



Background

Water quality is one of 12 vital signs in Pacific Island national parks. This brief summarizes 2008–2023 results for chemical and physical characteristics of standing waters at AMME (American Memorial Park), Kaloko-Honokōhau National Historical Park (KAHO), Pu‘uhonua o Hōnaunau National Historic Park (PUHO), and Pu‘ukoholā Heiau National Historic Site (PUHE).

The objective of the Pacific Island Network’s water quality monitoring protocol is to characterize the quality of groundwater, anchialine pools, and wetland waters within park boundaries, and to compare changes in the parks over space and time. Resource briefs provide regular updates to park superintendents and natural resource managers. The data will be analyzed and formally published in peer-reviewed reports or journals; the briefing allows for a more rapid transmission of data observations.

Highlights

- KAHO groundwater: After appearing to level-off in 2016-2017, total dissolved nitrogen (TDN) varied somewhat, but maintained no long-term change. Nitrate + nitrite was less variable over this time period. Total dissolved phosphorus (TDP) increased. Salinity decreased toward the end of the study period.
- KAHO anchialine pools: Previously reported increases in nutrients appear that leveled off ~ 2013 did not increase substantially. This pattern was especially apparent in central pool TDP.
- PUHO anchialine pools: Nutrients continue to vary within a consistent range, which may reflect seasonal fluctuations in phytoplankton populations.
- ALKA: Pools displayed no patterns of concern.
- PUHE: The brackish water body displayed no patterns of concern, though varied greatly due to its variable nature as an impounded water body or inlet open to the sea.
- AMME: Previously reported decreasing salinity rebounded to levels observed in the past but remained variable.

Certified data from 2008 to 2023 are presented in graphs on pages 2–12 (Figures 1–11).

Management Applications

- Identify park waters in compliance with relevant water quality regulations.
- Document long-term trends in water quality parameters.
- Document effects of management actions on water quality.
- Provide warnings for management on deteriorating water conditions.

More Information

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Vital Signs: [Pacific Island Inventory & Monitoring Network](#)

Program reports, protocols, and data products: <https://irma.nps.gov/DataStore/Reference/Profile/2238112>



