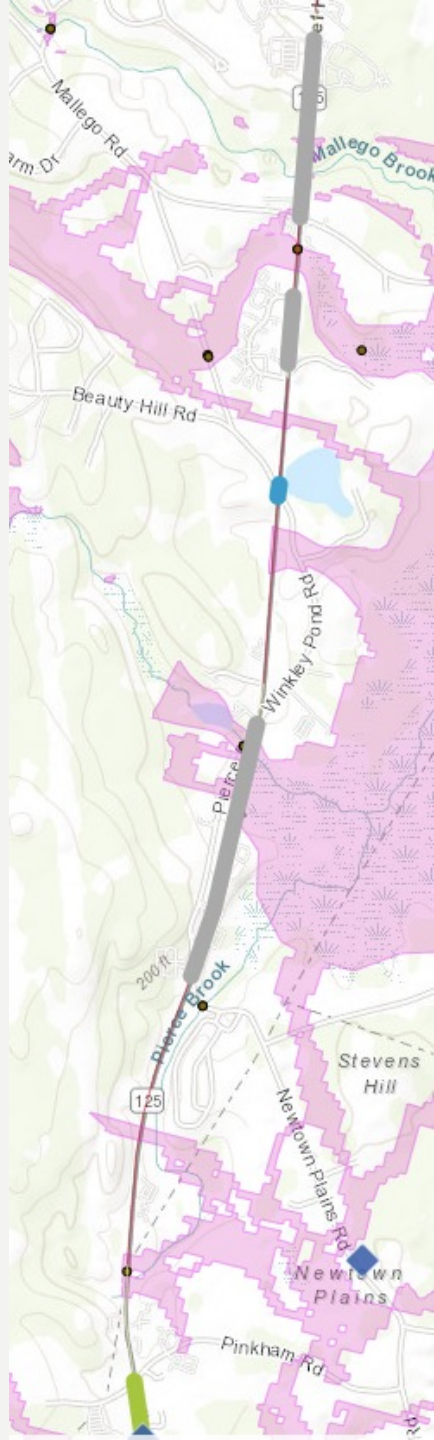
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Scrutiny also reveals  
network opportunity





# DECISION-MAKING SUPPORT



The screenshot shows the web application interface for the NH Wildlife Vehicle Collision Mapper. At the top, the title bar reads "NH Wildlife Vehicle Collision Mapper 2002-2019" with a link to learn more about WVCs. Below the title bar is a search bar with the placeholder text "Find address or place". The main map area displays a map of New Hampshire with various locations labeled, including Sullivan, Claremont, Concord, and others. A large green overlay box contains the following text:

**New Hampshire DOT Plymouth State UNIVERSITY**

**Welcome to the NH Wildlife Vehicle Collision Mapper**

Explore and identify potential areas of road-wildlife conflict through this visualization of reported *wildlife vehicle collisions* (WVC) between 2002-2019. To learn more, visit the [NH Wildlife Vehicle Collisions project website](#). Data shared herein reflects only one of several indicators of a road-wildlife conflict, the reported location of a vehicle collision associated with an animal. It does not include roadkill or near-collision interactions between wildlife and vehicles. Thus, the *wildlife vehicle collision* (WVC) data presented should be considered along other helpful data layers in the mapper, including primary and secondary wildlife corridors (predicted by the NH Dept of Fish and Game). The mapper also includes the locations of stream crossings, collected through [NH Stream Crossing Assessment](#), that might provide or have the potential to provide safe road crossing to wildlife.

This site was designed by researchers at Plymouth State University to help the NH Dept of Transportation, NH Dept of Fish and Game, and conservation and planning organizations assess potential problems, prioritize action, and make informed decisions. Questions regarding the data and project can be emailed to **Dr. Amy Villamagna at Plymouth State University** ([amvillamagna@plymouth.edu](mailto:amvillamagna@plymouth.edu)).

**Disclaimer:** The data presented is under constant revision, and may not depict the most up-to-date information. The New Hampshire Department of Transportation (NHDOT) is NOT responsible for the use or interpretation of this information by third parties. Not for legal use.

