Instream Bacteria Concentrations *and the* Influence of Bird Colonies at Bridges

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Research Question

What We Know

- Birds poop.
- Bird poop can be a major contributor to high instream *E. coli* concentrations.
- Instream *E. coli* samples are often collected near bridges.
- Some birds, such as cliff swallows, roost at bridges in large numbers.
- Landowners in some bacteria TMDL watersheds pin blame on bird colonies at water sampling sites.

What We Want to Know

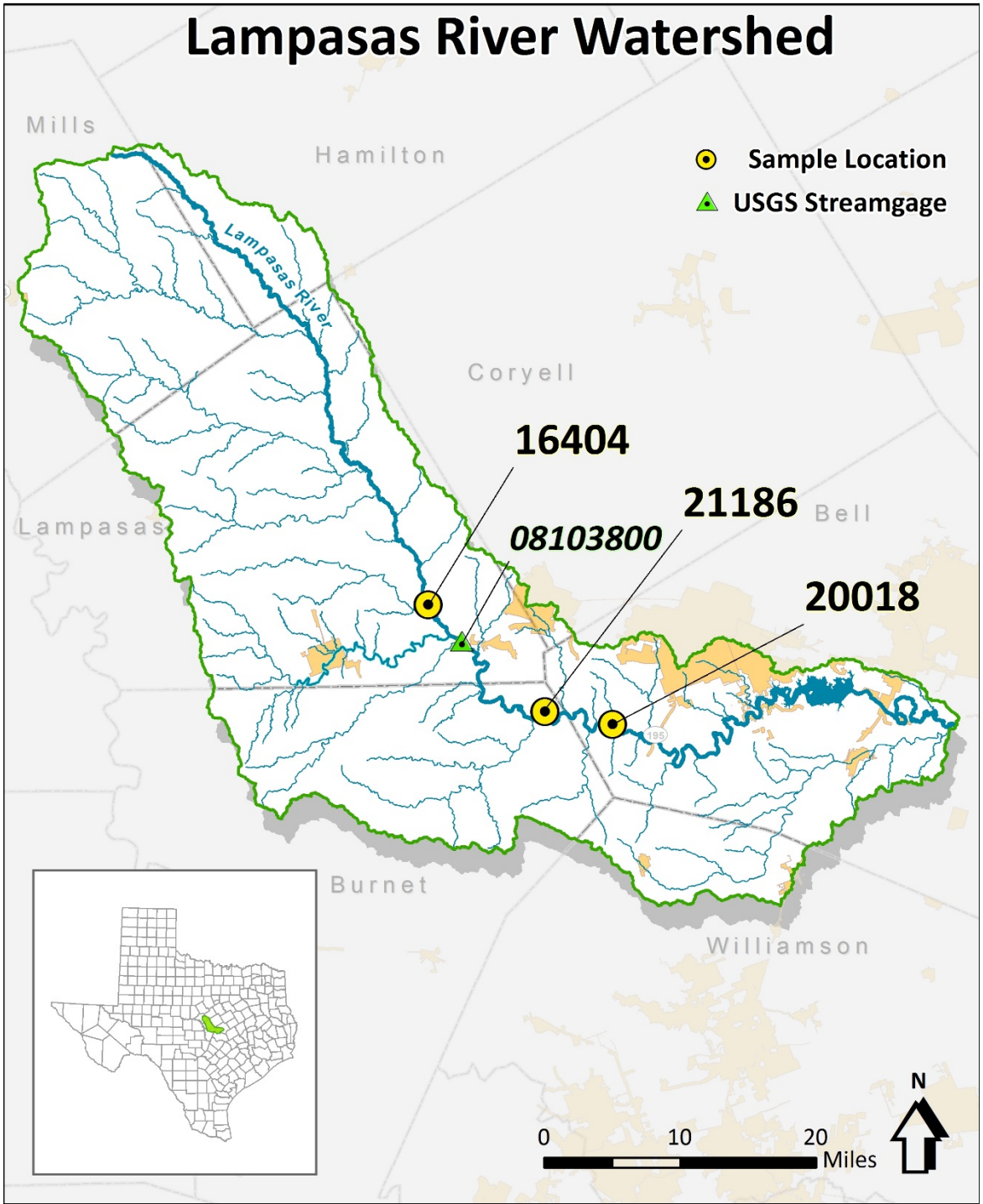
Research Question

Do birds roosting at bridge crossings significantly increase instream bacteria concentrations in the vicinity of bridges?

H_0 = *No significant increase in* **E. coli** *concentrations between upstream and downstream samples*

Study Design

Study Design



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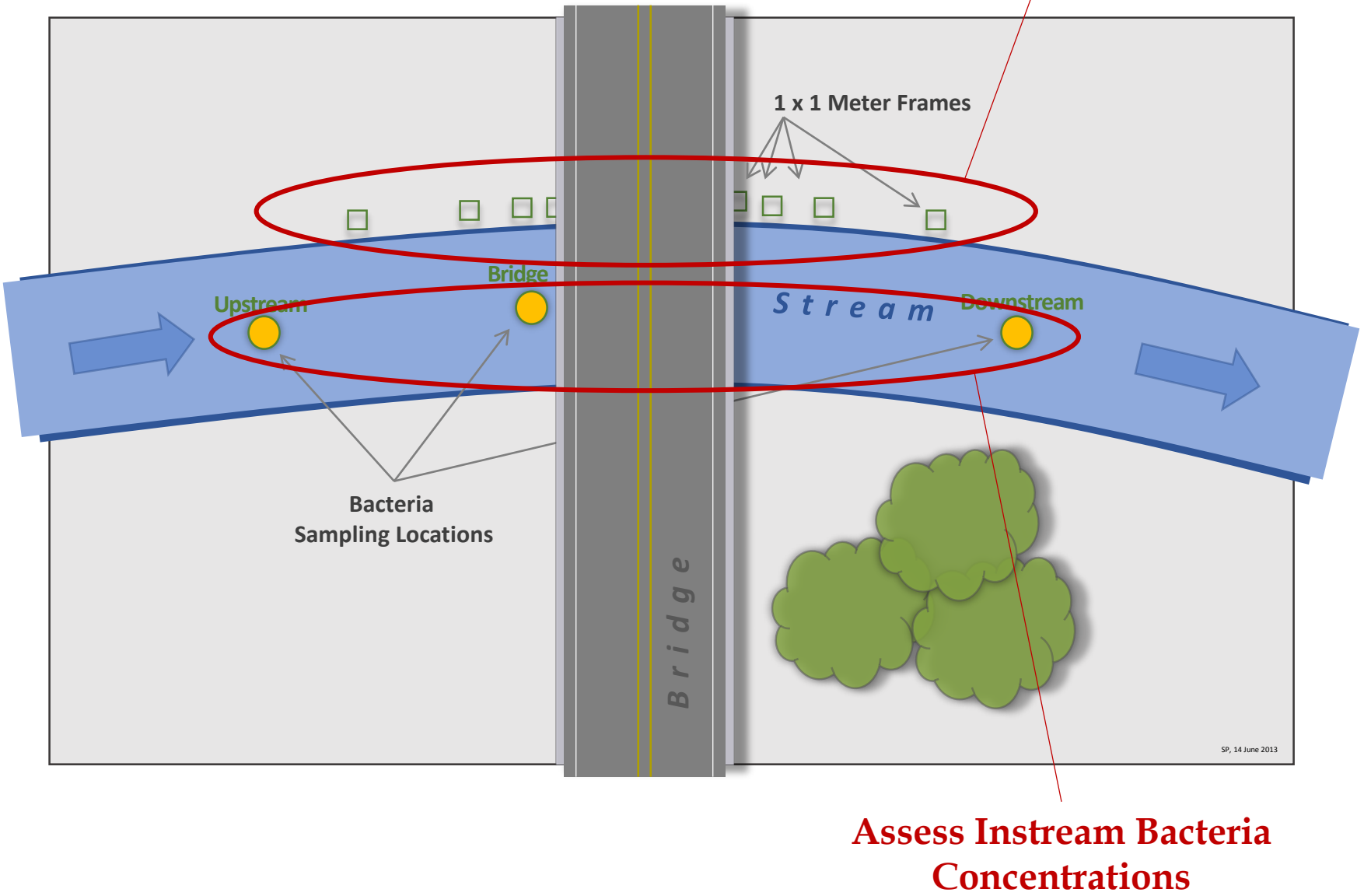

