WATERBIRDSS IN RICHARDSON BAY

ITEM 6.1.5

Assessing Rafting Waterbird Usage in Richardson Bay

Habitat Monitoring

Audubon CALIFORNIA

Waterbirds Rafting in Richardson Bay
Photo: Paige Fernandez

Contents

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Audubon's Role

Richardson Bay Audubon Center & Sanctuary has been a part of the Marin County community since 1957. Staff are the stewards and protectors of a 900-acre subtidal waterbird sanctuary within the great waters of Richardson Bay. Furthermore, over the last 65 years, Audubon California's expertise in environmental engagement, habitat restoration, and waterbird conservation has helped protect countless acres throughout the greater San Francisco Bay.

Richardson Bay is critically important to tens of thousands of diving ducks, grebes and other waterbirds who rely on the bay for roosting and feeding each winter. During the winter months, Richardson Bay teems with Surf Scoters, Lesser and Greater Scaup, Western and Horned Grebes, Double-crested Cormorants and other birds. Richardson Bay is also well known for its annual winter herring runs that are an important local fishery and provide important food for wintering birds. There is concern that the long-term decline in bird numbers and herring in Richardson Bay and other parts of San Francisco Bay is linked to the decline in native eelgrass beds.

The purpose of this paper is to support Richardson Bay Regional Agency's Eelgrass Protection and Management Plan[1] through the synthesis of data gathered from November 2022 to March 2023 on the usage patterns of rafting waterbirds. All data is compared to previous years' studies conducted by Audubon California staff.

Goals

The main goal of the drone surveys was to gather an additional year of seasonal data on rafting waterbird usage in Richardson Bay. This data was added to previous sets collected during the 2020 and 2021/22 monitoring seasons. Subsequently, we are hoping to learn where rafts of waterbirds are frequently observed and how this relates to the location of the eelgrass bed and anchor-out vessels. Finally, data gathered during the surveys will support the Eelgrass Protection Zone noted in Richardson Bay Regional Agency's Eelgrass Protection and Management Plan[2].

As an Audubon Important Bird Area, Richardson Bay is critical habitat for wintering waterbirds and is home to the second largest eelgrass bed in San Francisco Bay. Therefore, gathering rafting waterbird data supports the overall conservation goals of Audubon California and the Richardson Bay Audubon Center & Sanctuary.

Study Methodologies

Study mythology replicated the 2020 data collection process. Drone-based waterbird surveys were conducted by Audubon staff, who are an FAA Part 107 licensed pilot, six times during the wintering season. Survey dates were November 14, 2022; November 30, 2022; December 14, 2022; February 8, 2023; March 3, 2023; and March 8, 2023. Captured photographs covered approximately 1,700 bay acres, resulting in roughly 650 photographs per survey. These images were analyzed for presence and location of rafting waterbirds. The drone was launched from five separate locations around Richardson Bay in compliance with FAA rules and regulations.

Paige Fernandez, Audubon California's biologist based out of the Richardson Bay Audubon Center & Sanctuary, performed all drone flights and analyzed waterbird rafts.

Results

Staff manually analyzed just under 4,000 drone images taken across six surveys from November 2022 to March 2023. Paige Fernandez, Biologist for Audubon California, and Carly Lam, Richardson Bay Community Conservation Fellow, led the analysis and created associated maps.

Images show that waterbird rafts were most frequently observed near the northern and eastern shorelines of Richardson Bay, within Richardson Bay Audubon Center's sanctuary waters. Few rafts of waterbirds were observed between Sausalito and Belvedere with the exception of the survey completed on 2/8/23 when it is believed that we captured imagery of a herring run (Figure 1).

Statistically calculated hotspots were most often observed along the northern and eastern shorelines. The exception is the survey completed on 2/8/23 when it is believed a herring run was captured (Figures 4, 5).

During the first season of monitoring in 2020, waterbirds consistently gathered near the coastline along the northeastern most edge of Richardson Bay (Figure 3). Rafts were frequently observed in the waters between Sausalito and Belvedere where it was not uncommon to observe rafts around boats anchored out. Waterbird rafts closer to the middle of the bay tended to contain a higher number of birds compared to rafts closer to the coast (Figure 8).

During the 2021/2022 monitoring season, waterbird rafts were most frequently observed near the northern and eastern shorelines of Richardson Bay, within Richardson Bay Audubon Center's sanctuary waters. Very few rafts of waterbirds were observed between Sausalito and Belvedere (Figure 2). Waterbird rafts closer to the edges of the bay tended to contain higher number of birds compared to rafts closer middle of the bay (Figures 6, 7).

Major Takeaways and Limitations

The primary goal of this survey is to show which locations within Richardson Bay are most frequently used by waterbirds. This was done by combining data collected over 5 surveys in 2020, 6 surveys during 2021/2022, and 6 surveys during 2022/2023. The goal of this survey was not to assess population trends.