Standing Water Quality Update

Results

Water Quality at KAHO Groundwater Wells

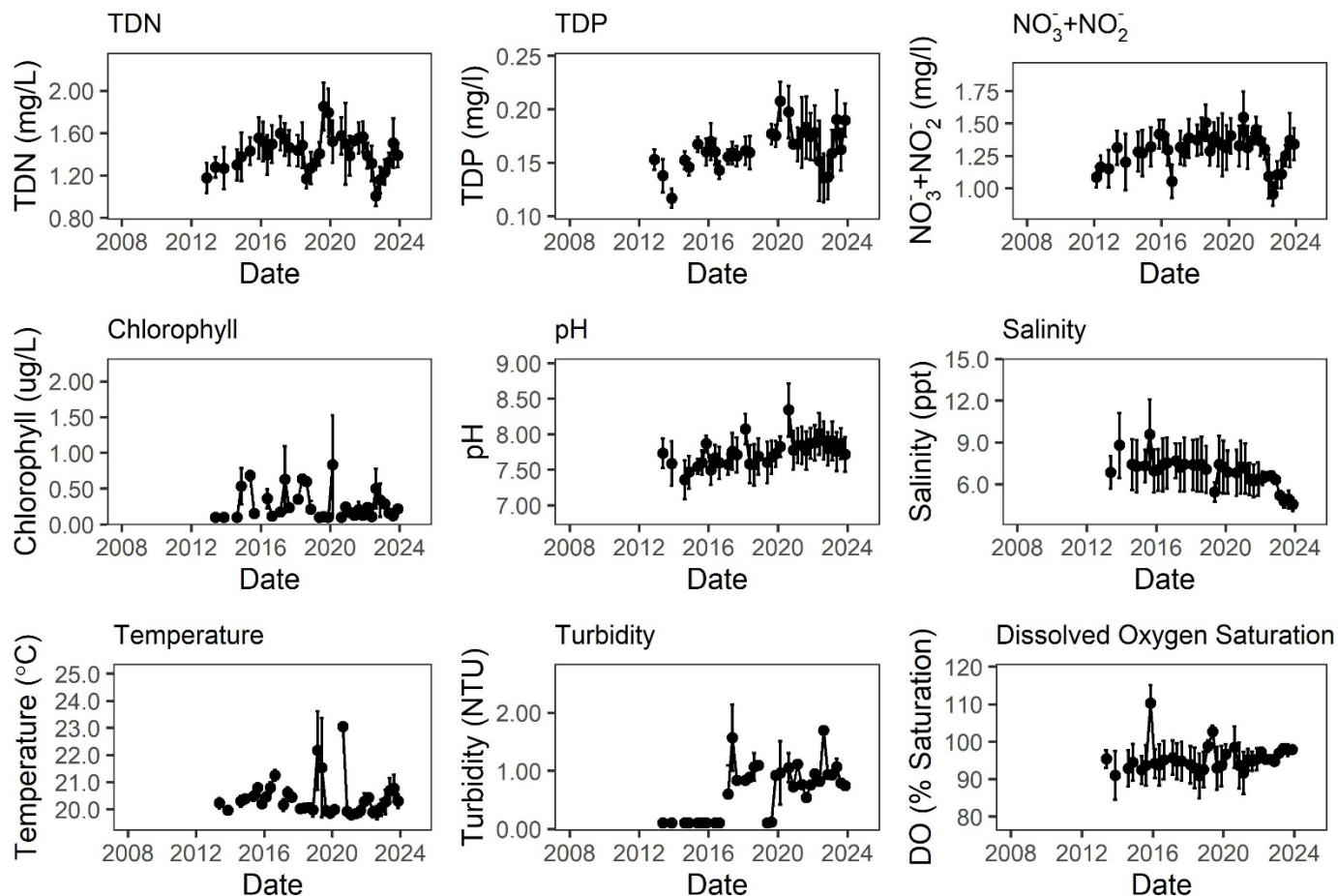


Figure 1. Water quality at Kaloko-Honokōhau National Historical Park (KAHO), 2008–2023. TDN is total dissolved nitrogen, TDP is total dissolved phosphorus, $\text{NO}_3^- + \text{NO}_2^-$ is nitrate and nitrite. Y-axis values are means of all sample sites. Error bars are ± 1 standard error.