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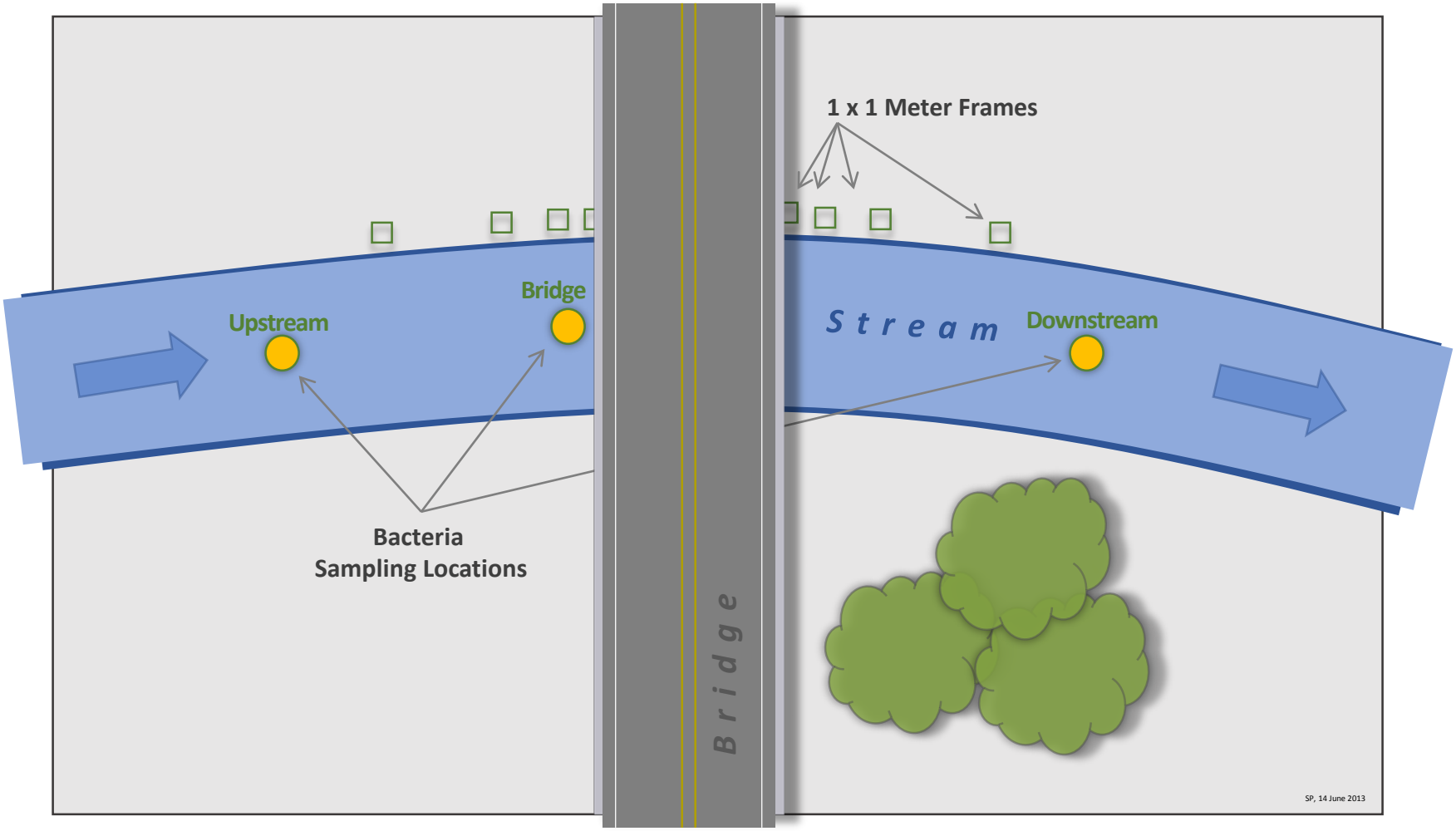
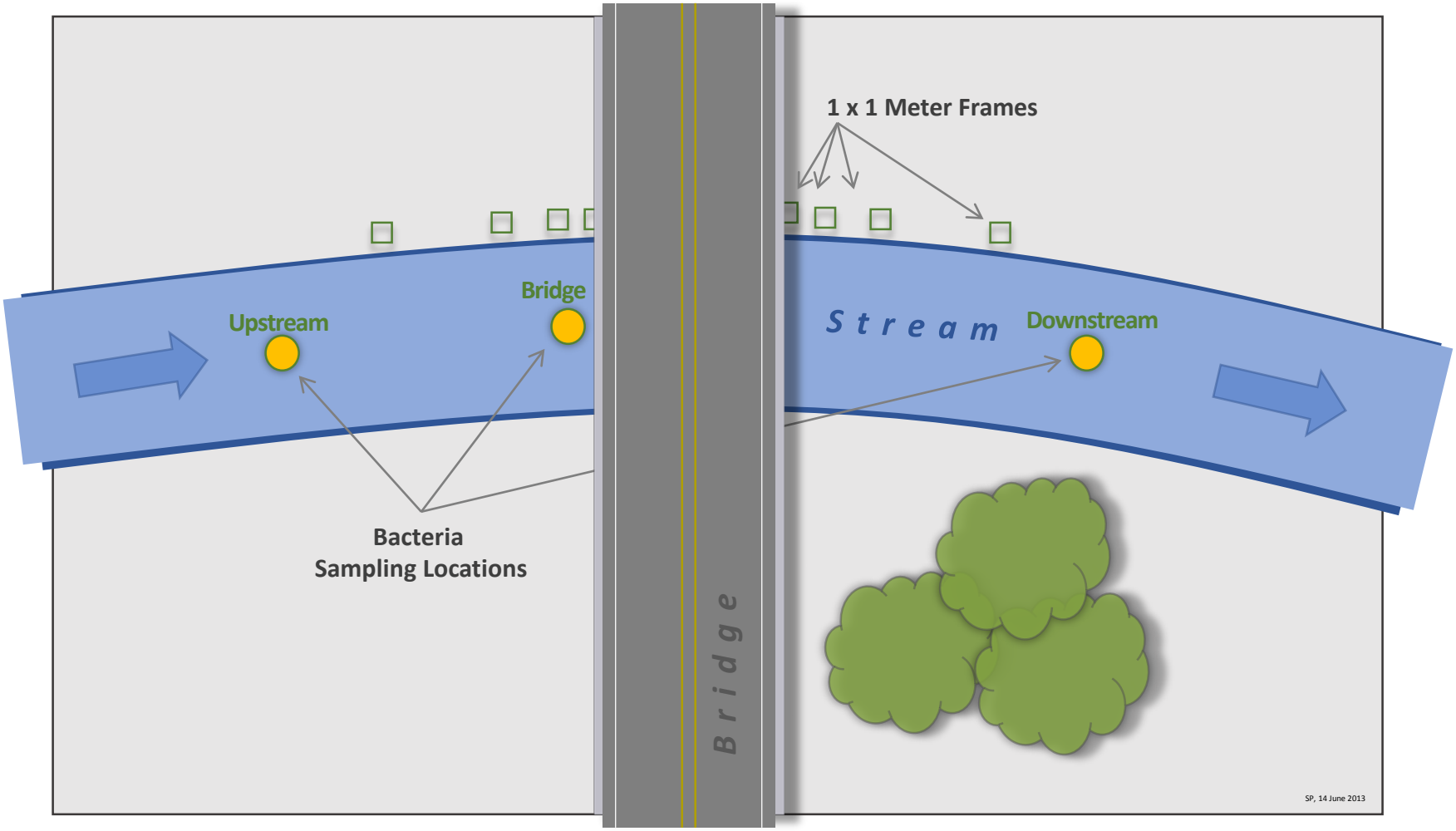


