

When Fire Changes the Observer

Negative Controls in Citizen-Science Estimates of Wildfire Effects on Birds

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Abstract

Can reports from volunteer birdwatchers show how wildfires affect birds? I compared 4.4 million California bird sighting reports from before and after fires. Sightings of the Wrentit, a shrubland bird, fell about 27% in the year after a fire. But water birds that these fires can’t touch also seemed to change, likely because birdwatchers visited 42% fewer spots after fires. Fire changed the birdwatchers, not just the birds. Still, 12 of 16 species changed in the direction I predicted.

1 Introduction

eBird holds millions of bird sighting reports from volunteer birdwatchers [1] that could show how California’s growing wildfires affect birds [2]. Past studies show fire helps birds that feed on dead trees but hurts forest birds [3, 4]. But fire might also change where birdwatchers go.

Research question: Can volunteer birdwatching data prove that fire caused changes in birds?

2 Data

Three public datasets, combined into 5 km squares:

- eBird: 4.4 million bird sighting reports (California, 2015–2026)
- NASA satellites: how green the plants are
- U.S. fire maps (MTBS): 1,956 fires and how badly each area burned

Main bird: the Wrentit, a small shrubland bird that stays put all year.

3 Methods

- Compare each square with itself, before vs. after the fire
- Measure how much of the square burned, not just yes/no
- Track changes year by year, from 5 years before to 8 years after
- Fairness check [5]: three water birds that shrubland fires can’t affect. If they “change,” something other than fire is at work.