Standing Water Quality Update

Water Quality at KAHO Central Anchialine Pools

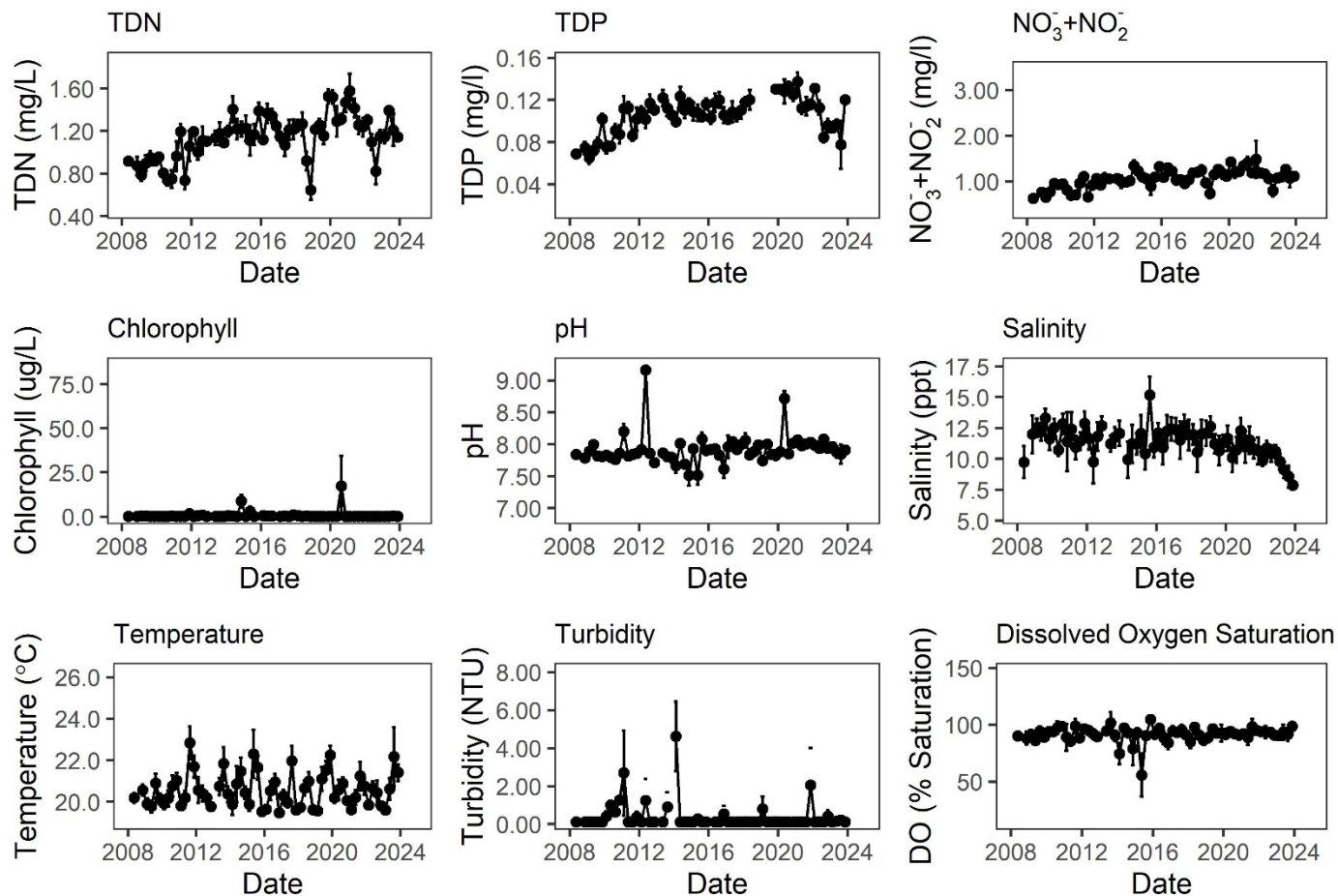


Figure 2. Water quality at Central Anchialine Pools, Kaloko-Honokōhau National Historical Park (KAHO), 2008–2023. TDN is total dissolved nitrogen, TDP is total dissolved phosphorus, NO₃ + NO₂ is nitrate and nitrite. Y-axis values are means of all sample sites. Error bars are ±1 standard error.