2 Treatment Bridges (16404 & 21186…swallows)

1 Spatial Control (20018…no swallows)

1 Temporal Control (16404… prior to swallow arrival)

Study Design



(5 Up + 5 Bridge + 5 Down) * 3 Events = 45 Samples

45 Samples * 8 Visits = 360 Samples

360 Samples * 2 Treatment Bridges = 720 Samples

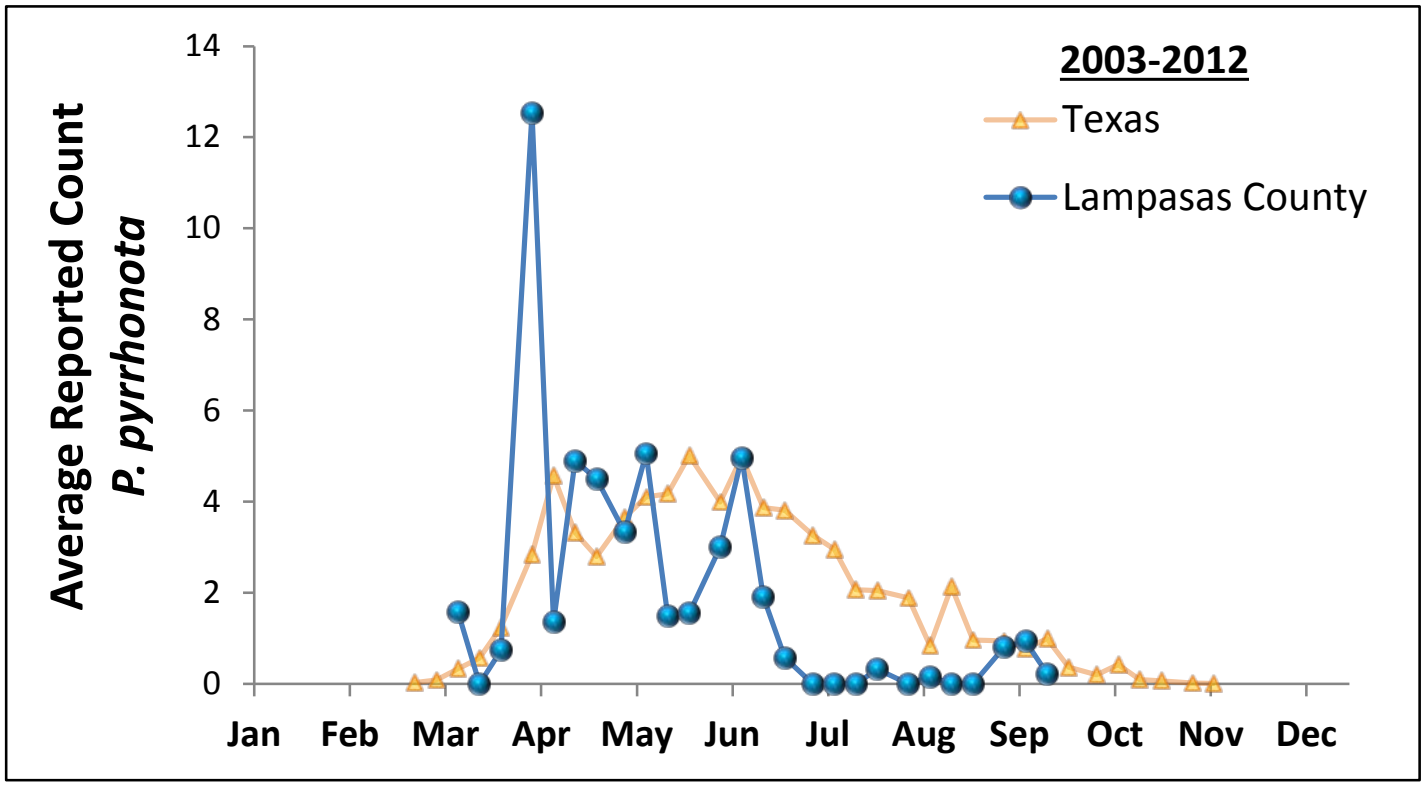
720 Treatment Samples + 315 Control Samples = 1,035

Natural history of Cliff Swallows

Cliff Swallow

(*Petrochelidon pyrrhonota*)

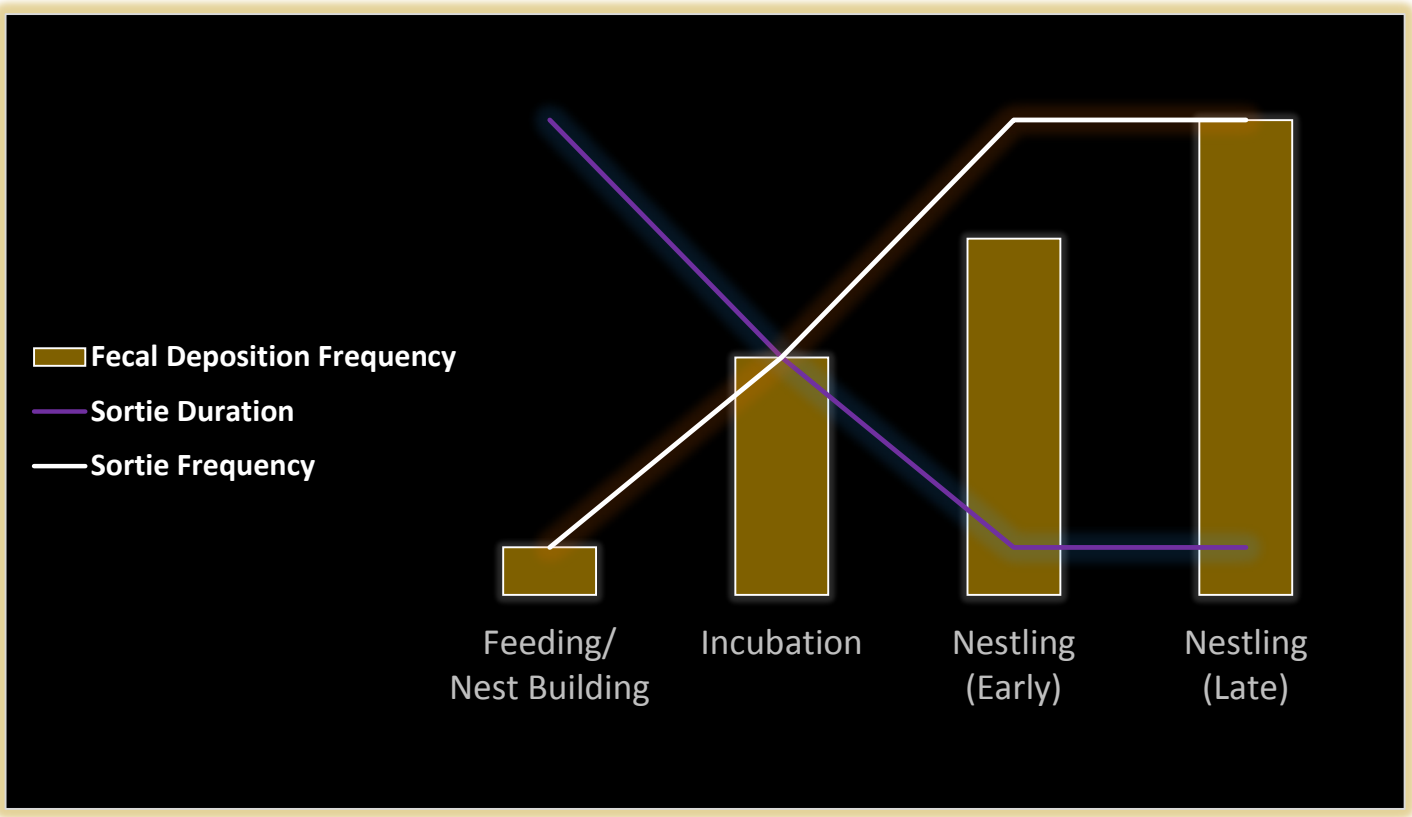
In Texas: Arrive early March, depart mid-June