Waterbirds were frequently observed in the shallow waters along the northern and eastern shorelines of Richardson Bay. These locations tend to have calmer waters where birds can rest out of the wind and waves. Occasions when rafts were observed in the middle and deeper waters of Richardson Bay were likely instances where the birds were responding to fish spawning events. Fish entering Richardson Bay would naturally flow along the central spine of the Bay, eventually ending up within the eelgrass beds.

Imagery from the 2022/2023 season did contain more images with rafts than the 2021/2022 season. The 2023 survey season was more similar to the 2020 survey. It is possible, more herring spawning events were captured in the imagery resulting in a higher number of photographs containing rafts. This assumption could be ground truthed by comparing Pacific Herring Spawn to past survey dates. It is also possible there were more waterbirds using Richardson Bay this season compared to last year; however, this study was not designed to answer that question.

Differences between years is likely due to the caveats of the monitoring methodology. Waterbird surveys are scheduled weeks in advance and are not reactively surveyed when Pacific Herring (or other fish species) are actively spawning in Richardson Bay. It is possible that the 2020 and 2022/2023 surveys captured more bird

responses to herring spawn events compared to the 2021/2022 surveys resulting in the higher number of rafts observed.

The figures on the following pages highlight locations of rafting waterbirds at a moment in time. They are not indicative of comprehensive waterbird populations or usage of Richardson Bay across a single day or season. Due to the fact each survey can take up to 8 hours to complete, it must be assumed waterbirds are moving locations throughout the survey window. Therefore, it is difficult to completely count or photograph all locations waterbirds are rafting or prevent recounts of the same bird on each survey date.

References

1. Lesberg, R.S. 2021. Richardson Bay Regional Agency: Richardson's Bay Eelgrass Protection and Management Plan. Coastal Policy Solutions (Document No. 0721). Vallejo, CA
2. Richardson Bay Regional Agency: Transition Plan. Adopted June 11, 2020