4 Results

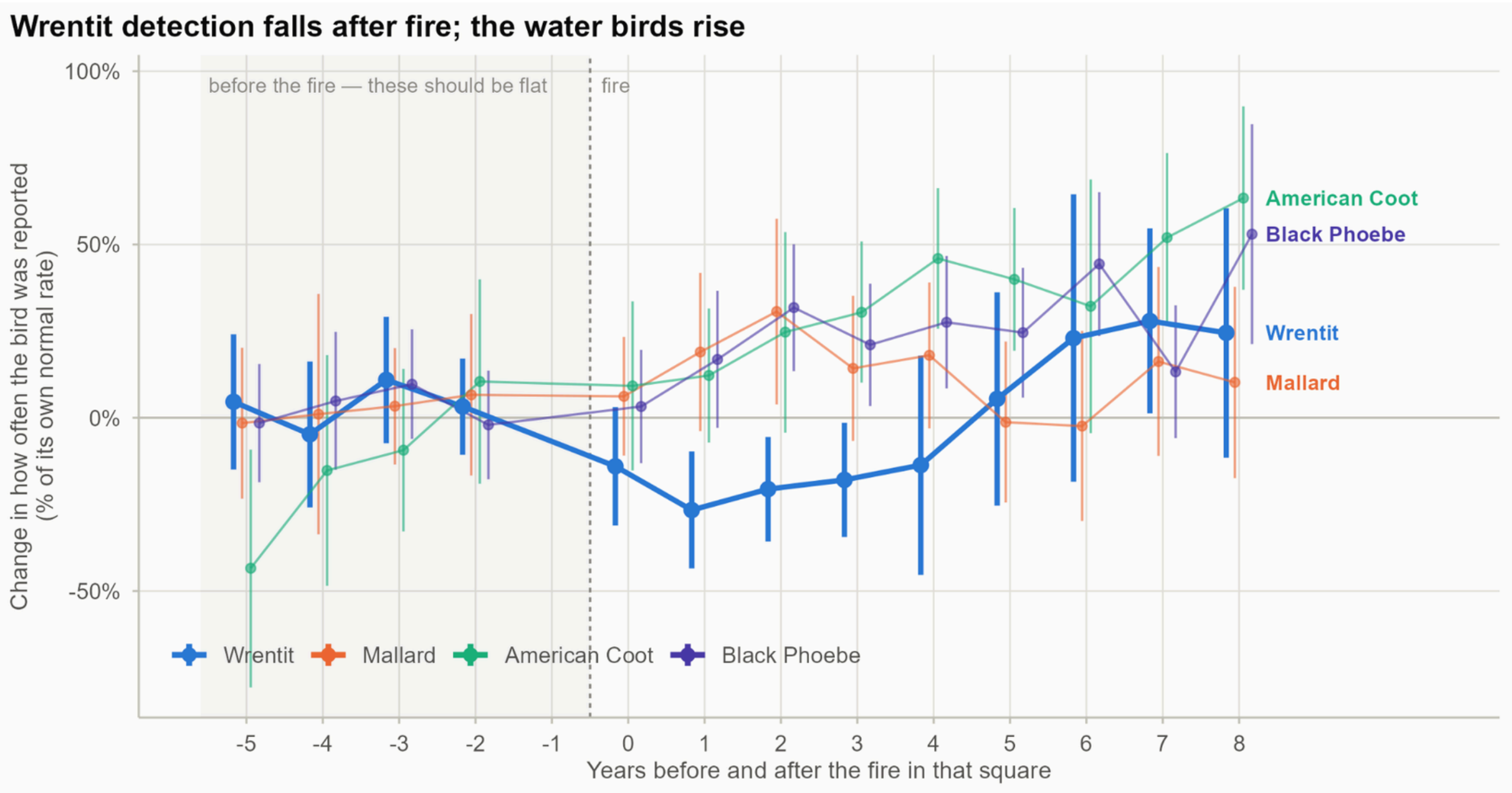


Fig 1. After a fire, Wrentit sightings drop about 27% and stay low for about 3 years. The water birds go up instead.



Fig 2. The fairness check fails: all three water birds show a statistically significant “fire effect,” even though fire can’t reach them.

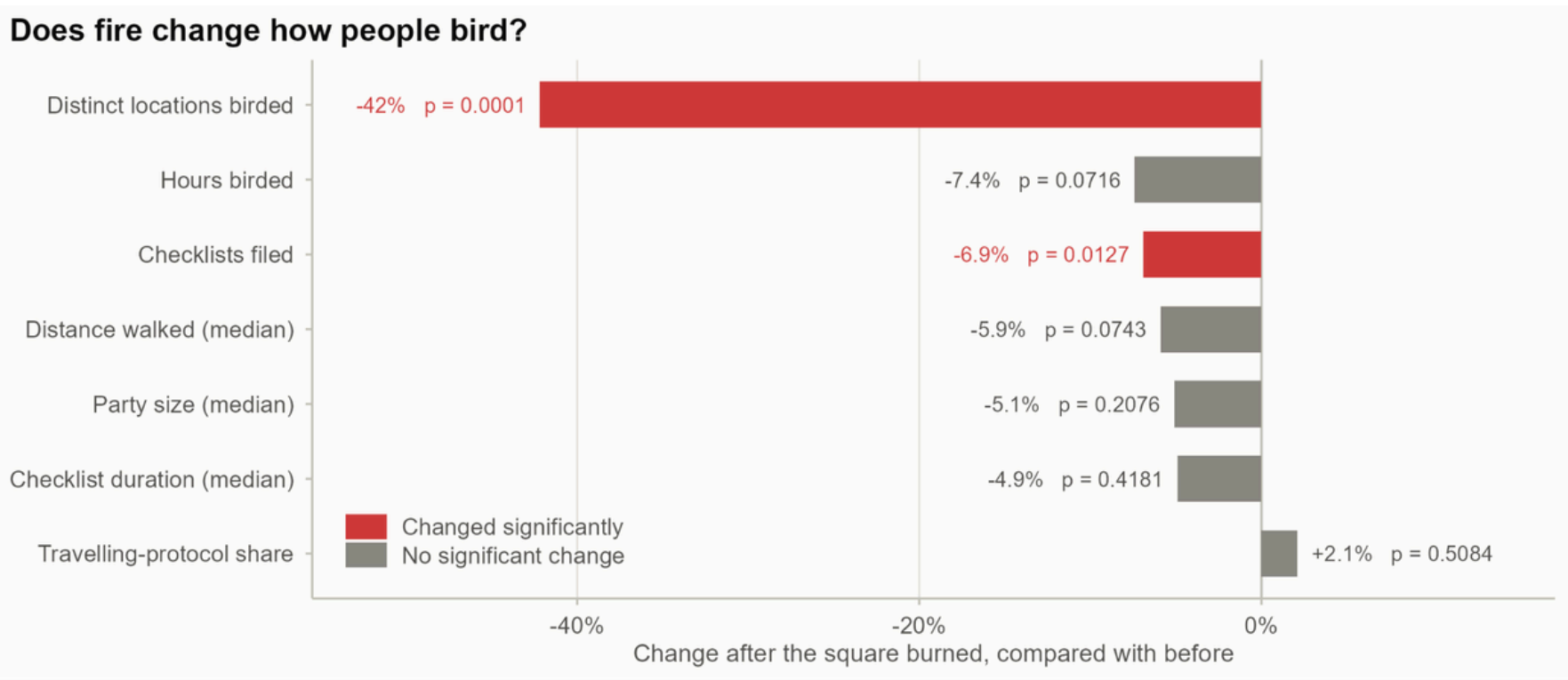


Fig 3. Why? After a fire, birdwatchers visit 42% fewer spots in the same area.

