1. Project Title: Montezuma National Wildlife Refuge Freshwater Impoundment Monitoring
    a. Integrated Waterbird Management and Monitoring
    b. PRIMR Survey ID: FF05RMNT00-025
    c. Time period that the survey was conducted: January 4 - May 28, 2024 and July 2 - December 2, 2024
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3. Date Prepared: June 5, 2025
4. Objective - Manage approximately 3,500 acres of Impounded Wetlands on Montezuma NWR to maintain the ecosystem over time (e.g., water control infrastructure), support migratory bird populations (e.g., migrating waterfowl and shorebirds, breeding waterbirds), and maintain native biological diversity and ecological integrity (e.g., reduce invasive species) from 2020 to 2035 with the following attributes (measurement units) and aspirational targets (values):
    a. Migrating Waterfowl:
        i. A minimum of 2,000 acres, consisting of shallow flooded wetlands, with 20-60% open water (2-18 inches depth) and 40-80% emergent/moist-soil vegetation dominated by native species with high waterfowl food value (e.g., millets/barnyard grass, sedges, beggarticks, spike rushes, rice cutgrass, panic grasses, smartweeds), with high water–vegetation interspersion, during spring (March-April) and fall (Sep-Nov), for migrating waterfowl
        ii. Maximize dabbling duck (guild) bird use days (BUD) during fall migration (Sep–Nov; unadjusted BUD ≥ 600,000; 5-year moving window average) and spring migration (Mar–April; unadjusted BUD ≥ 59,000; 5-year moving window average), with at least nine species of migrating dabbling duck (e.g., American Black Duck, Northern Pintail) present annually (calculated from impoundments surveyed using the IWMM Protocol [n = 20], approximately 3,770 to 5,385 acres, depending on visibility, and without taking into account detectability)
    b. Migrating Shorebirds:
        i. A minimum of 100 acres of shallow water (< 4 inch water depth) mudflats, with less than 15% vegetation cover and low interspersion of vegetation and non-vegetated areas during spring (April–May) and late summer-fall (July–Nov) migration
        ii. Maximize shorebird (guild) bird use days (BUD) during spring (April–May; unadjusted BUD ≥ 6,000; 5-year moving window average) and late summer-fall migration (July–Nov; unadjusted

BUD ≥ 15,000; 5-year moving window average), with at least 20 species of migrating shorebirds (e.g., Semipalmated Sandpiper and Greater and Lesser Yellowlegs) present annually (calculated from impoundments surveyed using the IWMM Protocol [n = 20], approximately 3,770 to 5,385 acres, depending on visibility, and without taking into account detectability).

5. Methods:
    a. Timing: Waterbird surveys should occur at least once per week throughout the survey period (typically beginning in late winter or early spring and lasting through full freeze-up, with the exception of during the summer breeding season).
    b. Field Method:
        i. Most units are surveyed by driving (or walking) around the perimeter and recording data along the way.
        ii. Scan the survey unit systematically, counting every individual waterbird. If there are too many individual waterbirds to accurately count, then surveyors should estimate as best they can by counting groups in tens, hundreds, thousands, or more.
    c. Data Entry: Enter data into the Avian Knowledge Network (AKN) Database.
    d. Data Analysis: Use tools in the AKN to calculate bird use days per unit.
6. Results: Counts were conducted weekly in targeted units for shorebirds and waterfowl through the migration seasons.
7. Important Findings: Results were used in 2024 to make water level management decisions in the moment. For example, if shorebird numbers declined in a unit, we either raised or lowered the water level or switched to lowering the water in a different unit, depending on the situation.
8. Problems Encountered: Normally survey results are analyzed in the winter to facilitate habitat management decisions for the following year. The 2024 data were not analyzed after the season due to staff shortages (no bio techs).