Maps

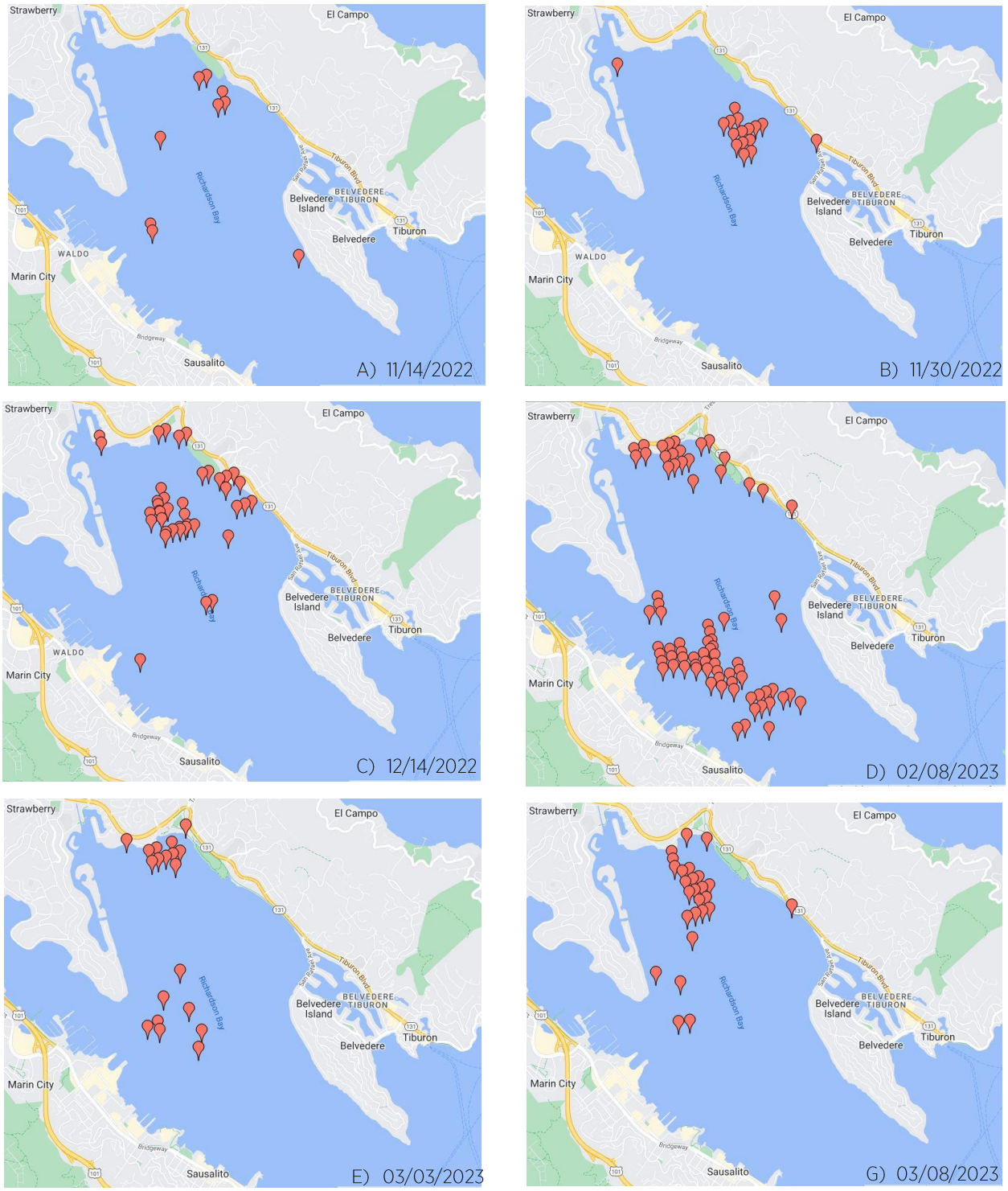

Figure 1. Locations of rafting waterbirds in Richardson Bay from November 2022 to March 2023. Red pins represent partial or whole rafts. (A raft of birds is 40 individuals or more.)

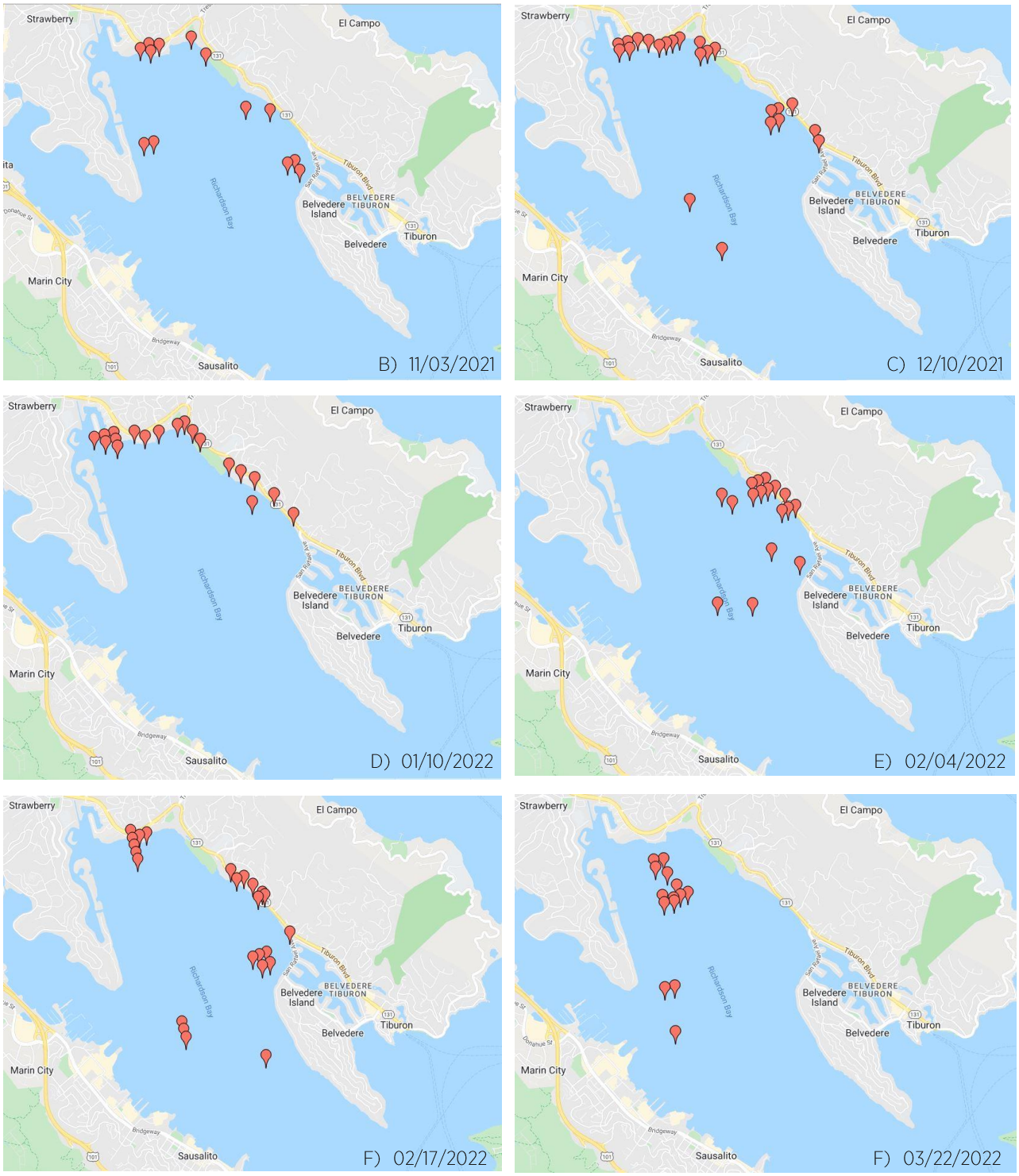

Figure 2. Locations of rafting waterbirds in Richardson Bay from November 2021 to March 2022. Red pins represent partial or whole rafts. (A raft of birds is 40 individuals or more.)