Standing Water Quality Update

Water Quality at KAHO Harbor North Anchialine Pools

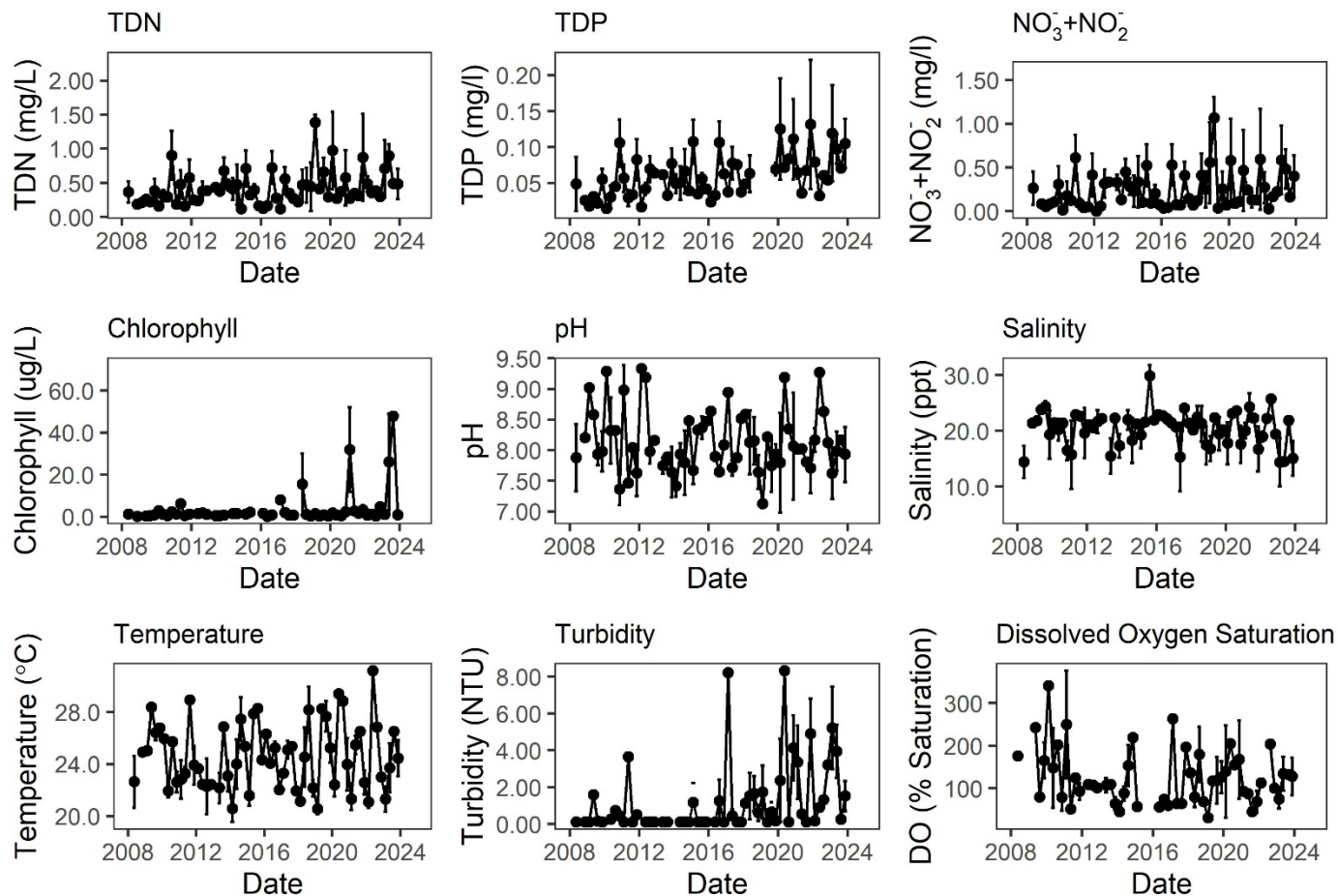


Figure 3. Water quality at Harbor North Anchialine Pools, Kaloko-Honokōhau National Historical Park (KAHO), 2008–2023. TDN is total dissolved nitrogen, TDP is total dissolved phosphorus, NO₃ + NO₂ is nitrate and nitrite. Y-axis values are means of all sample sites. Error bars are ±1 standard error.