☐ I agree to the above terms and conditions.

At the bottom of the overlay box, it says "Move mouse to get coordinates".

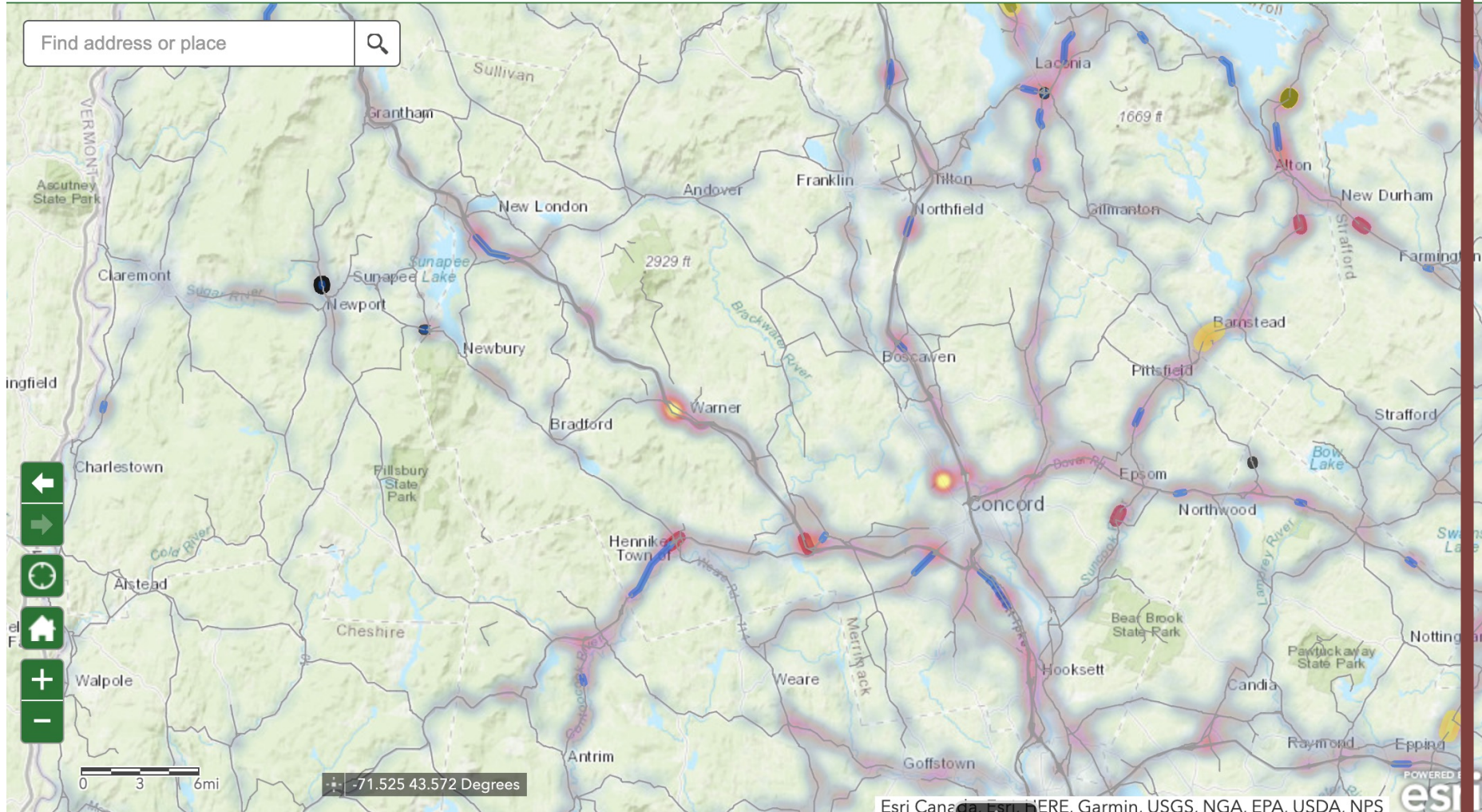
On the right side of the interface, there is a panel titled "How to use the Mapper" with the following instructions:

- Want to interpret the pre-loaded map?** Click on the Legend icon at the top right of the screen
- Want to add or remove active layers?** Click on the folder icon at the top right of the screen and click in the box to activate a layer or click on the minus icon to remove a layer.
- Want to switch base maps?** Click on the four squares icon to review and choose alternatives.
- Want to filter the data in a given layer?** A pre-defined query has been loaded to query unique road segments based on the total WVCs recorded between 2015-2019. Processing a query produces in a new nameable layer that is then added to the mapping session when *Apply* is tapped.
- Want to measure distance or area on the map?** Click on the ruler icon and select area (acres) or distance (miles).
- Want to change transparency, opacity or move a layer up (on top) or down (below) in mapping order?** Click on the three dots icon to see options.

At the bottom of the panel, there is an "OK" button.

<https://arcg.is/01TP8G0>

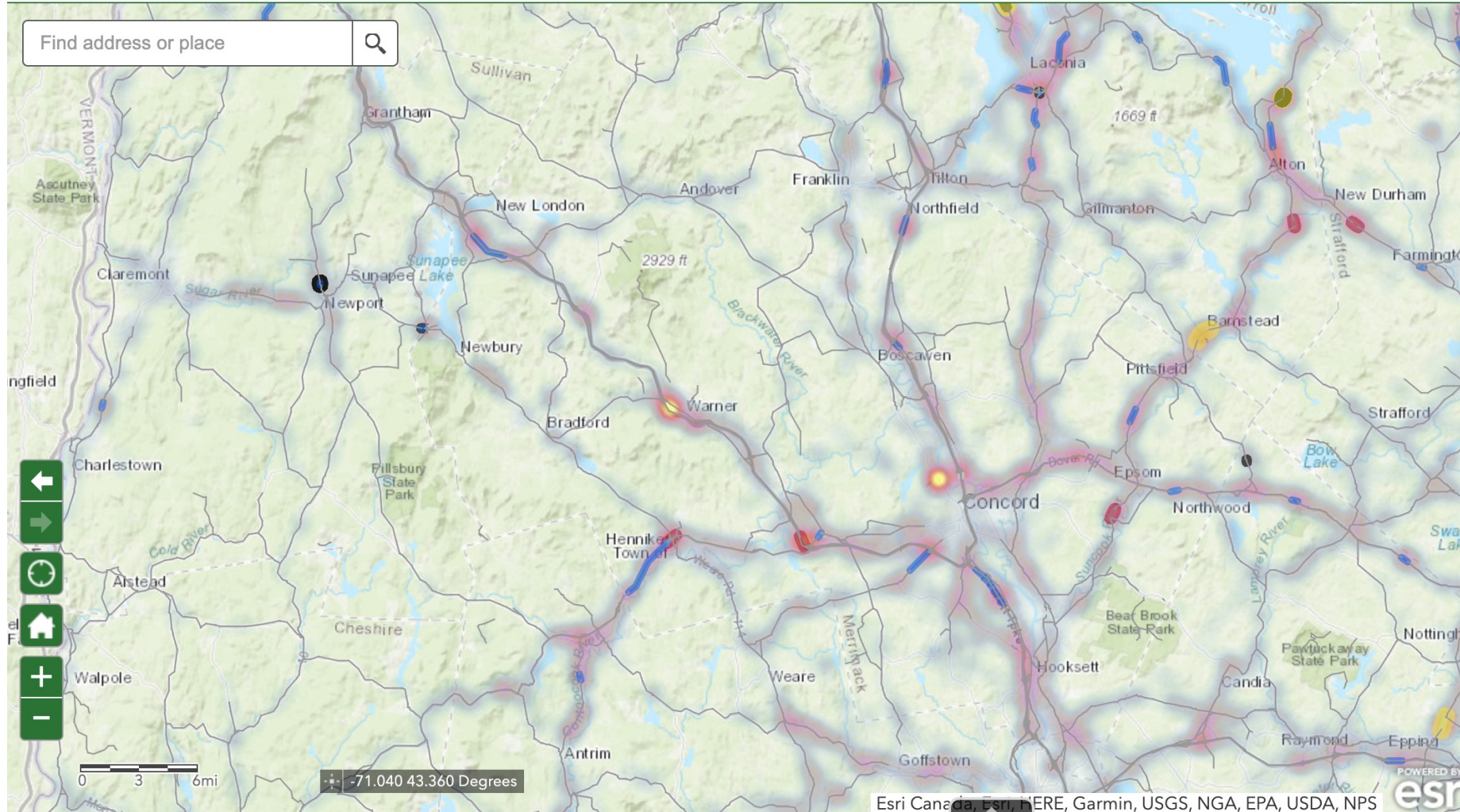




- Want to interpret the pre-loaded map?** Click on the Legend icon at the top right of the screen
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- ... **Want to change transparency, visibility or move a layer up (on top) or down (below) in mapping order?** Click on ... to see options







## Wildlife-Vehicle Collisions (WVCs)

### WVC locations & road summaries (2015- )

#### Layers

- ☒ Total WVCs per road (NHDOT) 2015-2019
- ☒ WVC Density per mile road (NHDOT) 2015-2019
- ☒ WVC locations 2015-2019

### WVCs prior to 2015

#### Layers

- ☐ WVC Density per mile road (NHDOT) 2002-2019
- ☐ Total WVCs per road (NHDOT) 2002-2019
- ☐ WVC locations 2010-2014