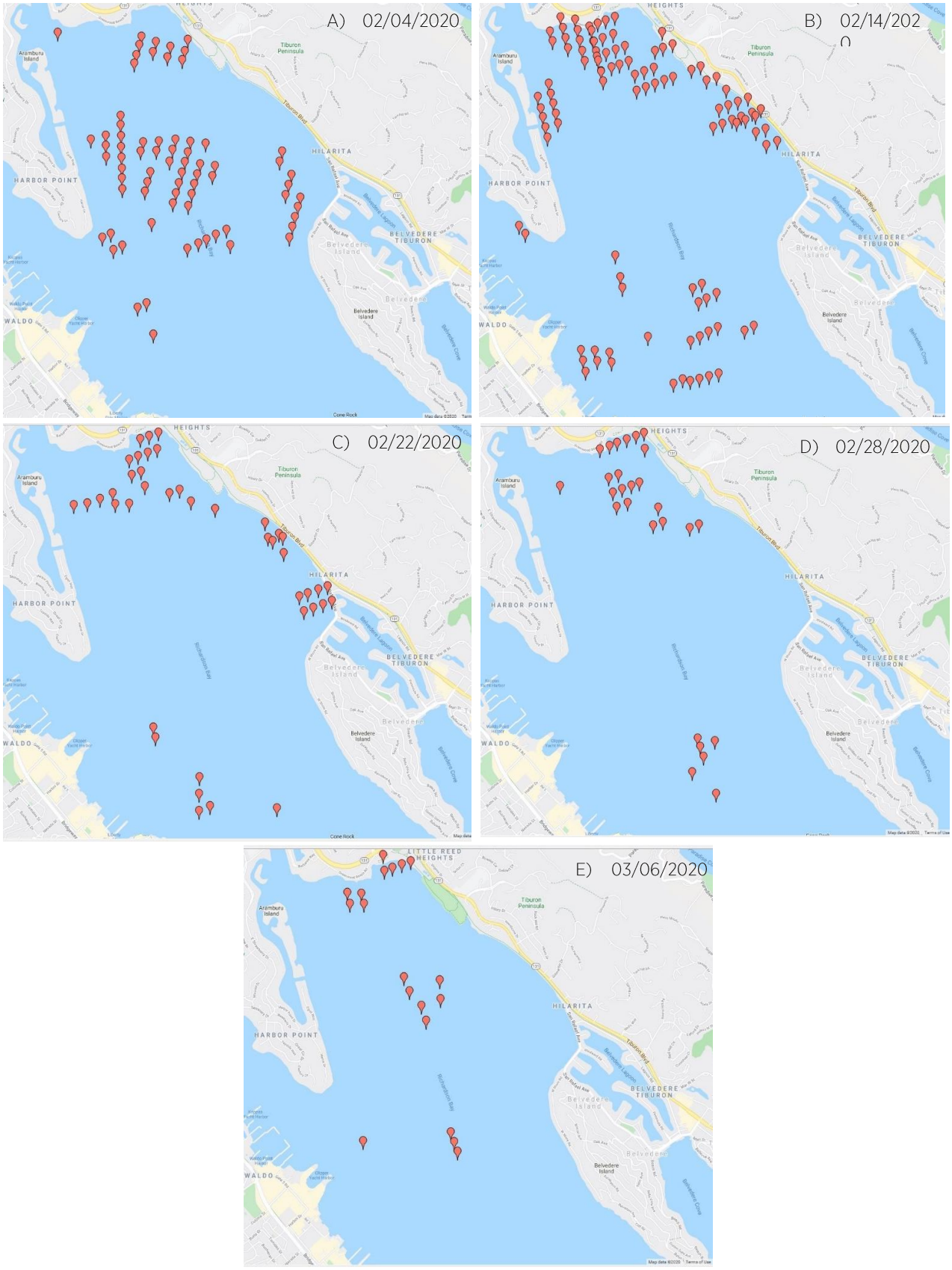

Figure 3: Locations of rafting waterbirds in Richardson Bay from February 2020 to March 2020. Red pins represent partial or whole rafts. (A raft of birds is 40 individuals or more.)