5 Discussion

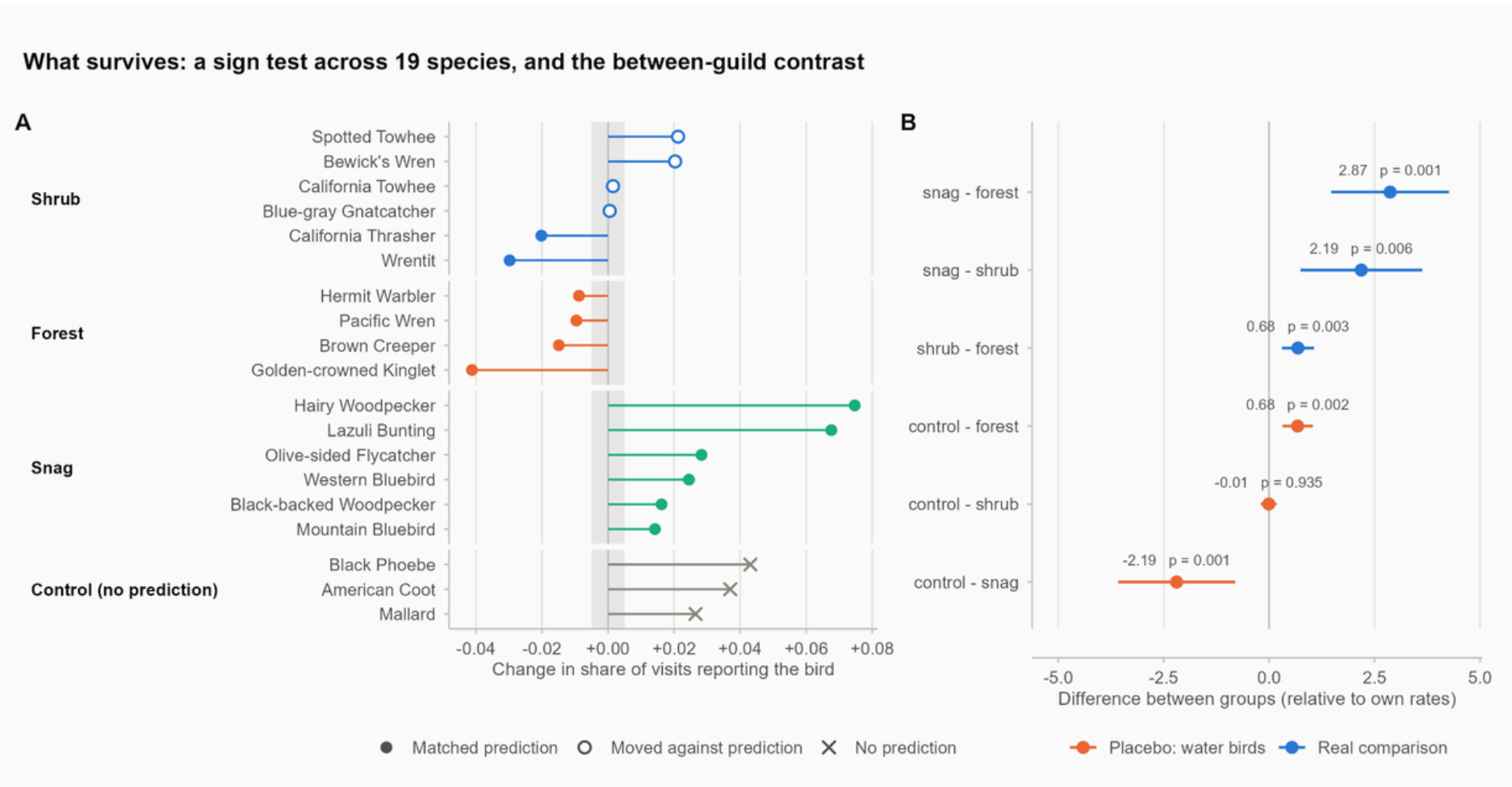


Fig 4. Twelve of 16 species changed in the direction I predicted before looking at the data. Birds that feed on dead trees went up (6/6); forest birds went down (4/4); shrubland birds were mixed (2/6). This matches past studies [3, 4]. But group comparisons (Fig 4B) couldn’t separate real changes from noise, so the direction is trustworthy but the exact sizes are not.

6 Conclusion

Takeaway: This project can’t measure fire’s true effect on birds. It shows that fire changes where birdwatchers go, which can fool the analysis.

Next steps: track where birdwatchers go, and pick test birds from the Wrentit’s shrubland.

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References

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