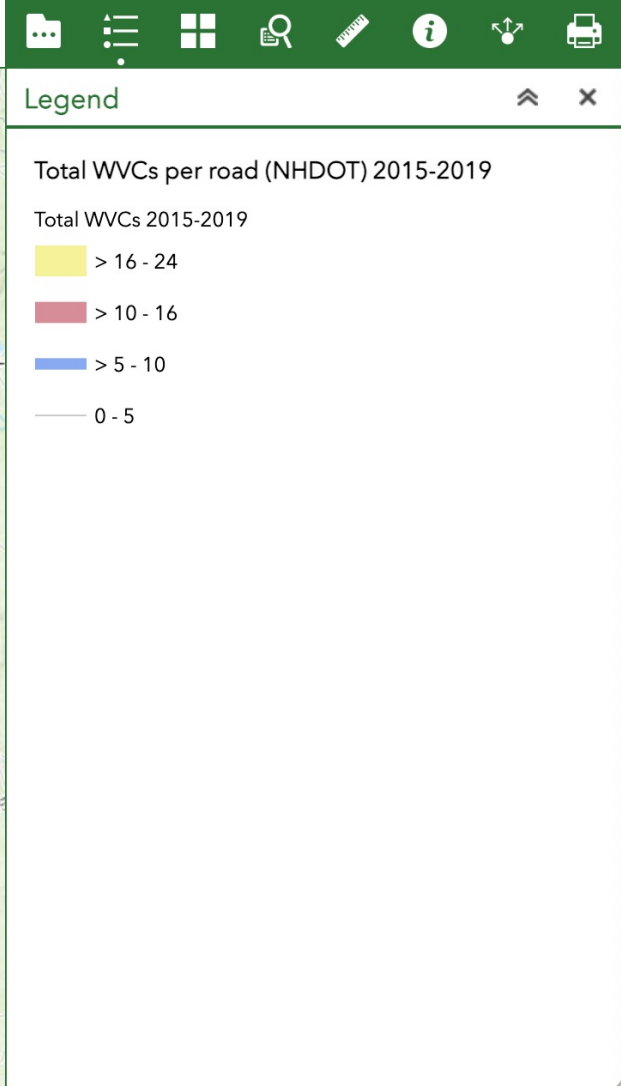