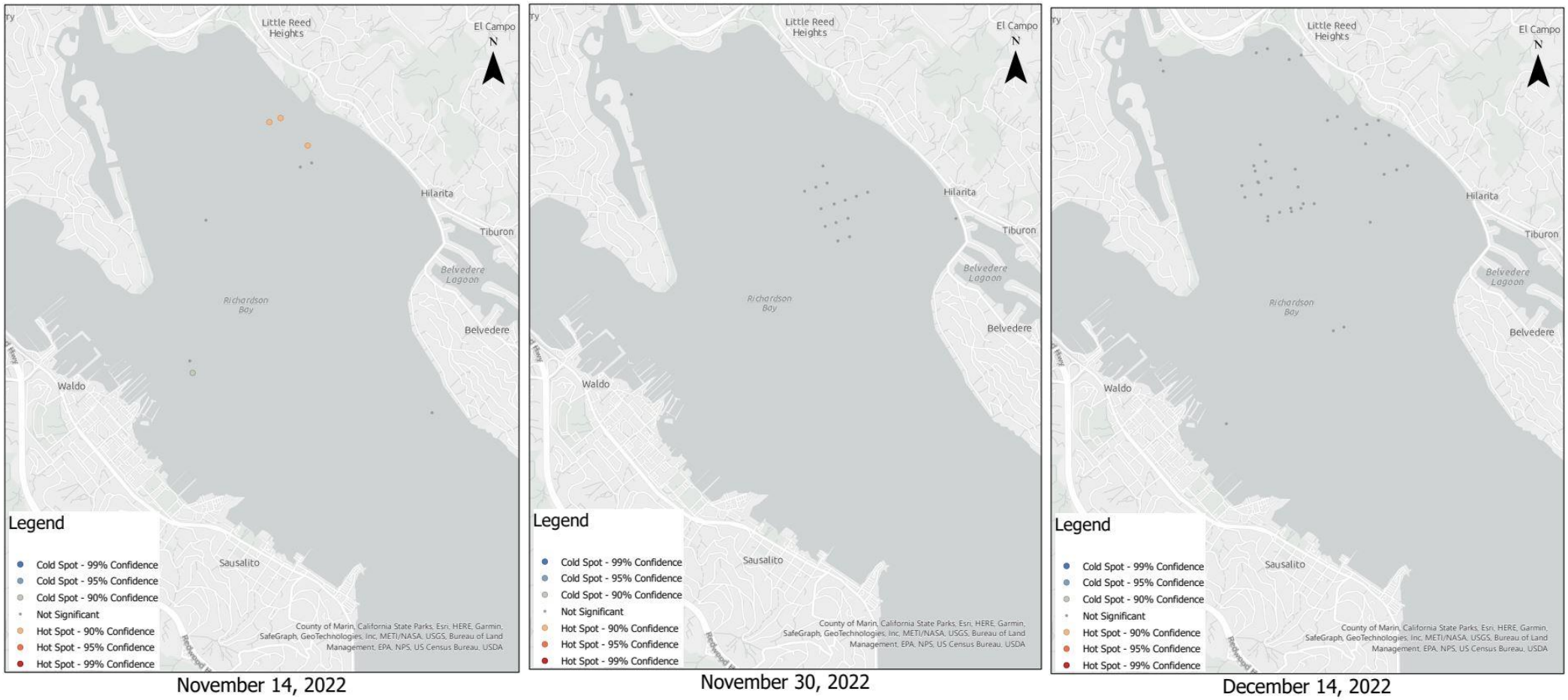

Figure 4a: Rafting waterbird heat maps of Richardson Bay across 2022-2023 survey period. Dots indicate the locations of rafting birds. Warmer colors indicate statistical hotspots with the largest number of birds. Cooler colors indicate statistical cool spots with the lowest number of birds.