Data: www.ebird.org

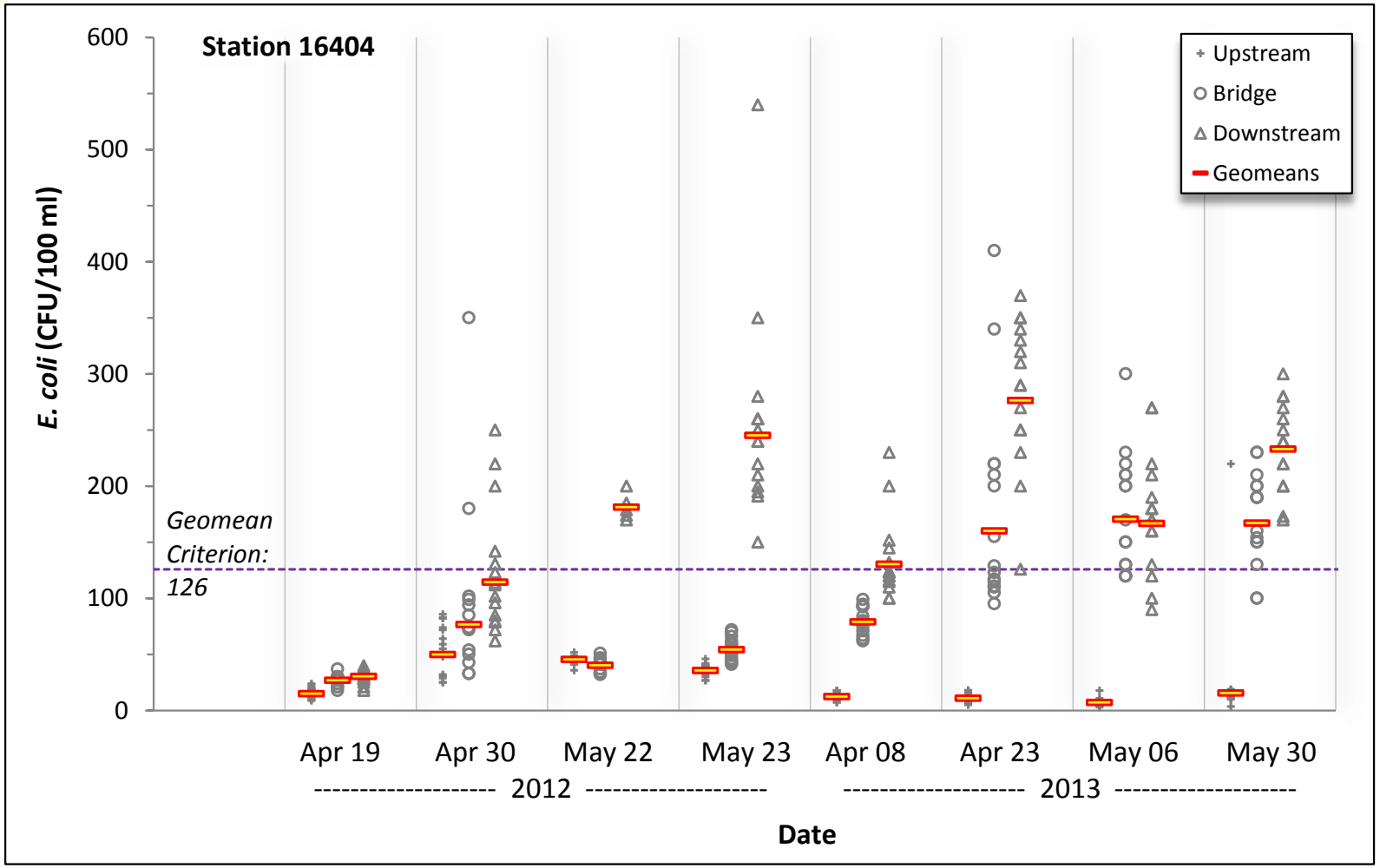
Cliff Swallow
(*Petrochelidon pyrrhonota*)

