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Great Lakes RESTORATION

Use of eDNA to inform integrated pest management actions

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U.S. Department of the Interior
U.S. Geological Survey

Goal and objectives

Goal: Link eDNA with fish movement and/or spawning

Objectives:

1. Determine if number of positive detections correlate with fish movement or spawning
2. Determine if DNA copy number correlate with fish movement or spawning
3. Compare sampling along a transect for eDNA collections, between different sites

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Copy number estimates and detections coupled with radio-telemetry

Wabash River near Lafayette, IN

- Repeated transect based sampling – May 29 – June 19, 2013
- 297 tagged silver carp (Purdue University)
- Sample DNA over time
- Use qPCR markers
  to link DNA with:
  - Fish movement
  - Spawning activities
  - Flow/discharge

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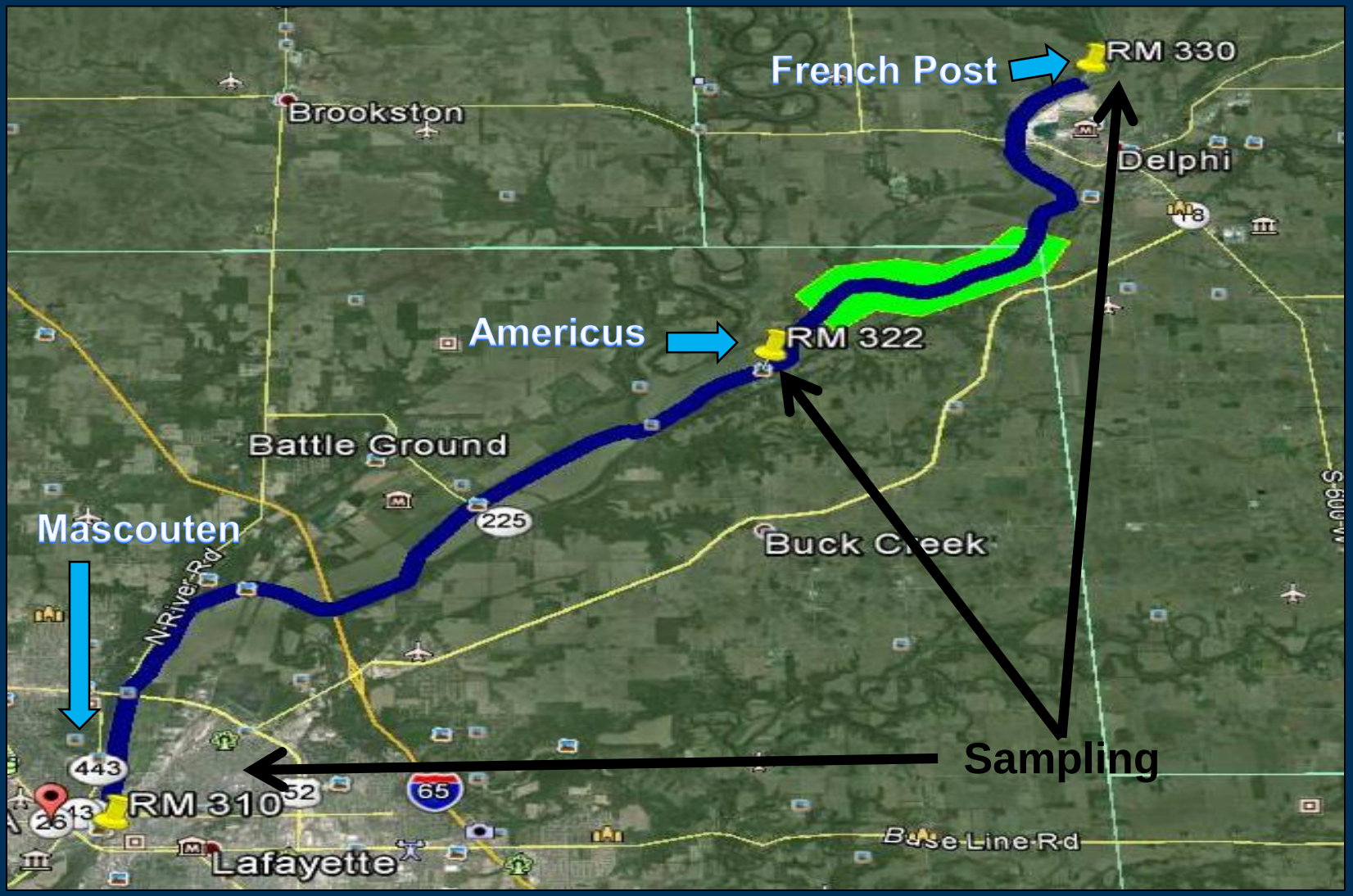
Overview of sample area



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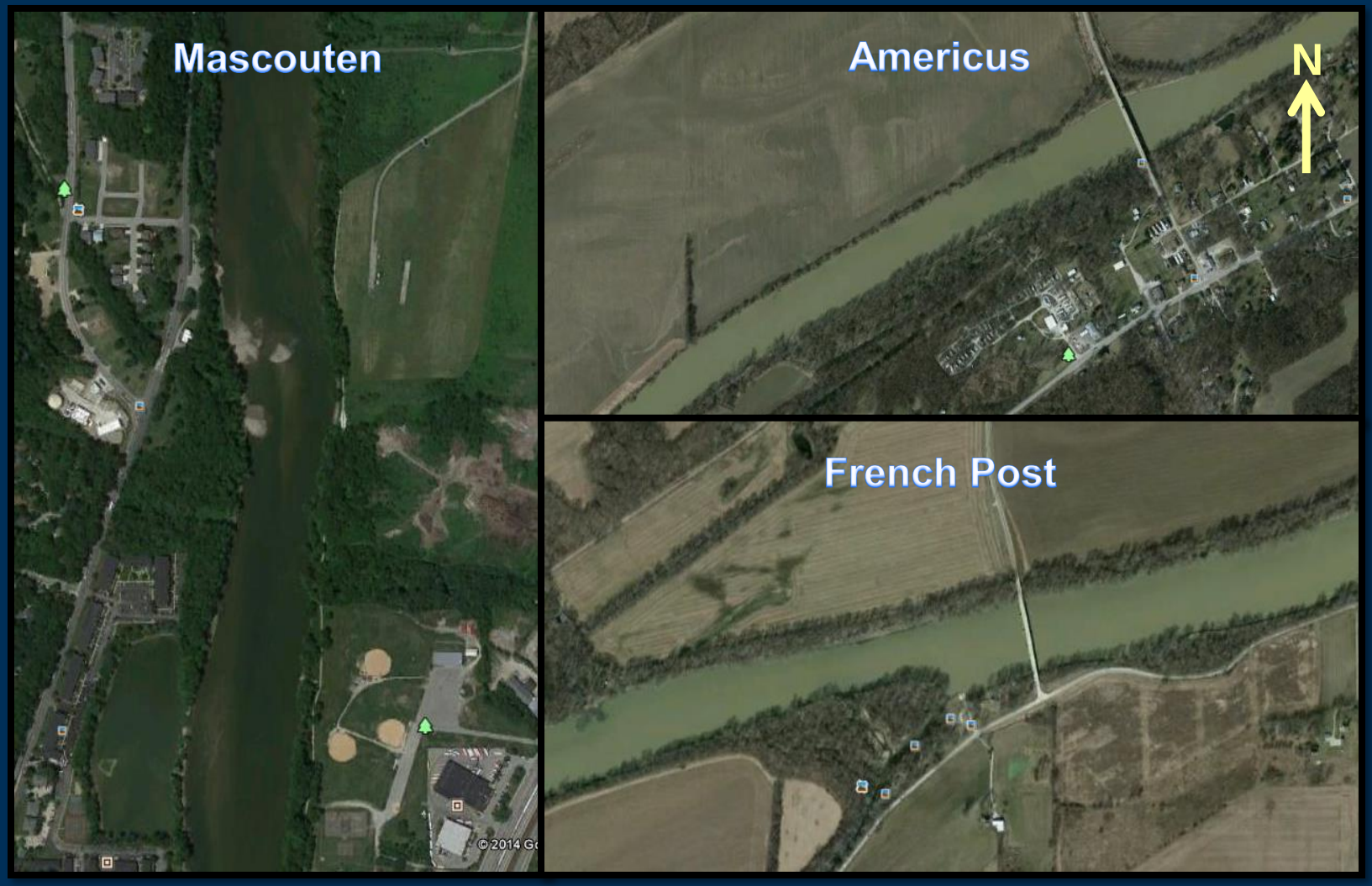
A closer look at the sample sites