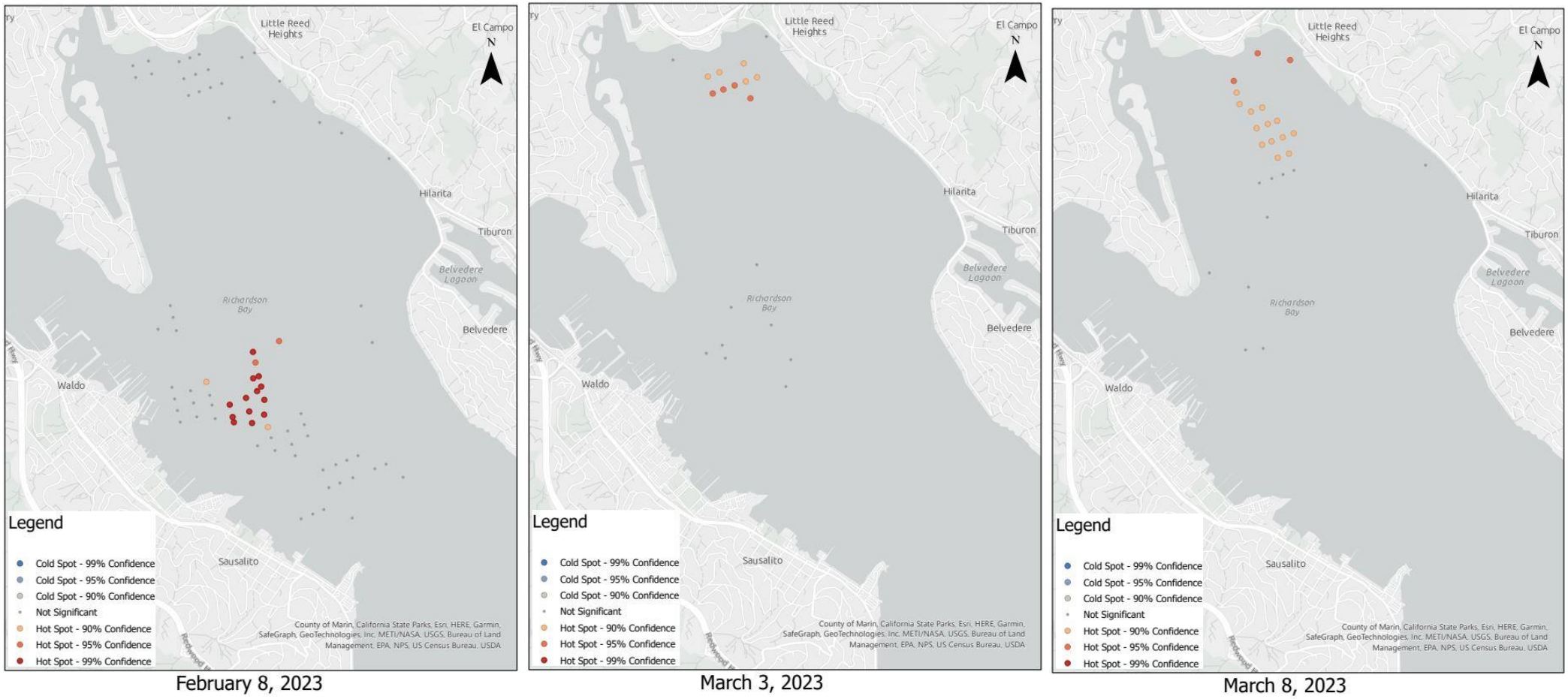

Figure 4b: Rafting waterbird heat maps of Richardson Bay across 2022-2023 survey period. Dots indicate the locations of rafting birds. Warmer colors indicate statistical hotspots with the largest number of birds. Cooler colors indicate statistical cool spots with the lowest number of birds.

Figure 5a: Rafting waterbirds in Richardson Bay across 2022-2023 survey period. Concentric circle sizes correspond to number of waterbirds counted within each whole or partial raft. Please note, each survey has unique upper and lower bounds.

Figure 5b: Rafting waterbirds in Richardson Bay across 2022-2023 survey period. Concentric circle sizes correspond to number of waterbirds counted within each whole or partial raft. Please note, each survey has unique upper and lower bounds.