The Three Phases of Nesting



Results

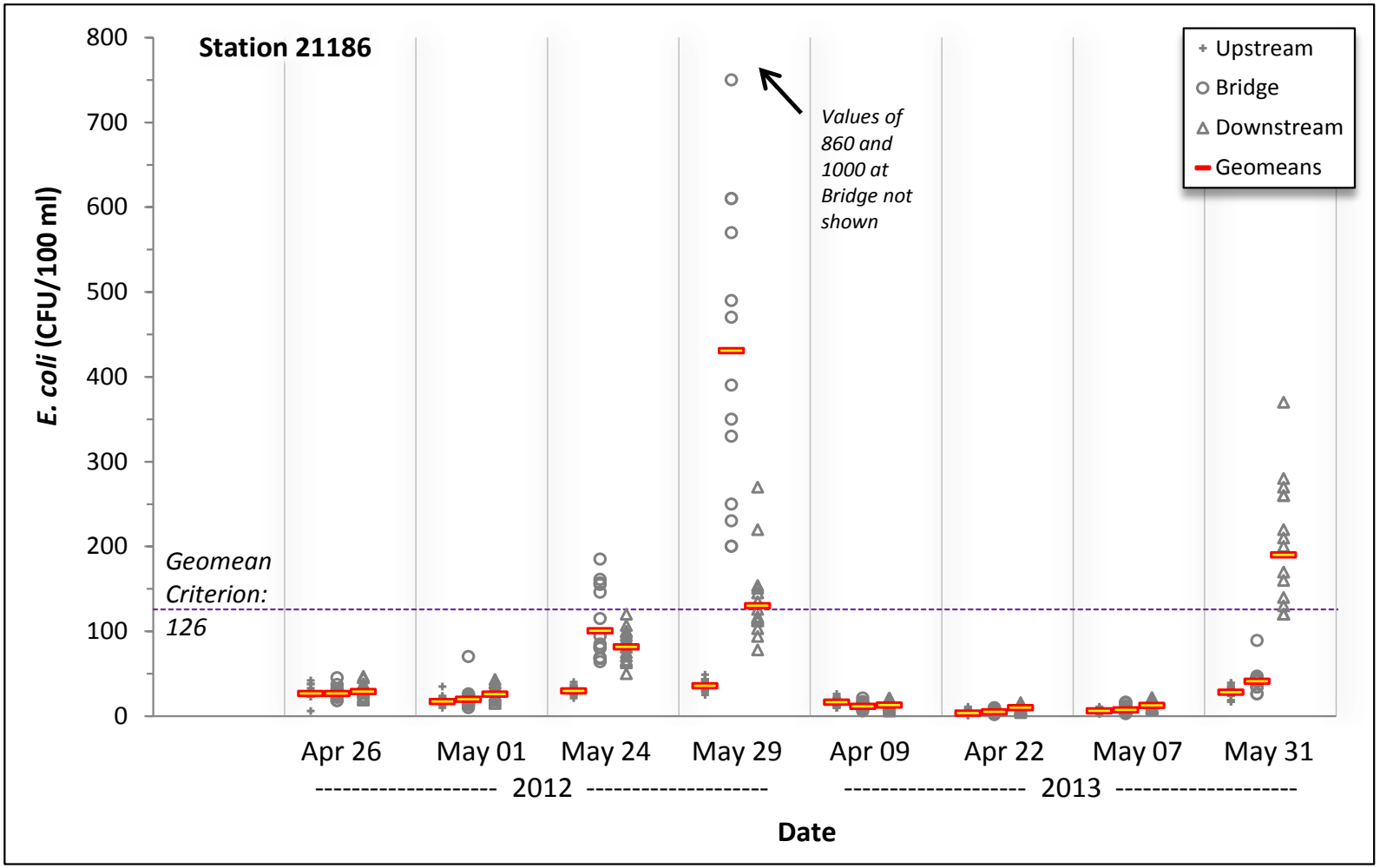
Instream *E. coli*



Densely Populated Treatment Bridge

Results

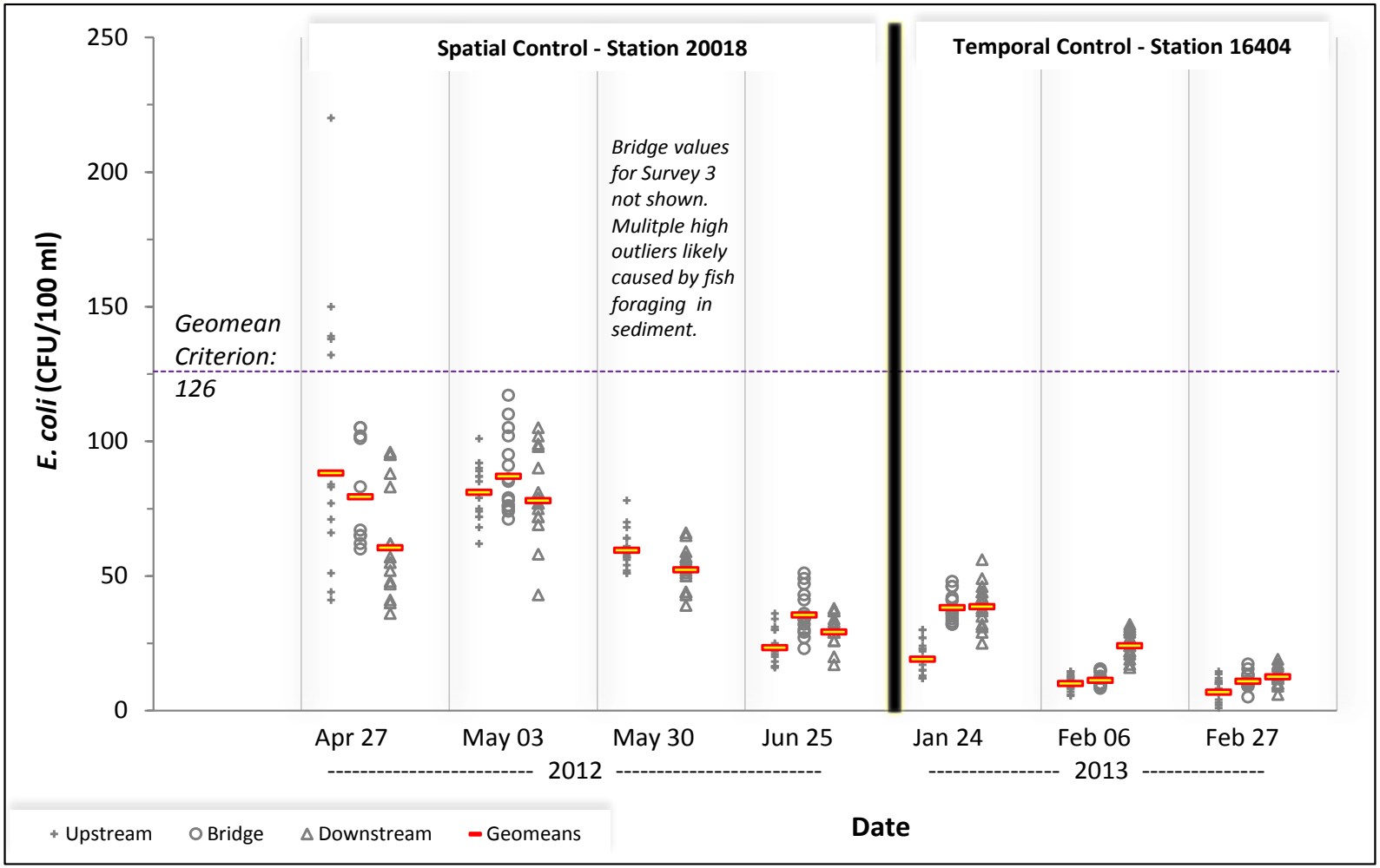
Instream *E. coli*



Moderately Populated Treatment Bridge

Results

Instream *E. coli*



Control Bridges

Results

Discussion

Research Question

Do birds roosting at bridge crossings significantly increase instream bacteria concentrations in the vicinity of bridges?