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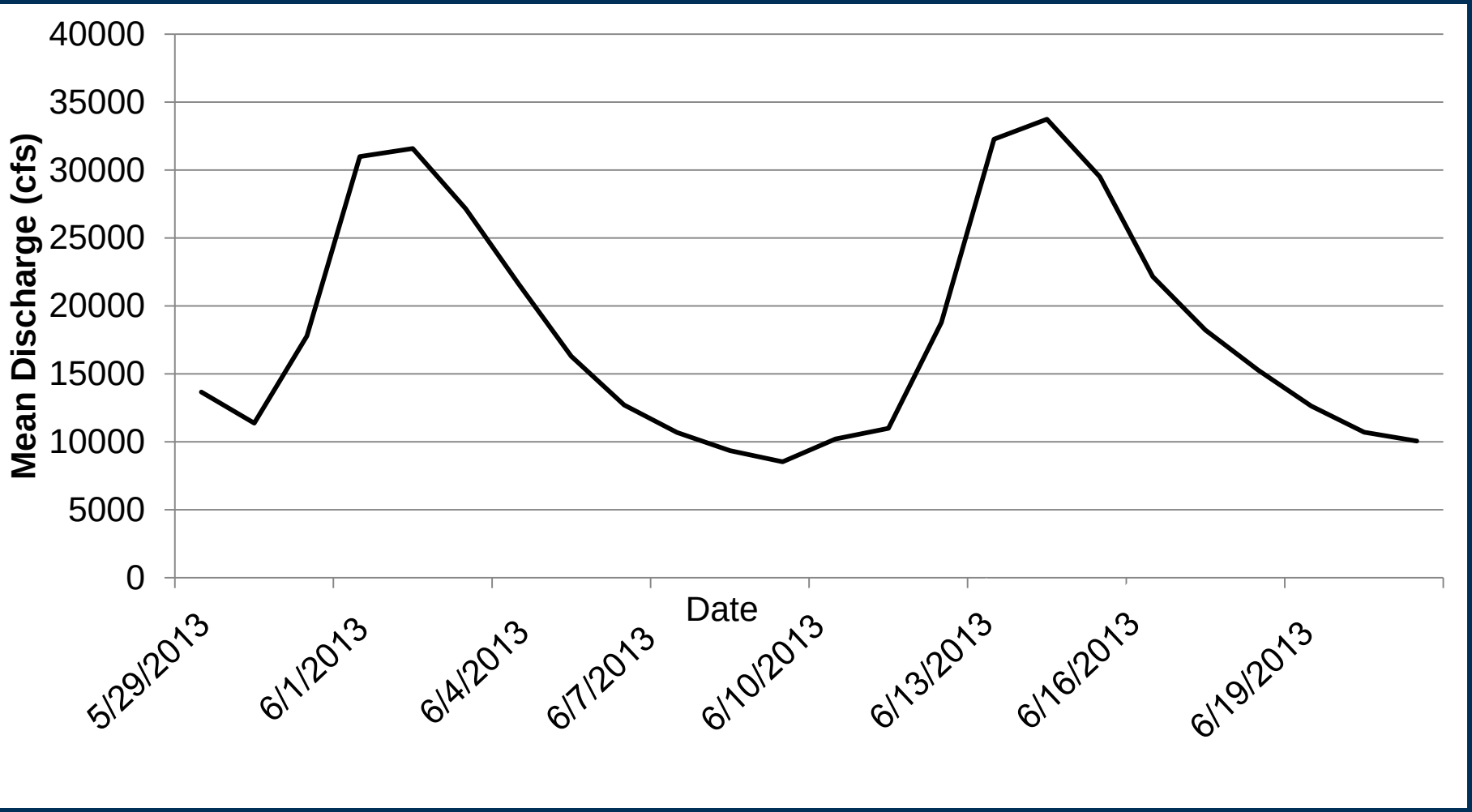
Discharge