Standing Water Quality Update

Water Quality at KAHO North Anchialine Pools

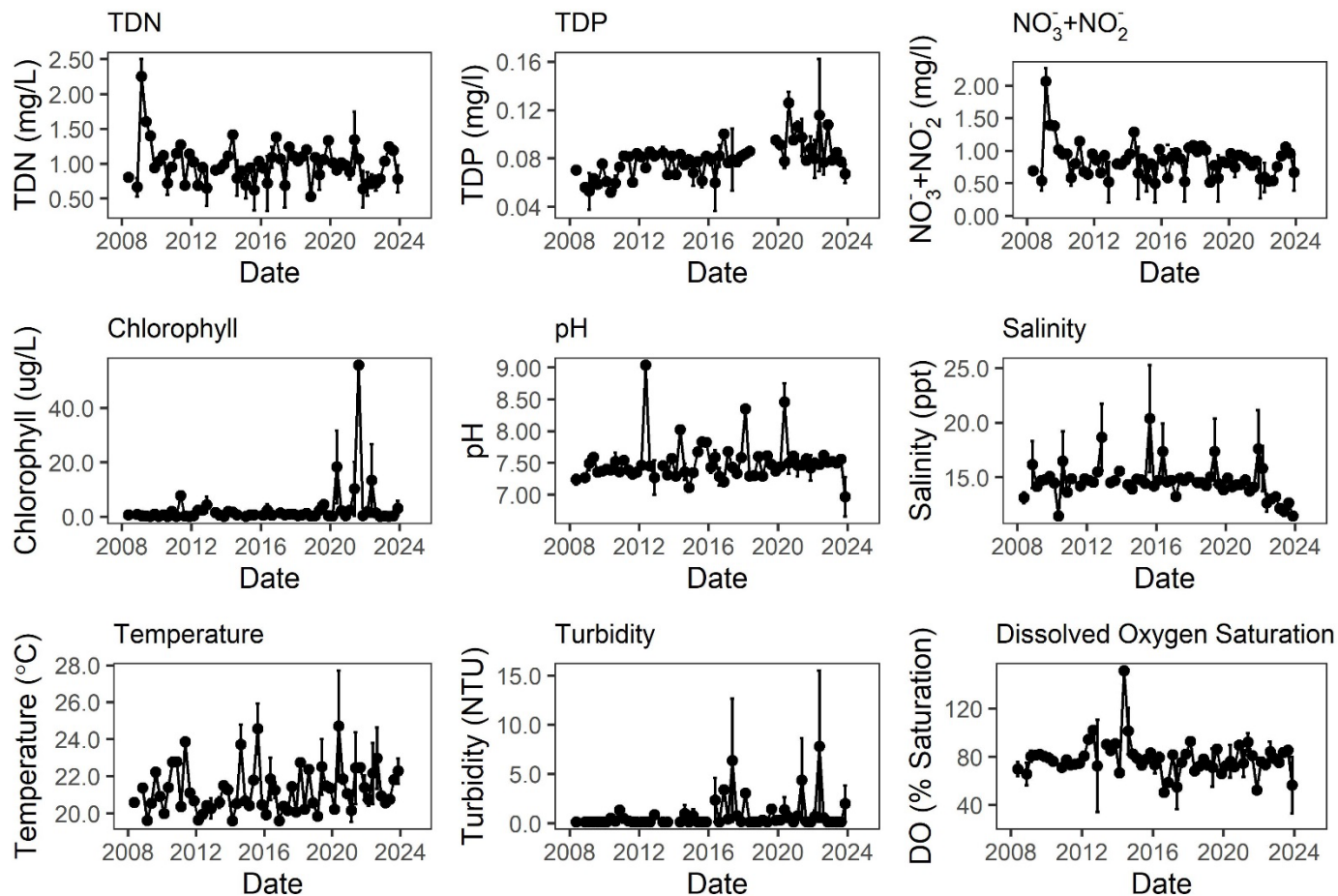


Figure 4. Water quality at North Anchialine Pools, Kaloko-Honokōhau National Historical Park (KAHO), 2008–2023. TDN is total dissolved nitrogen, TDP is total dissolved phosphorus, NO₃ + NO₂ is nitrate and nitrite. Y-axis values are means of all sample sites. Error bars are ±1 standard error.