Yes…

Sometimes…

It Depends…

Discussion

Research Question

Discussion

Yes……

Differences were always significant between upstream and downstream samples…

Sometimes……

At the densely birded bridge…

It Depends……

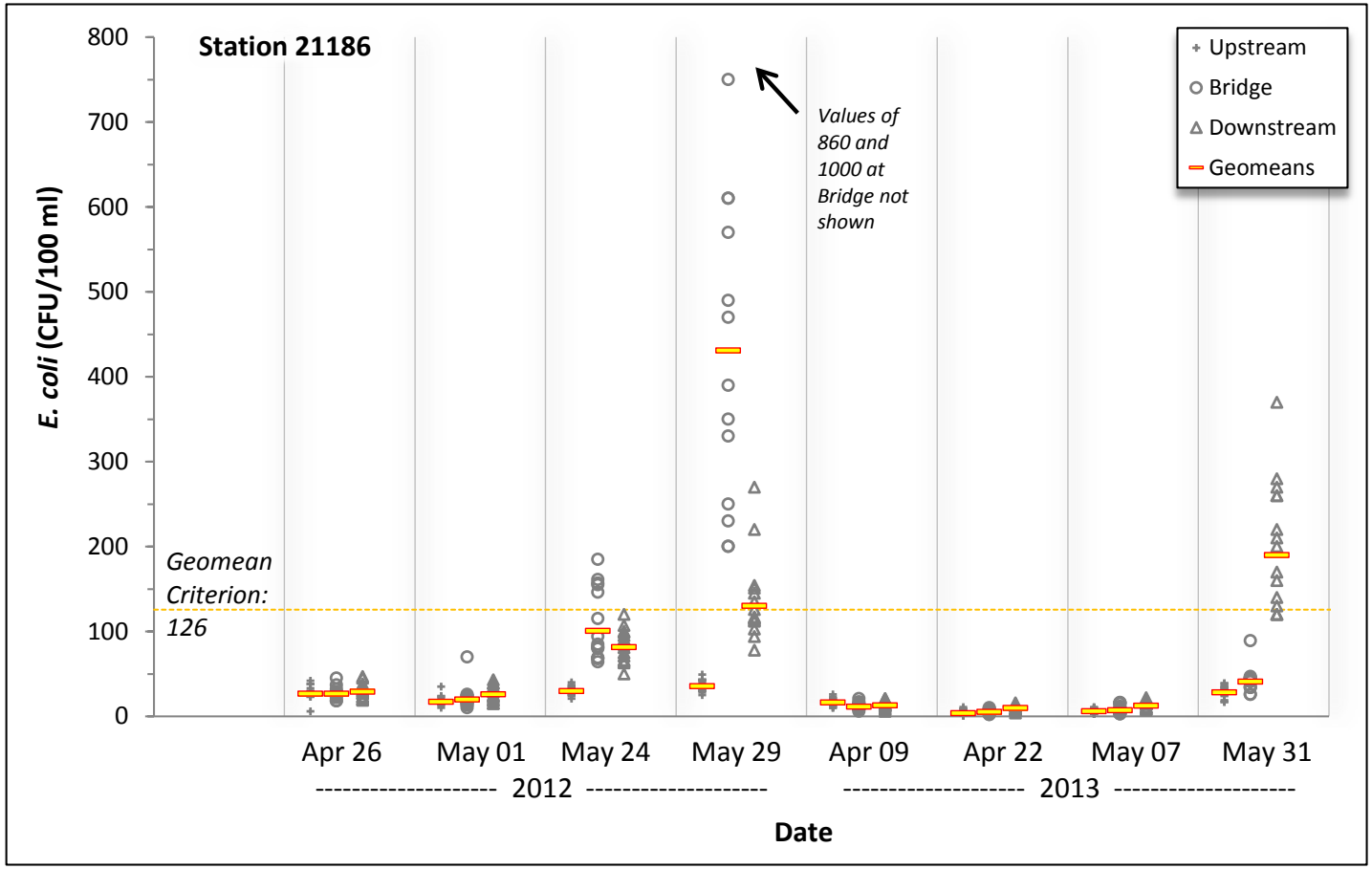
When swallows were present…

Research Question

Meanwhile at the moderately birded bridge…

Differences were less pronounced…

Differences were significant only during peak bird activity…



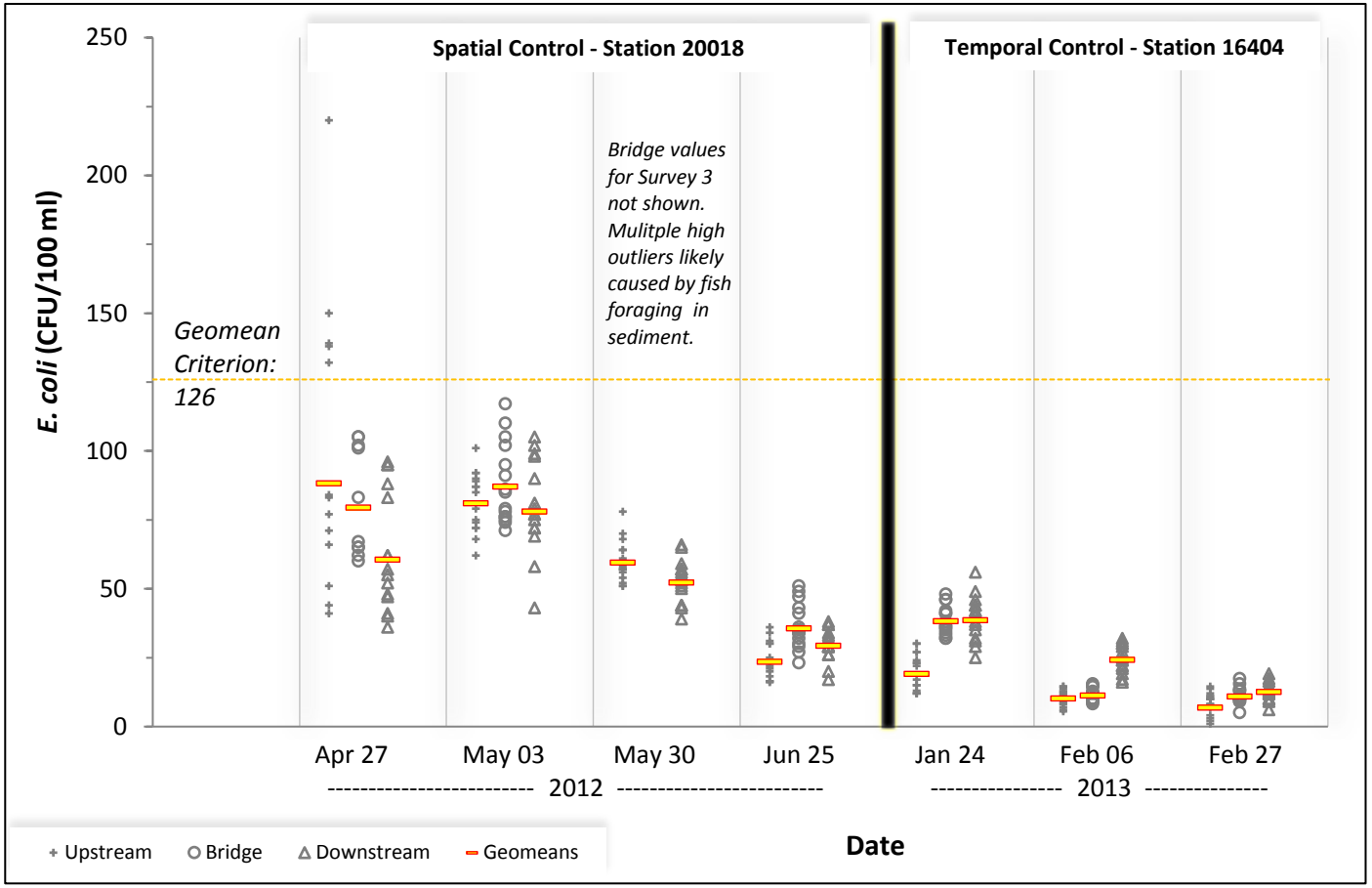
Discussion

Research Question

Furthermore, at the control bridges…

No differences at nestless SPATIAL control bridge…

Significant differences at TEMPORAL control likely due to small perennial house sparrow colonies…