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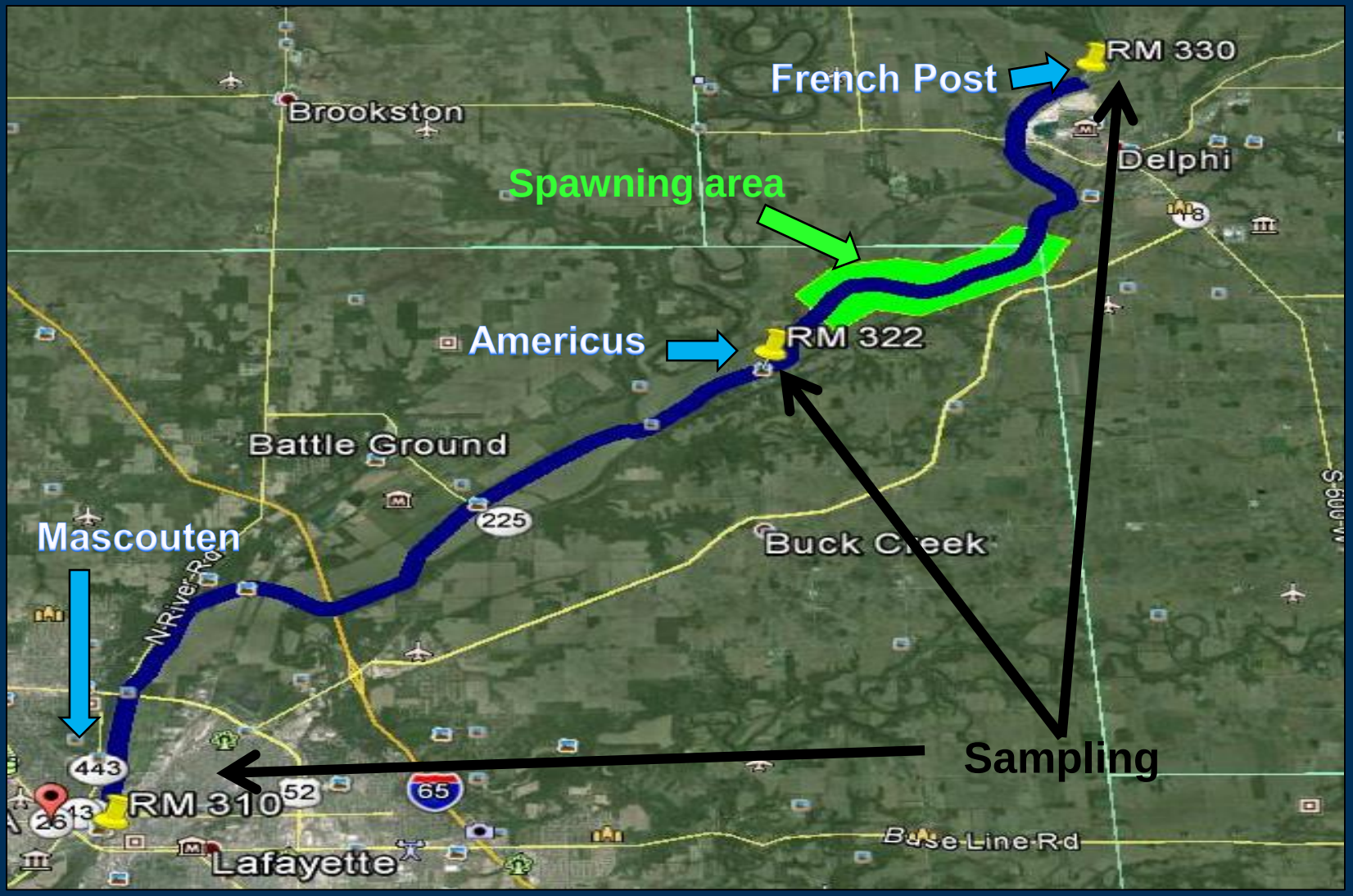
Flow Data courtesy of Indiana Water Sciences Center
USGS 03335500 WABASH RIVER AT LAFAYETTE, IN

Focusing in on Americus…



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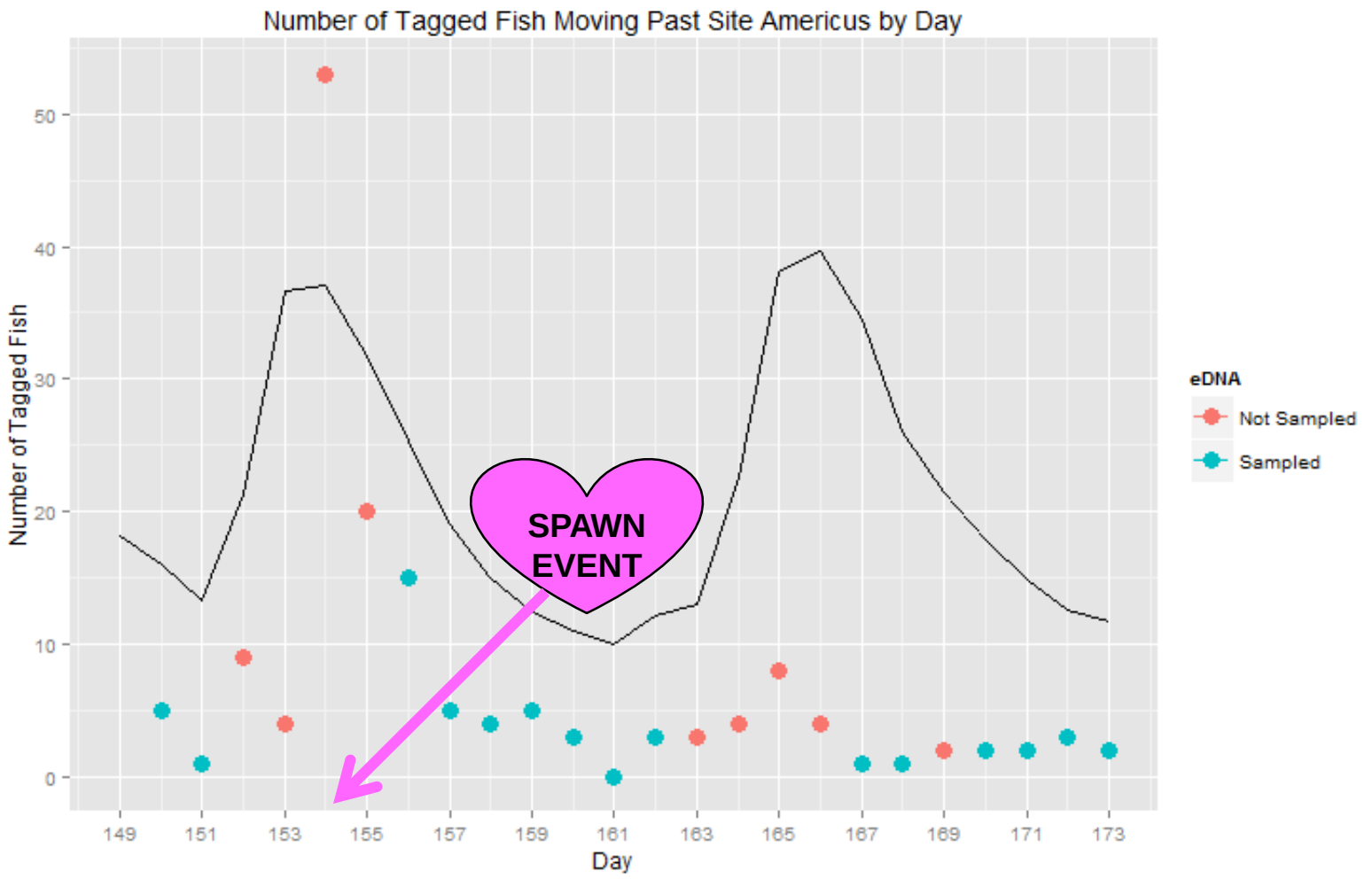
Number of tagged fish at Americus…