Standing Water Quality Update

Water Quality at PUHO Royal Grounds Anchialine Pools

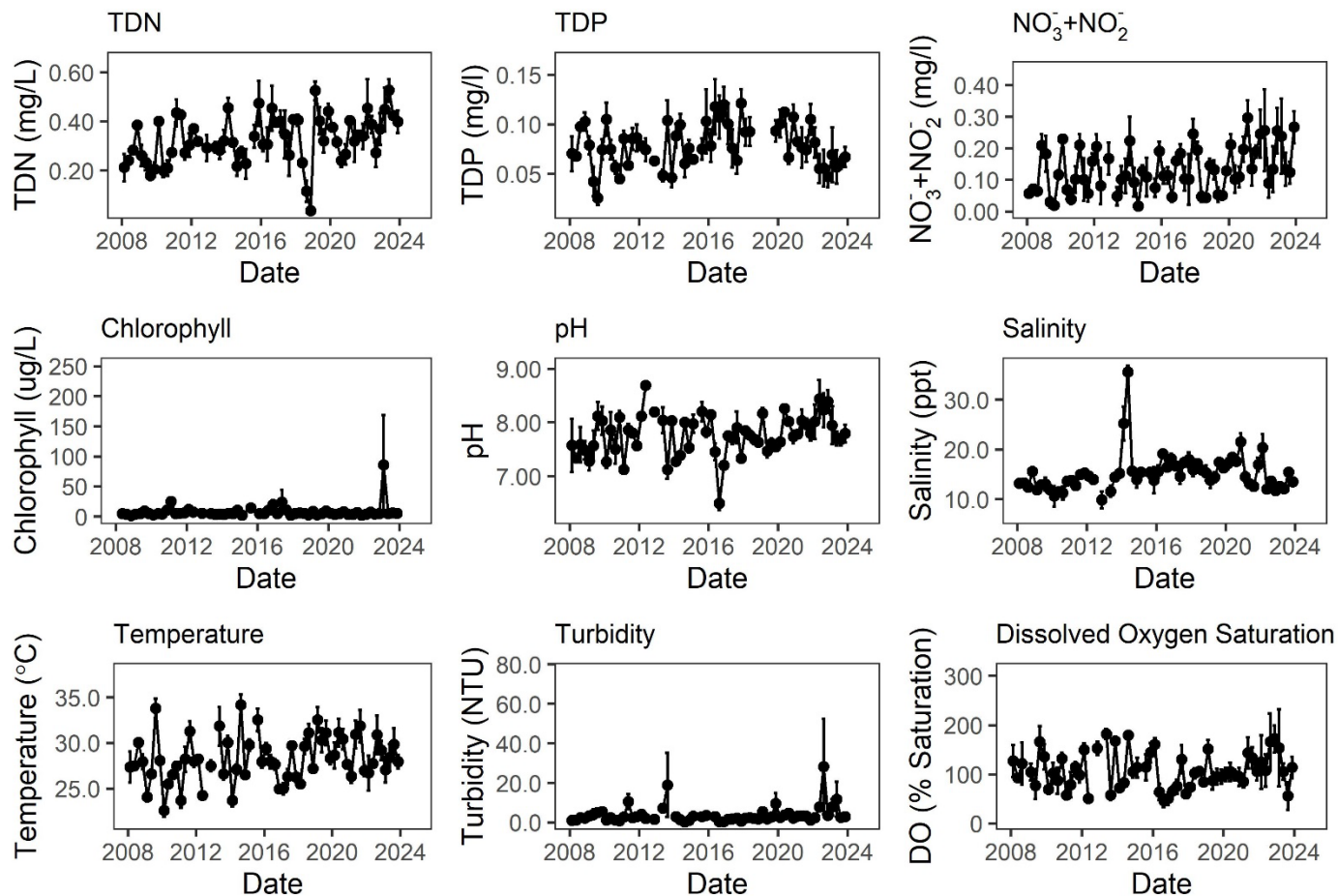


Figure 5. Water quality at Royal Grounds Anchialine Pools, Puʻuhonua o Hōnaunau National Historic Park (PUHO), 2008–2023. TDN is total dissolved nitrogen, TDP is total dissolved phosphorus, NO₃ + NO₂ is nitrate and nitrite. Y-axis values are means of all sample sites. Error bars are ±1 standard error.