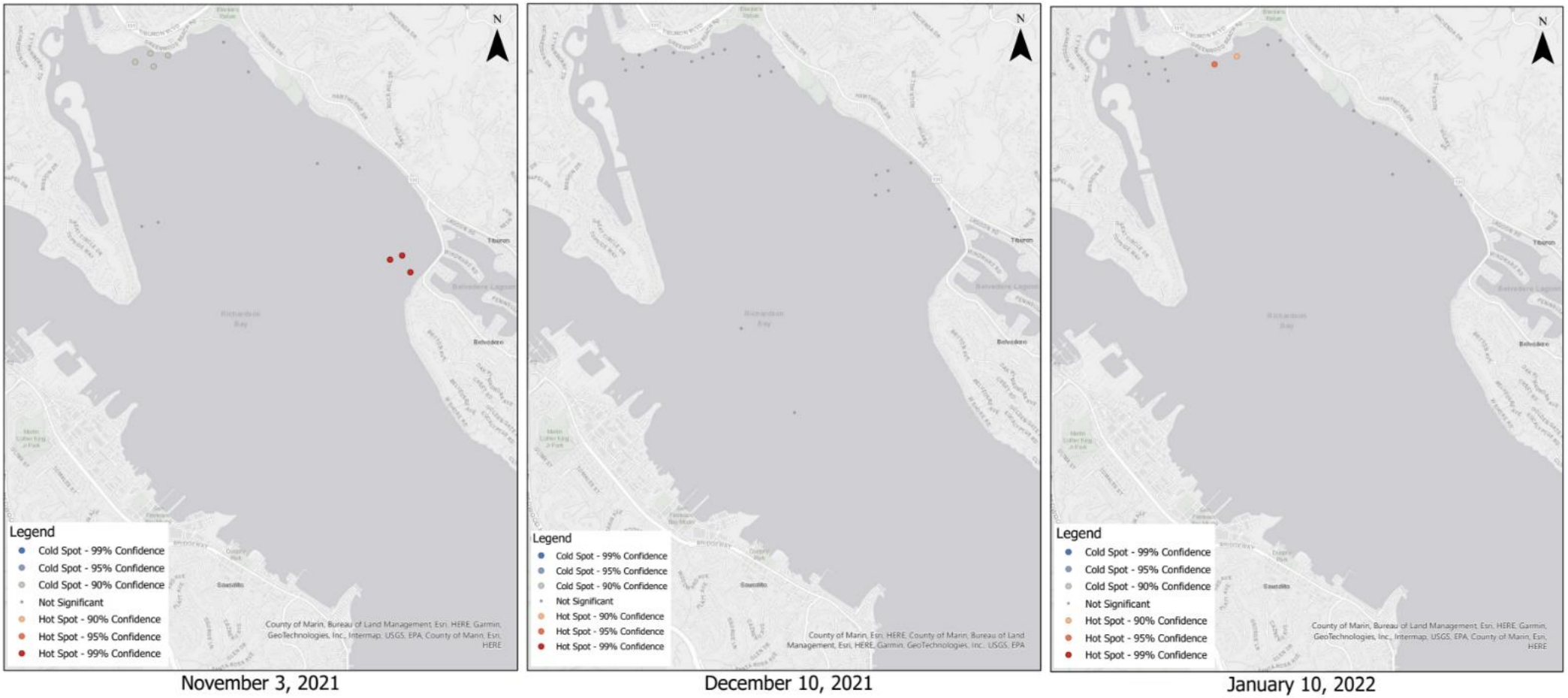

Figure 6a: Rafting waterbird heat maps of Richardson Bay across 2021-2022 survey period. Dots indicate the locations of rafting birds. Warmer colors indicate statistical hotspots with the largest number of birds. Cooler colors indicate statistical cool spots with the lowest number of birds.

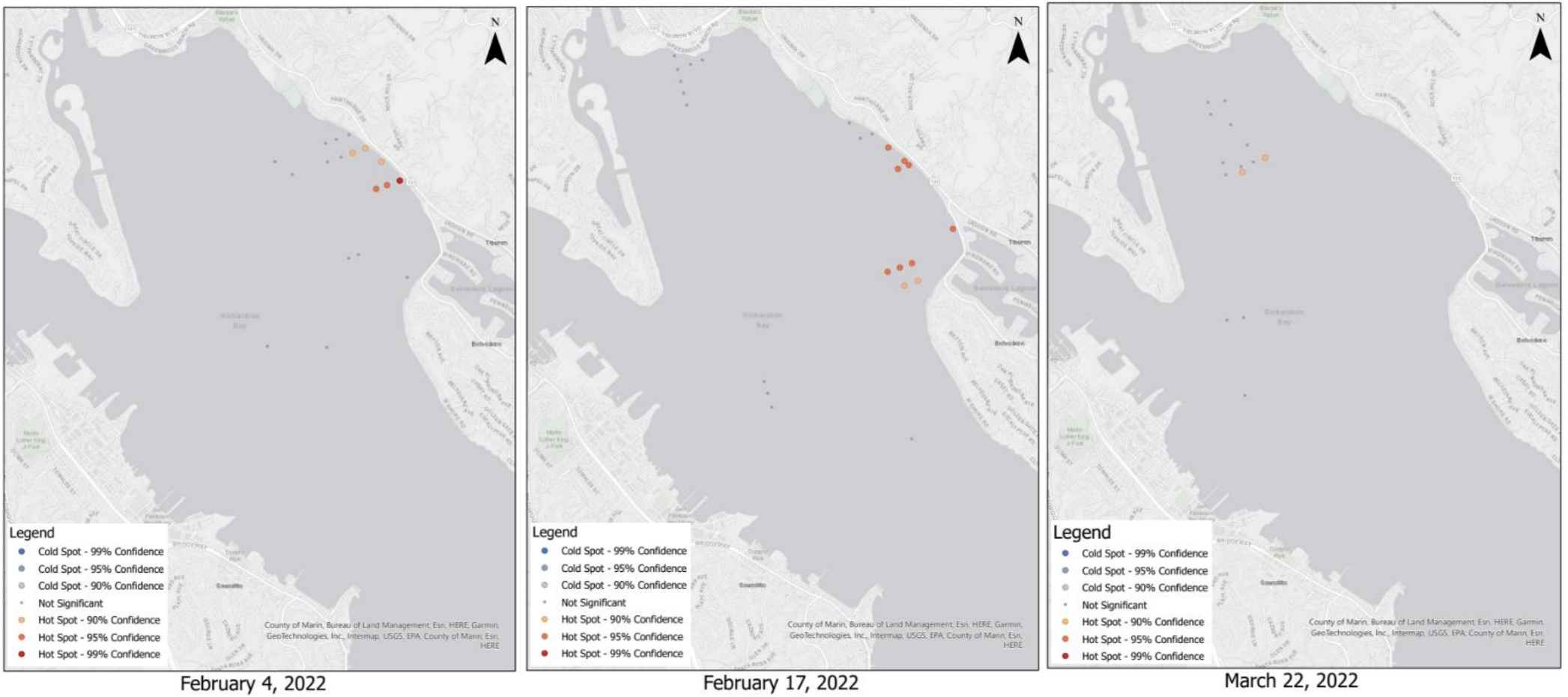

Figure 6b: Rafting waterbird heat maps of Richardson Bay across 2021-2022 survey period. Dots indicate the locations of rafting birds. Warmer colors indicate statistical hotspots with the largest number of birds. Cooler colors indicate statistical cool spots with the lowest number of birds.