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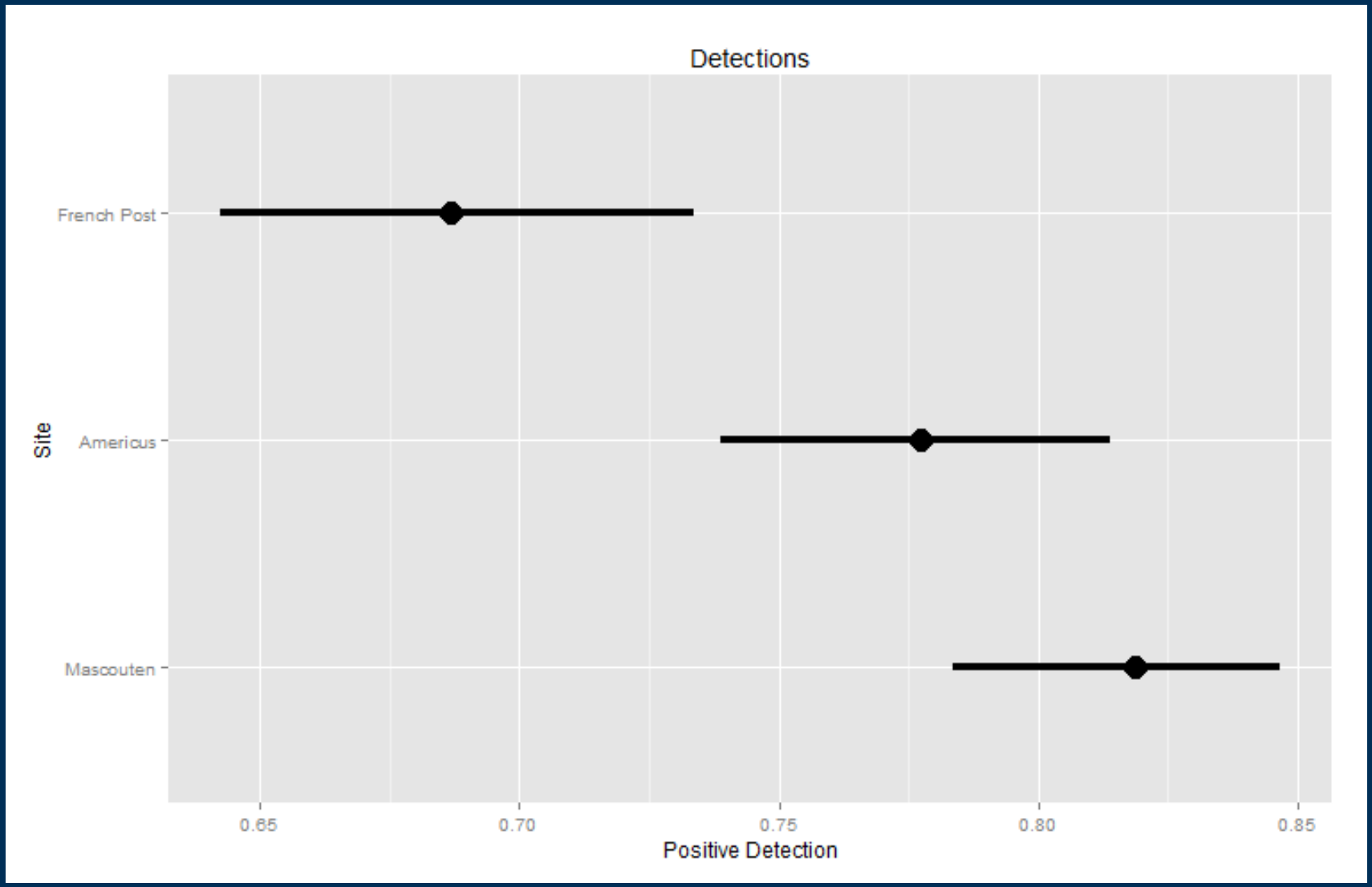
Comparisons among sites - Detections



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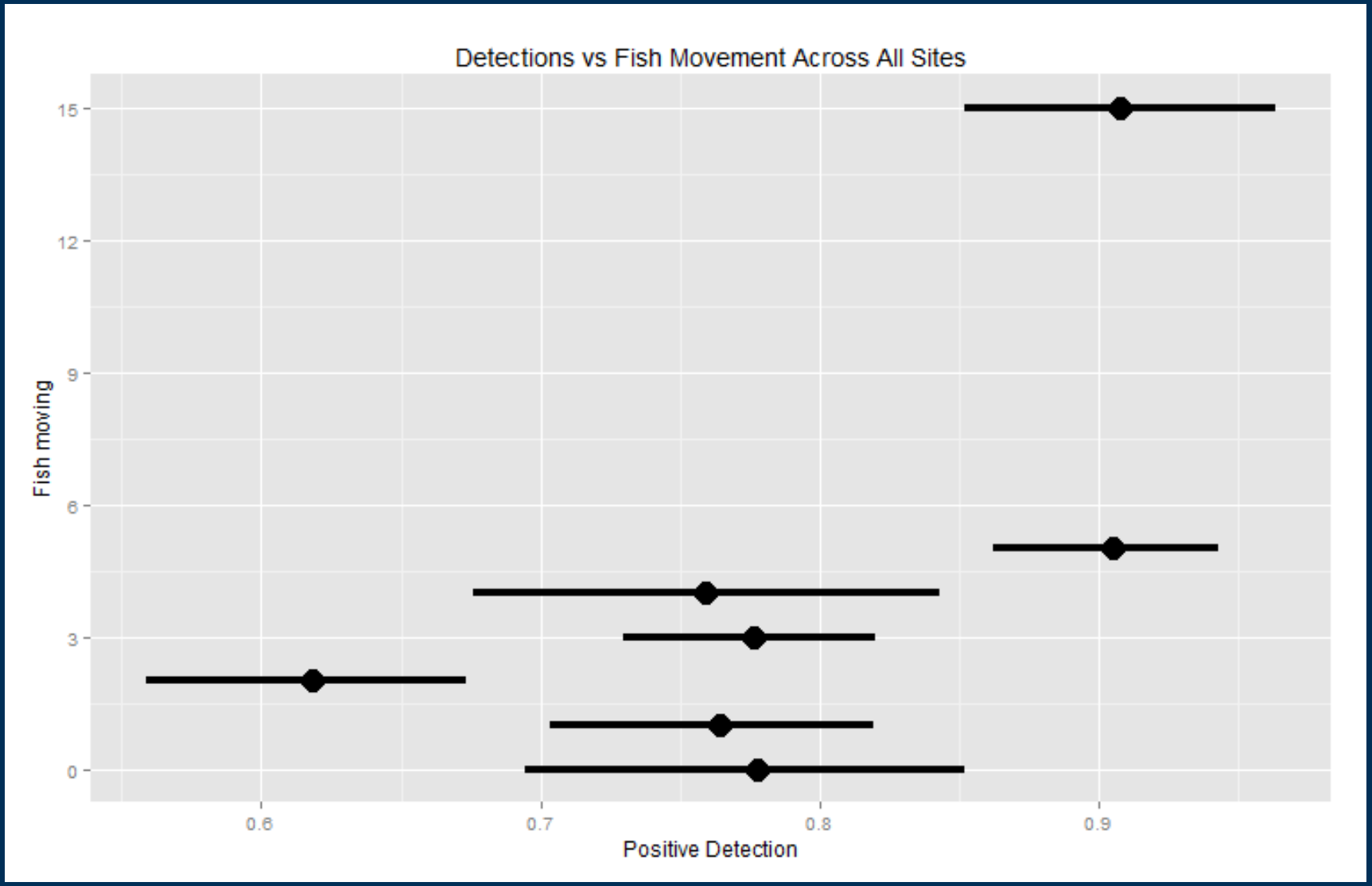
Comparisons among sites – Detections vs Movement