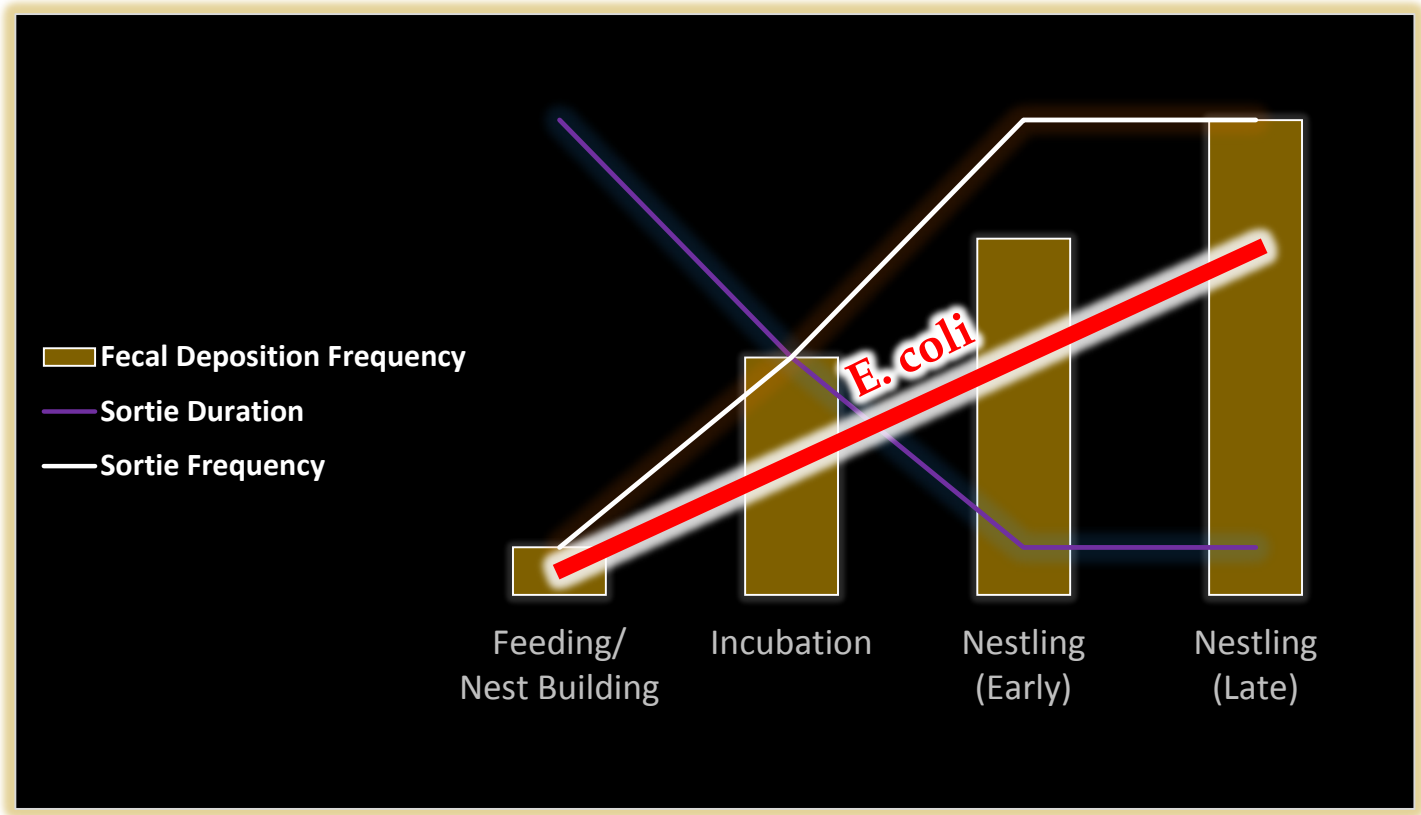


Discussion

Research Question

And the natural history…

E. Coli concentrations generally increased with bird activity at the nests



Discussion

Research Question

Discussion

Conclusion?

Implications

Discussion

Implications for Water Quality Technicians

- **Assess presence of birds (and bats?).**
- **Sample at a BPJ distance from the upstream bridge face.**
- **Be mindful of migratory patterns (avoid nesting periods?).**
- **Landowners in TMDL watersheds can—but probably shouldn't—pin high *E. coli* concentrations on migratory swallow colonies.**

Acknowledgements

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Jesus Christ

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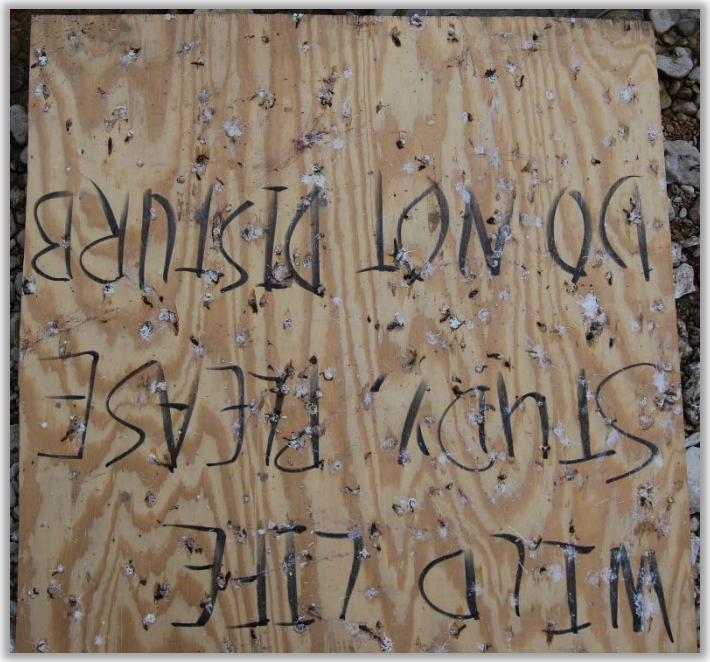
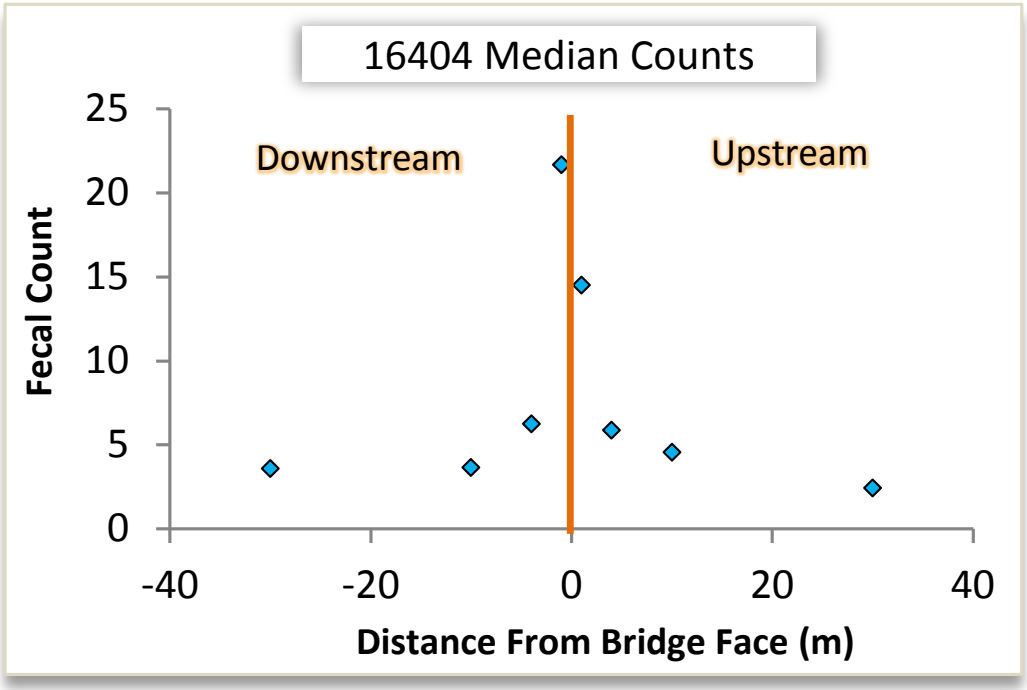
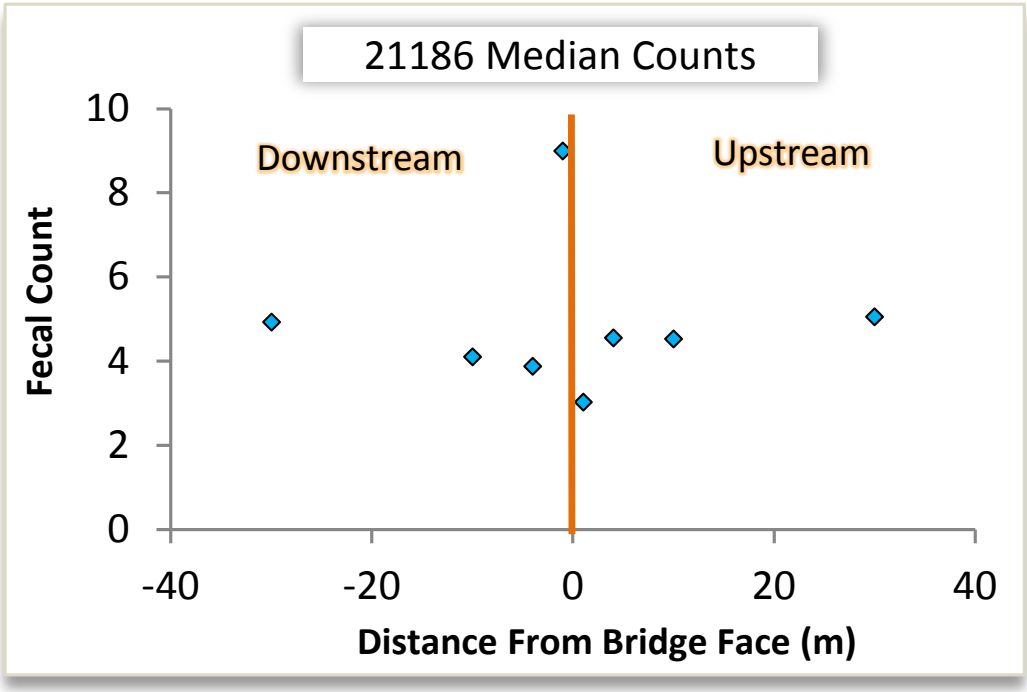
Questions