Standing Water Quality Update

Water Quality at PUHO Keokea 003 Anchialine Pool

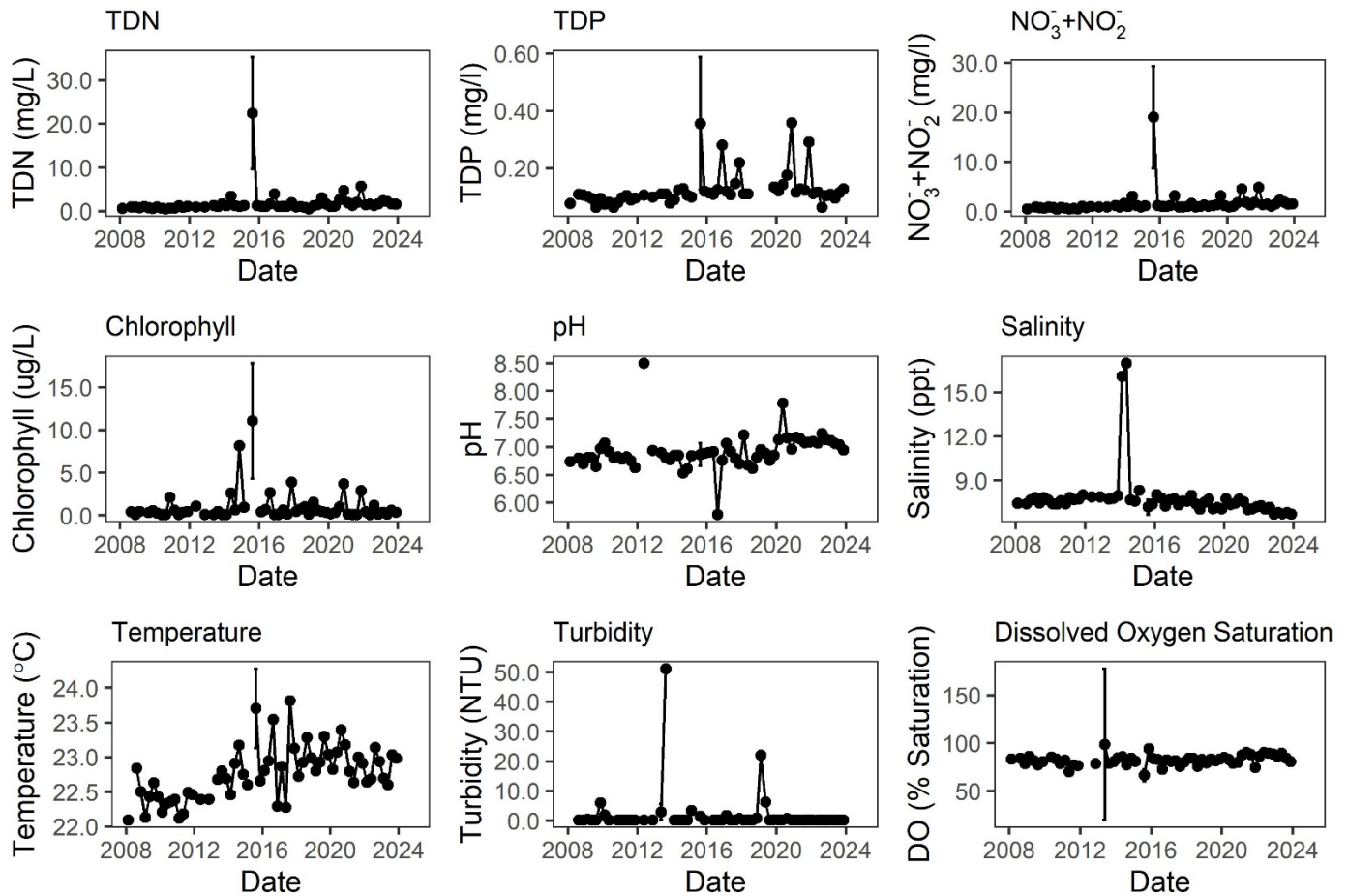


Figure 6. Water quality at Keokea Anchialine Pools, Puʻuhonua o Hōnaunau National Historic Park (PUHO), 2008–2023. TDN is total dissolved nitrogen, TDP is total dissolved phosphorus, NO₃ + NO₂ is nitrate and nitrite. Y-axis values are means of all sample sites. Error bars are ±1 standard error.