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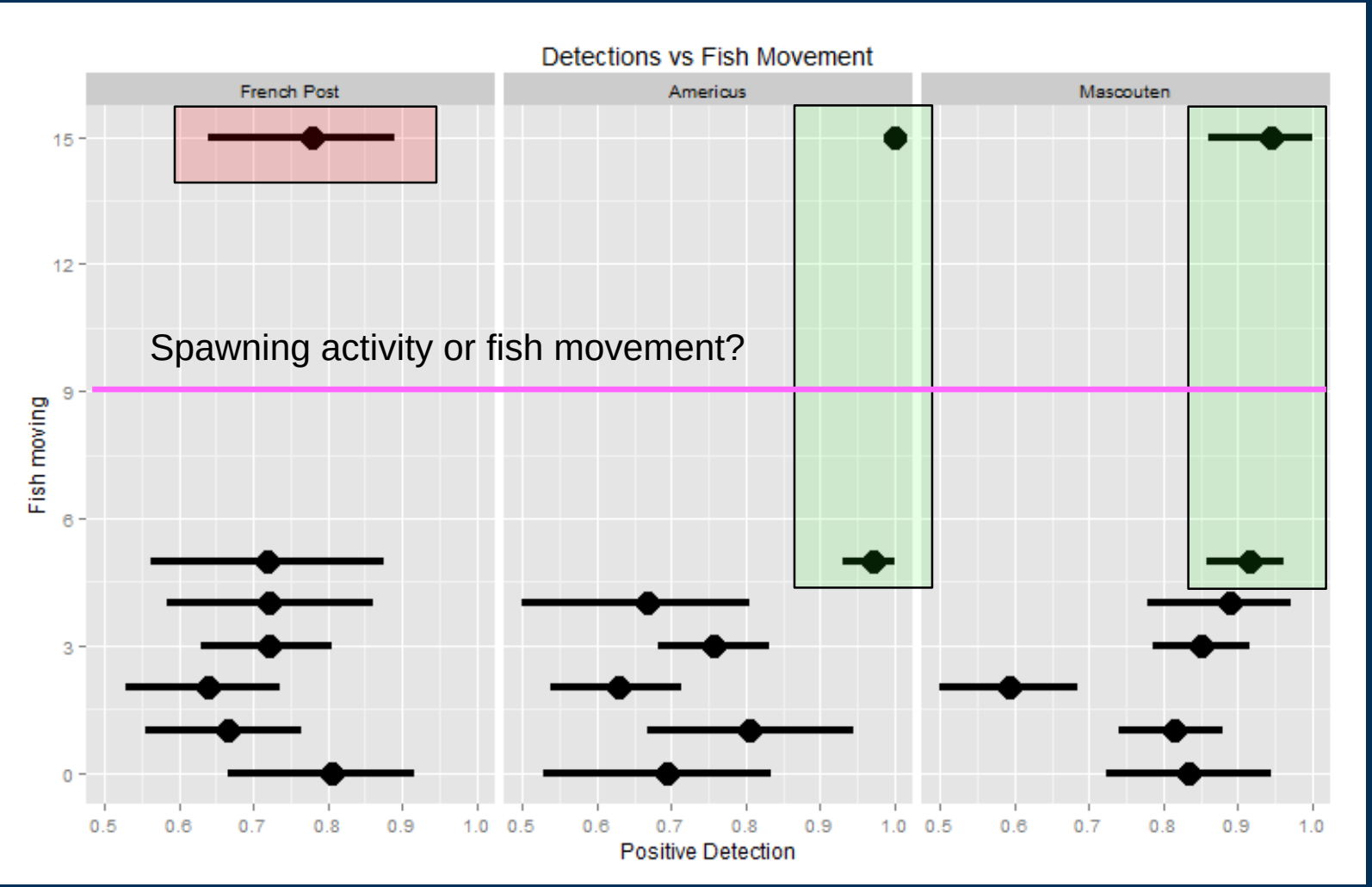
Comparisons among sites – Detections vs Movement

Upstream → Downstream



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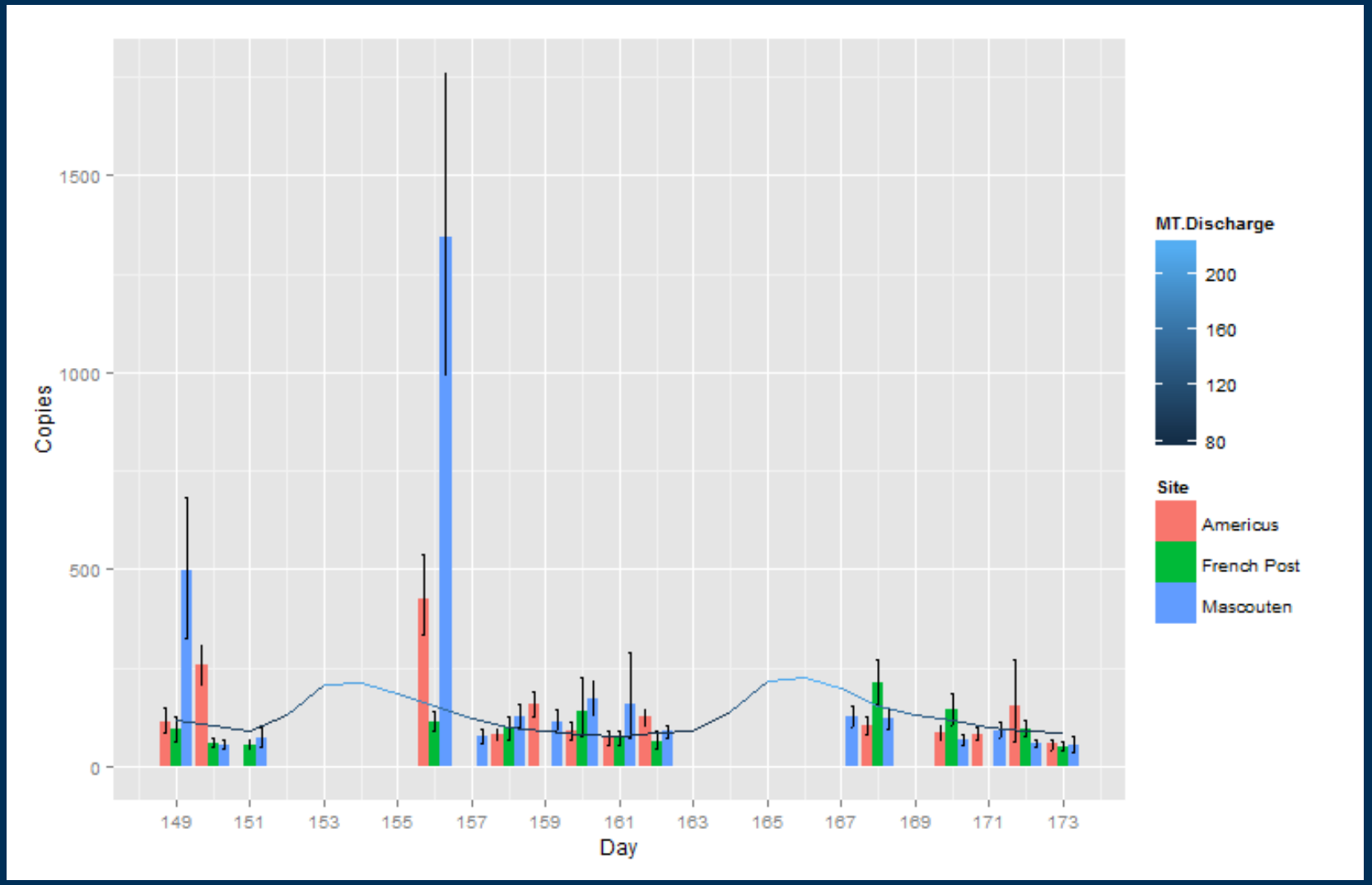
Comparisons among sites – Copy Numbers all days