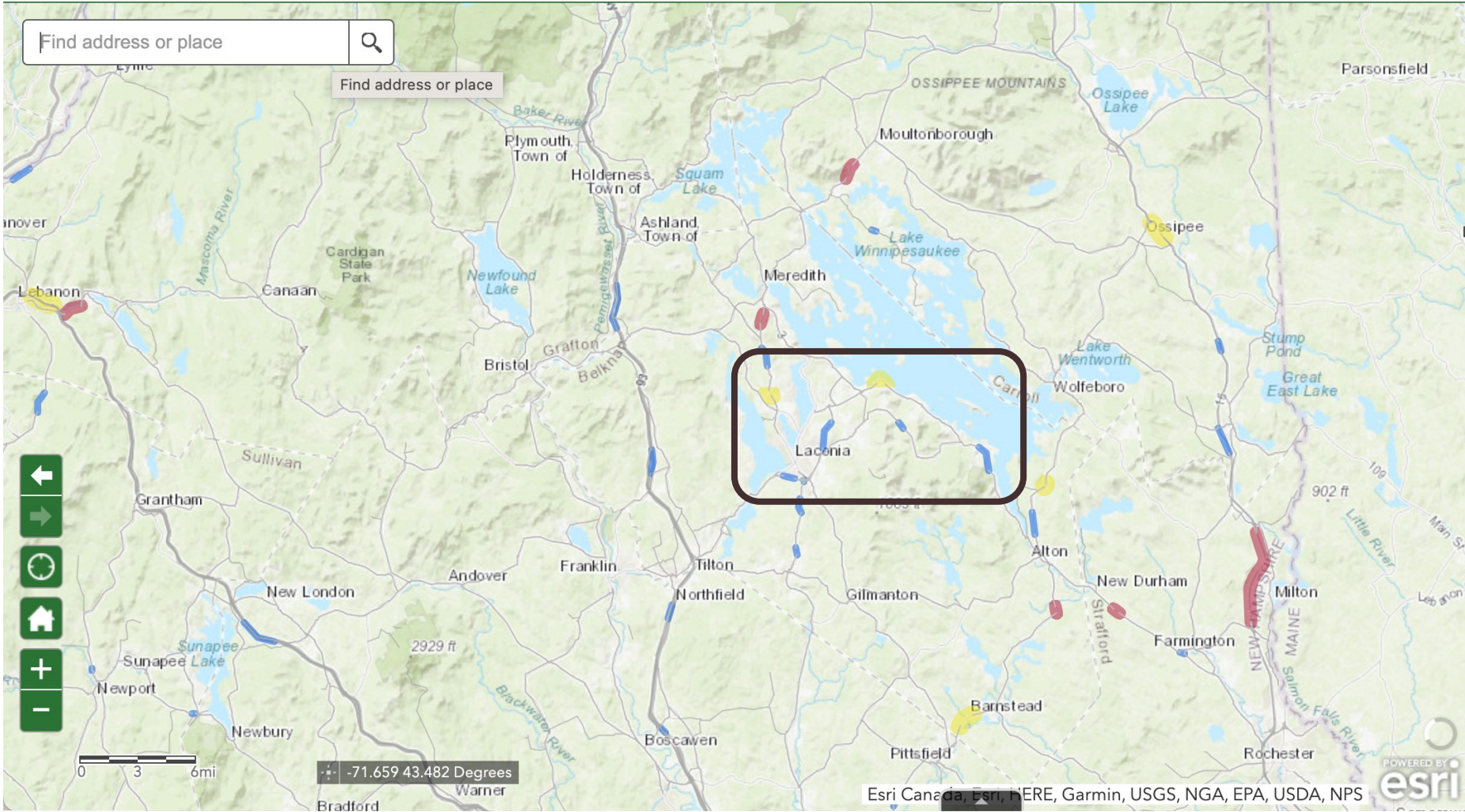
### Wildlife & Human Influences