Figure 7a: Rafting waterbirds in Richardson Bay across 2021-2022 survey period. Concentric circle sizes correspond to number of waterbirds counted within each whole or partial raft. Please note, each survey has unique upper and lower bounds.

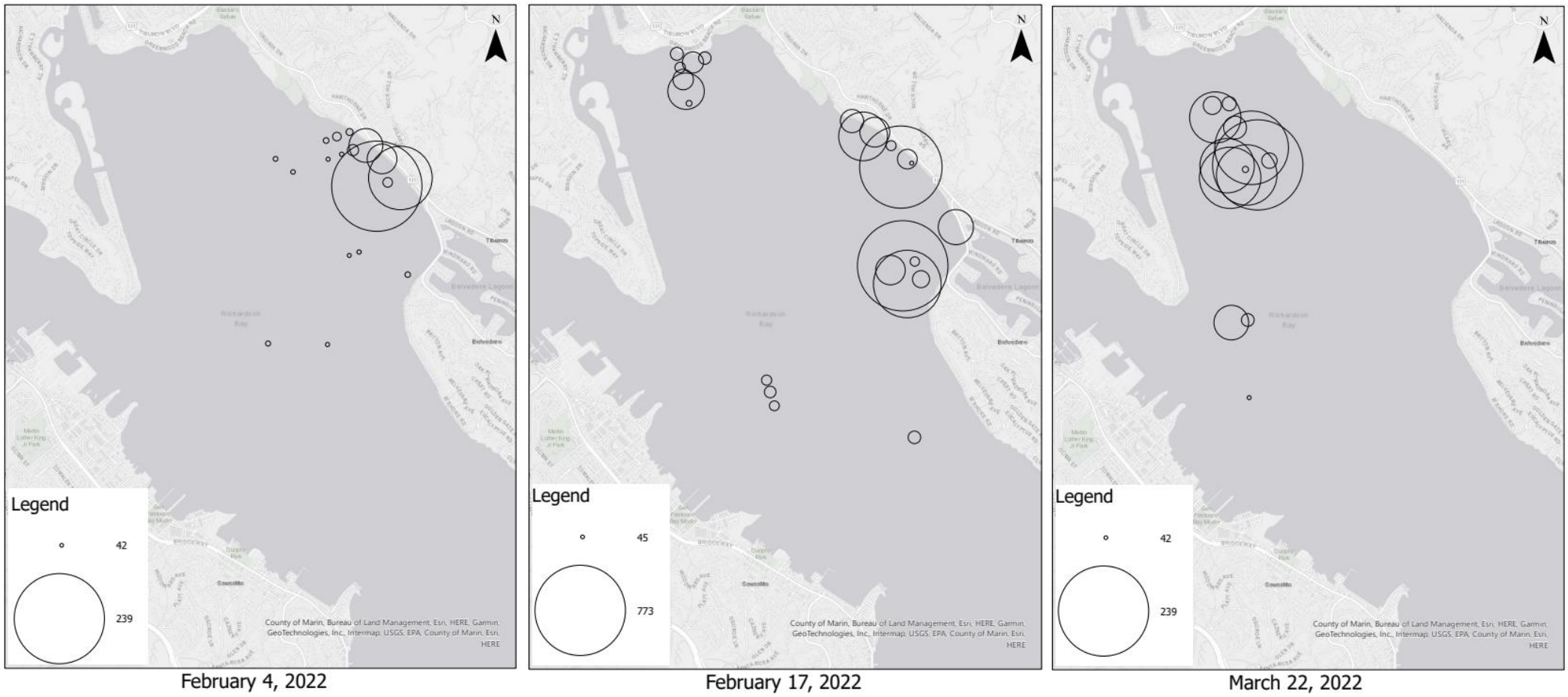

Figure 7b: Rafting waterbirds in Richardson Bay across 2021-2022 survey period. Concentric circle sizes correspond to number of waterbirds counted within each whole or partial raft. Please note, each survey has unique upper and lower bounds.

Figure 8: Rafting waterbird heat maps of Richardson Bay across 2020 study period. Dots indicate the locations of rafting waterbirds. Warmer colors indicate rafts with the largest number of birds where cooler colors indicate rafts with the lowest number of birds for that survey date.