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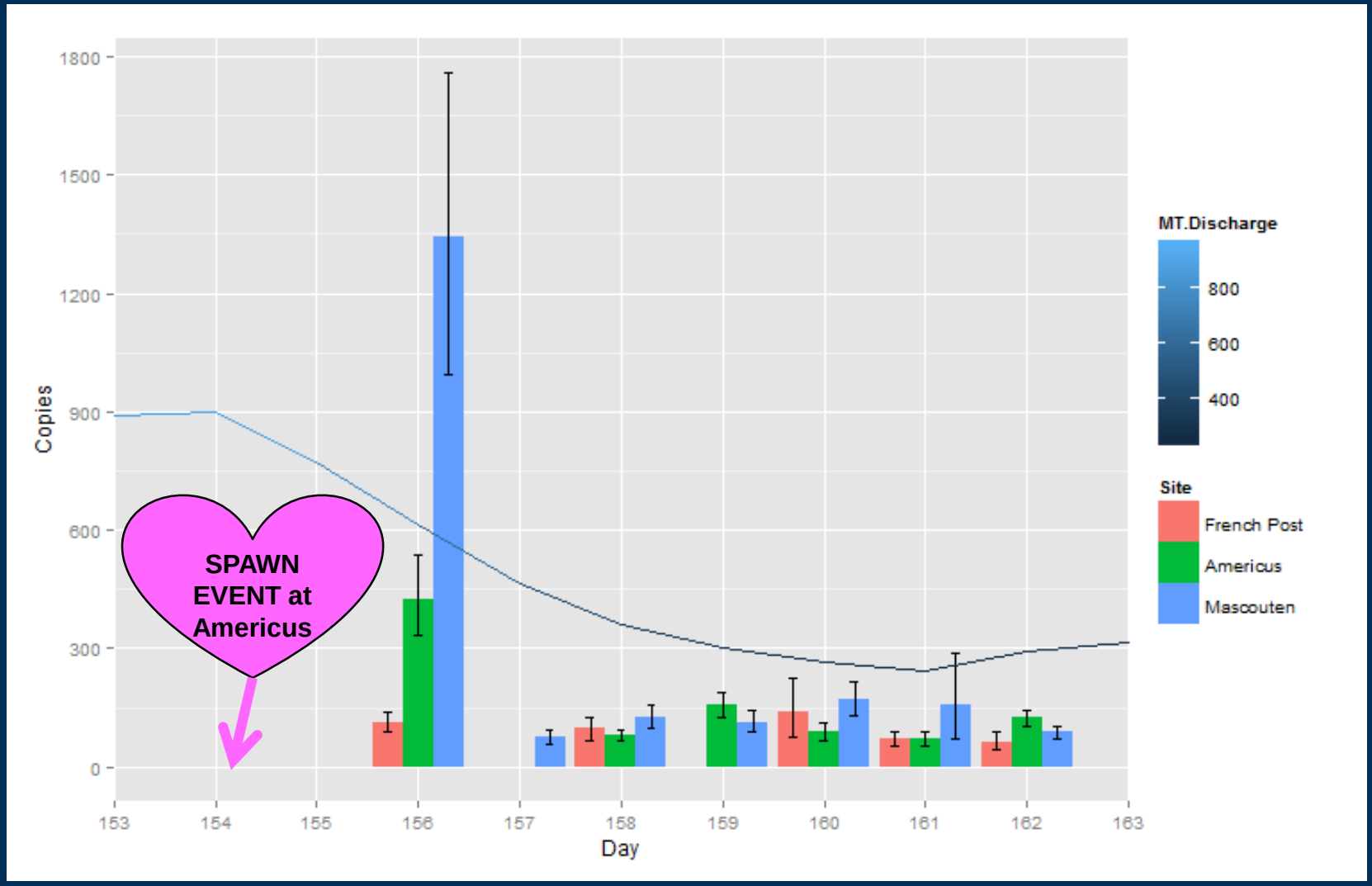
Copy Numbers all days – Focused on Spawning Event



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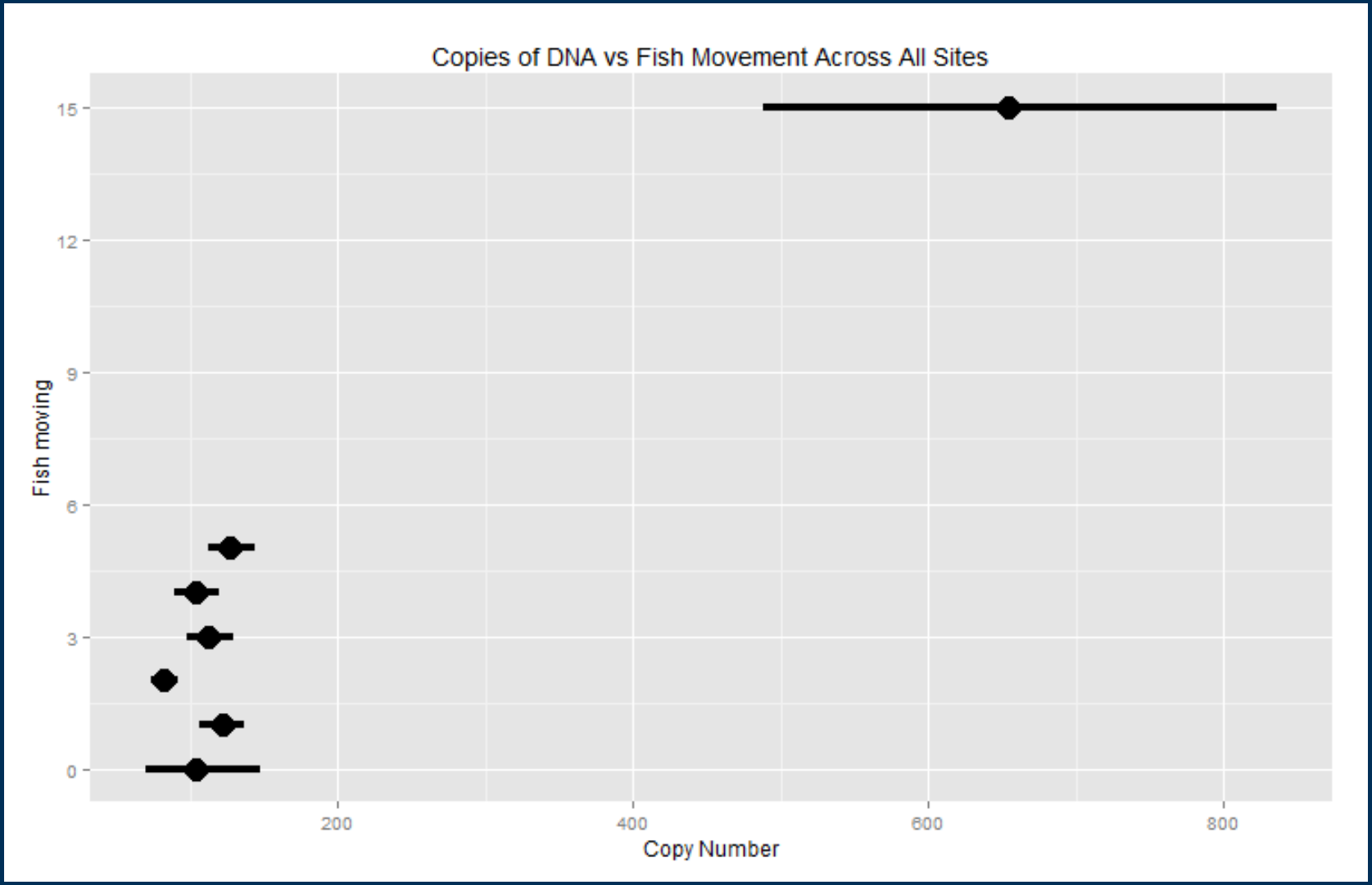
Comparisons among sites – Copies vs Movement