#### Layers

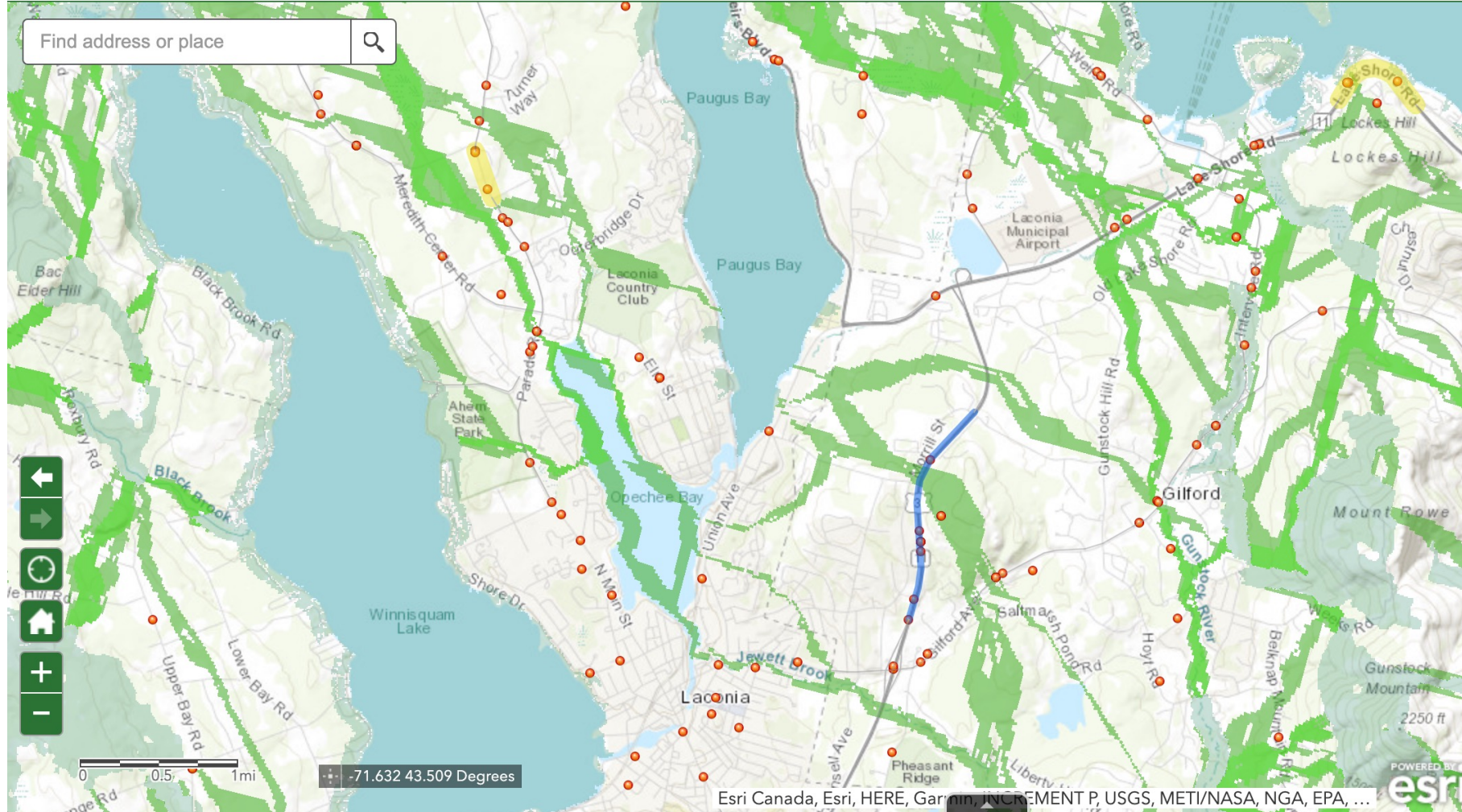
- ☒ Prioritized Habitat Blocks
- ☒ Primary Wildlife Corridors
- ☒ Secondary Corridors