Appendix

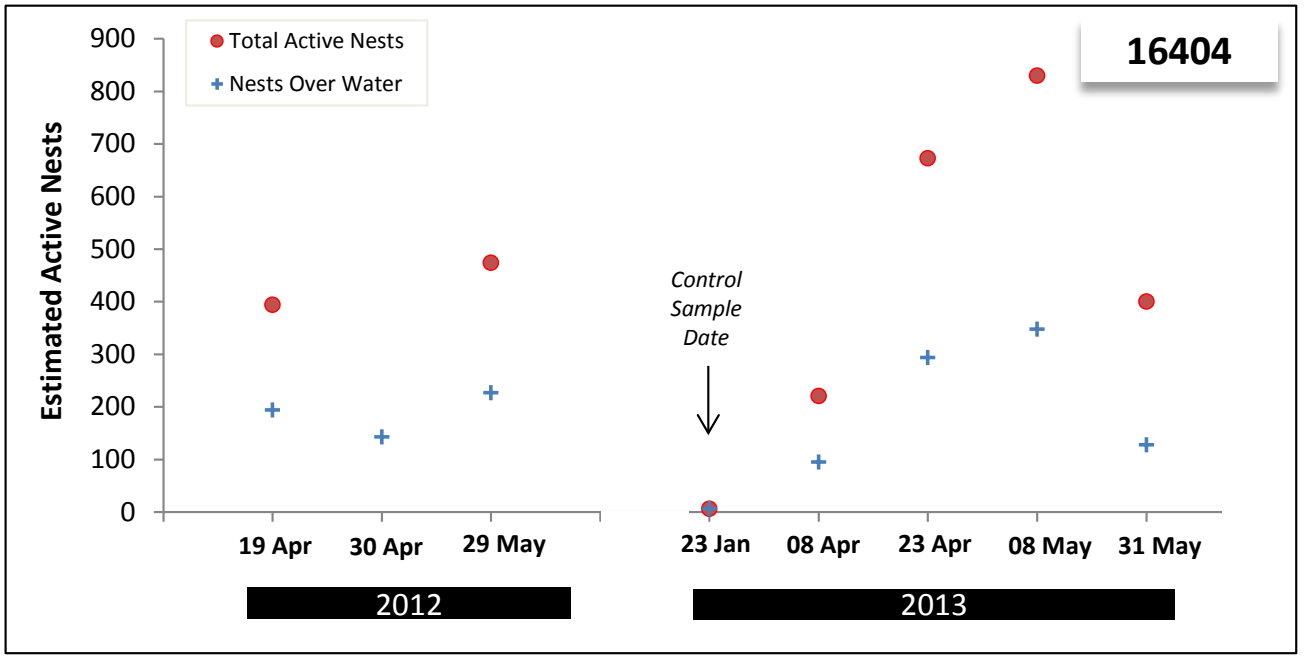
Poop Frames

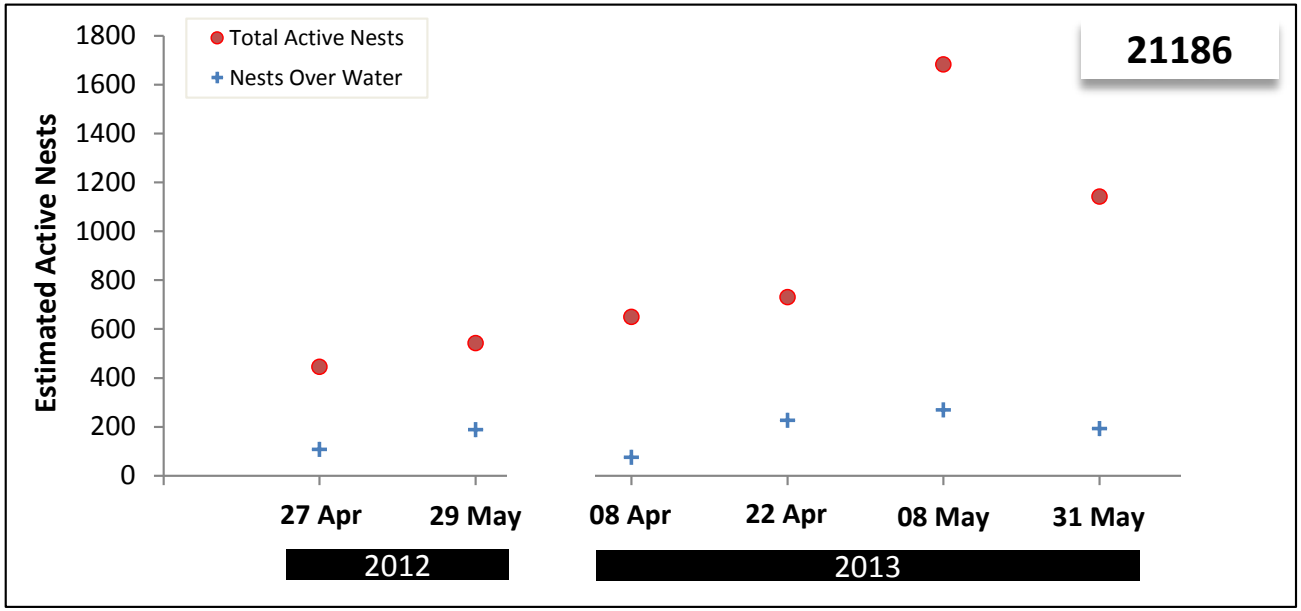






Nest Counts





Appendix