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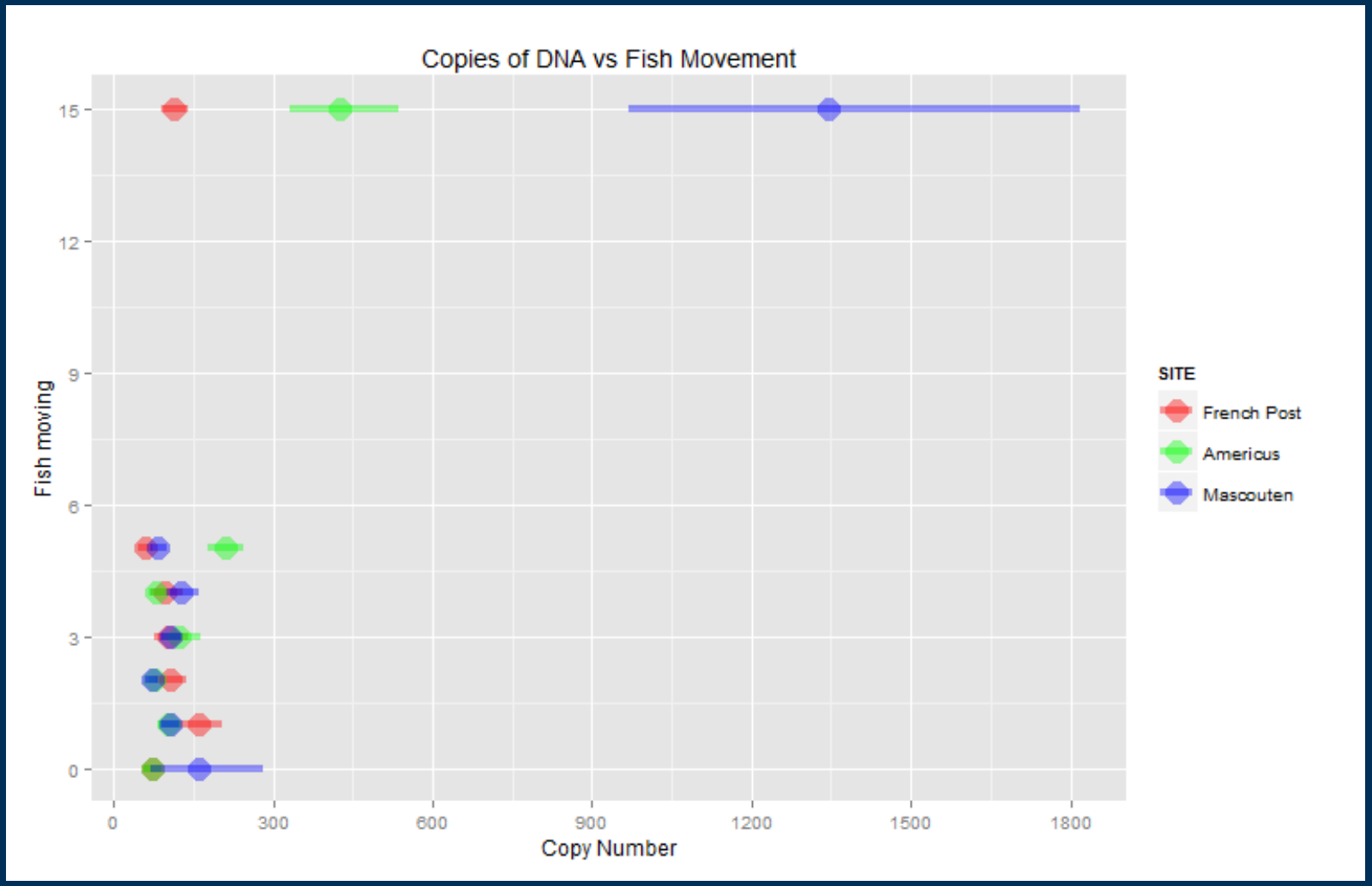