### Legend

Total WVCs per road (NHDOT) 2015-2019

Total WVCs 2015-2019

- > 16 - 24
- > 10 - 16
- > 5 - 10
- 0 - 5

WVC locations 2015-2019

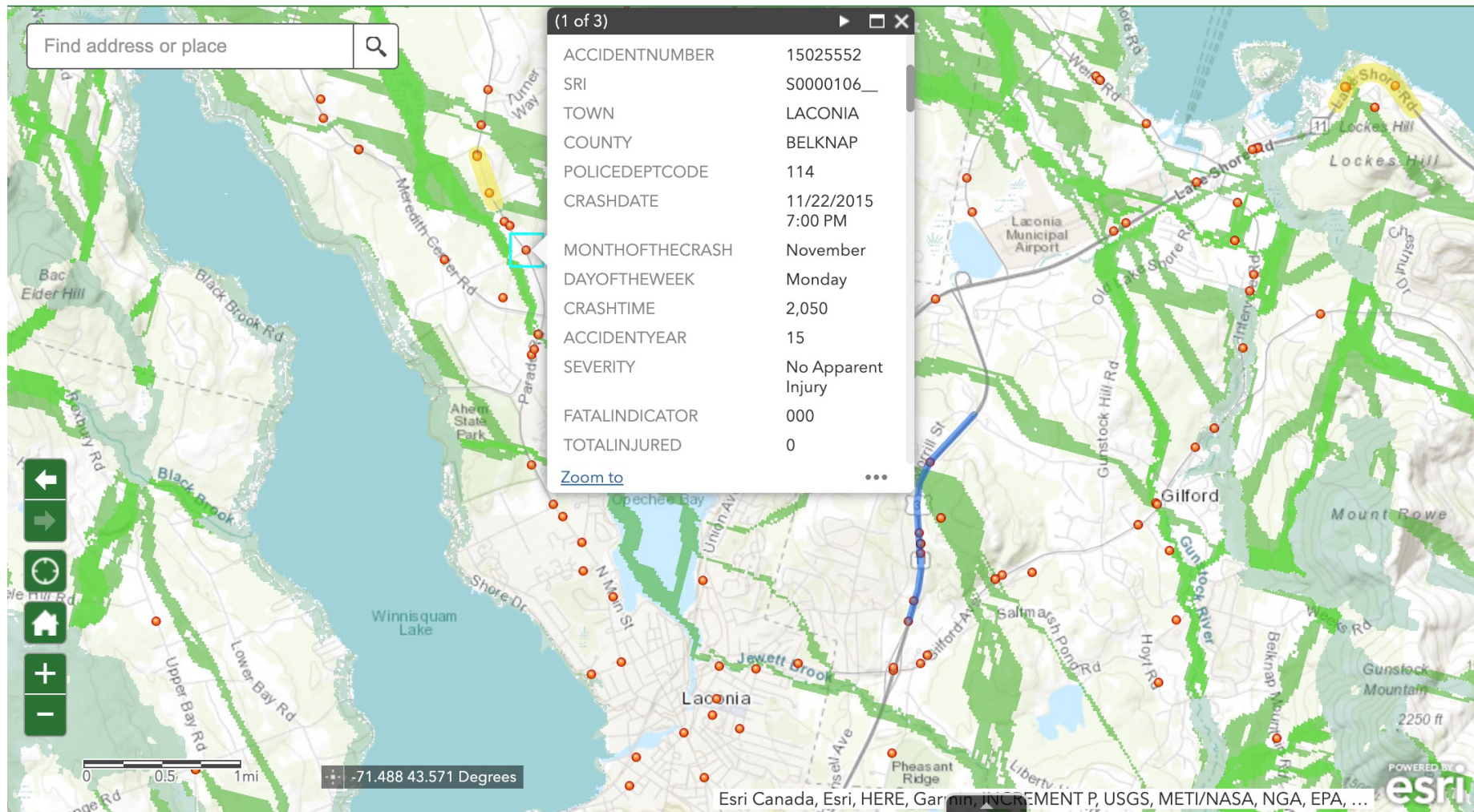
Prioritized Habitat Blocks

Primary Wildlife Corridors

Secondary Corridors







## Legend

### Total WVCs per road (NHDOT) 2015-2019

#### Total WVCs 2015-2019

> 16 - 24

> 10 - 16

> 5 - 10

0 - 5

### WVC locations 2015-2019



### Prioritized Habitat Blocks



### Primary Wildlife Corridors



### Secondary Corridors





NH WVC StoryMap



NH WVC Mapper

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