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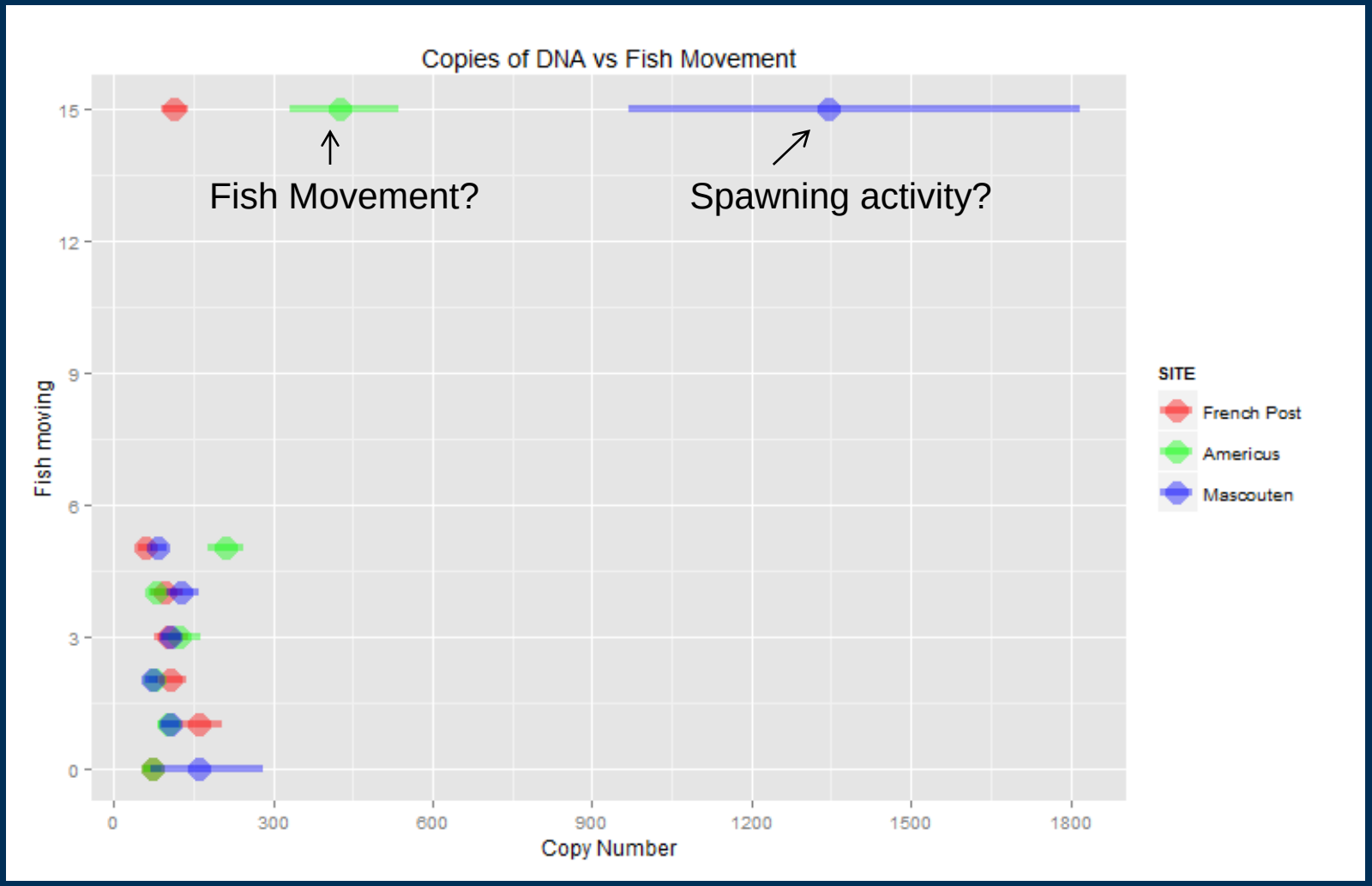

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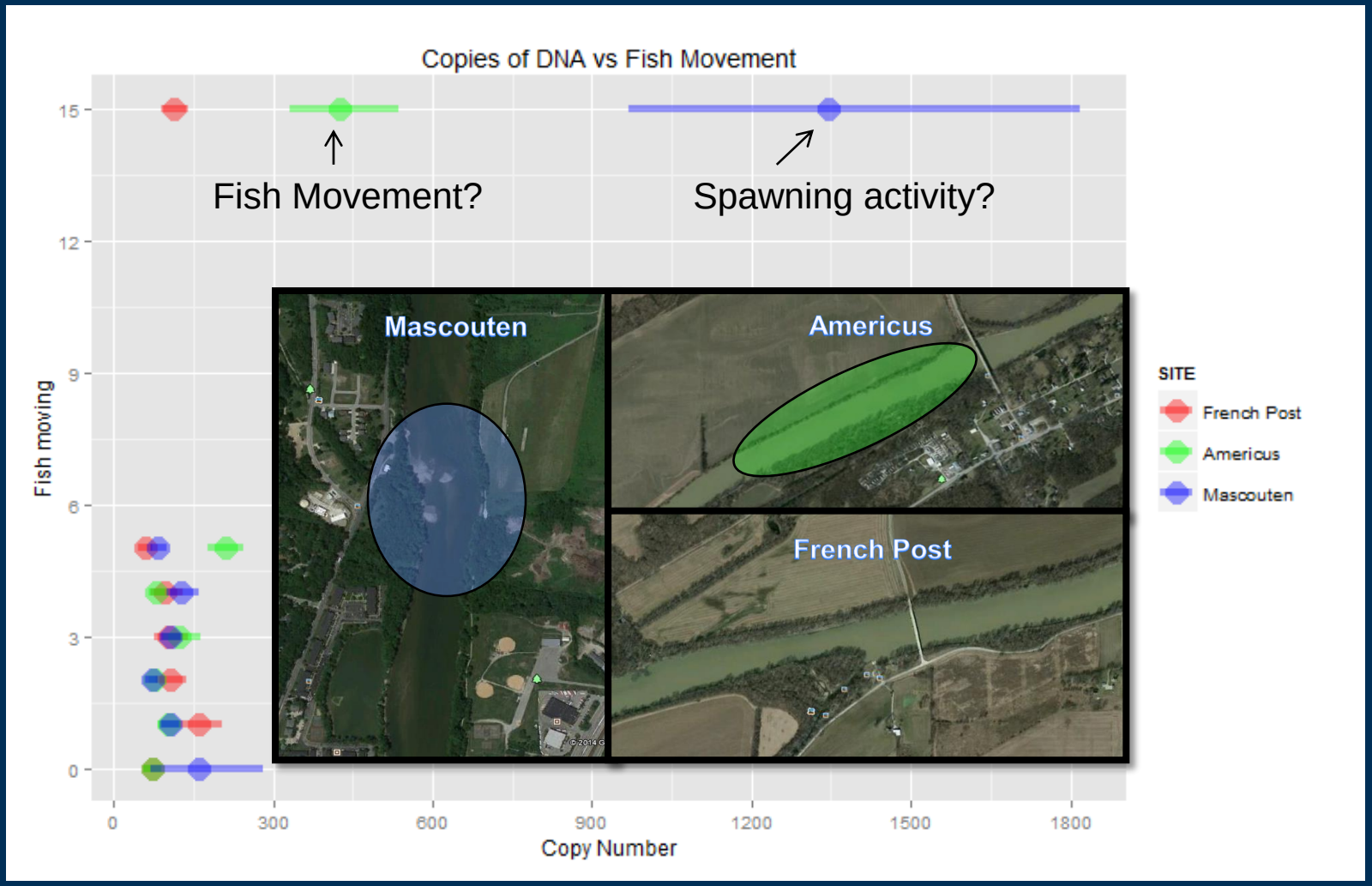

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Summary

- Major change in hydrograph
- Fish movement correlated with spawning
- 100% positive detections
  - Difficult to correlate with absence/presence
- Copy number increase with spawning activity
- Correlation with movement

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Next

- Complete analysis of samples collected between June and November
- Analyze detections and copy number estimates using Silver/Bighead allelic discrimination marker
- Analysis with microbial marker

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Potential implications on IPM Program for Asian Carp

- Repeated water sampling at key times of year can help to predict spawning events
- Fish movement activity can be inferred with eDNA copy number, data indicates population must be well established
- Site selection important in establishing this correlation, e.g. Mascouten, collection of genetic material
- Tying eDNA results in with habitat types can help to focus control strategies

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Acknowledgements

Funding provided by the Great Lakes Restoration Initiative and USGS appropriated funds