Standing Water Quality Update

Water Quality at ALKA Puuwaa 001 Anchialine Pool

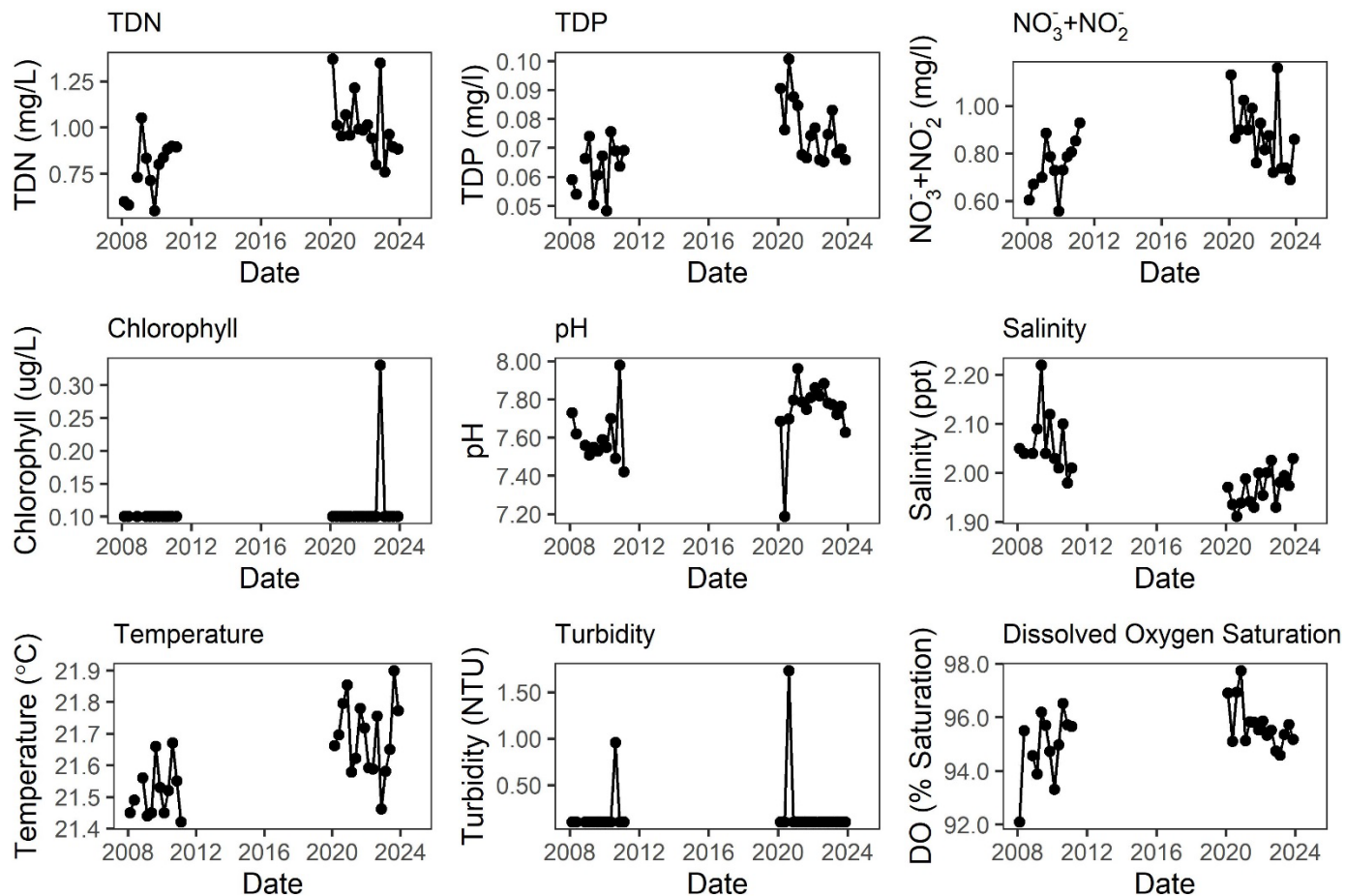


Figure 7. Water quality at Kiholo anchialine pools along the Ala Kahakai National Historical Trail (ALKA), 2008–2023. TDN is total dissolved nitrogen, TDP is total dissolved phosphorus, NO₃ + NO₂ is nitrate and nitrite. Y-axis values are means of all sample sites. Error bars are the standard error.



Standing Water Quality Update

Water Quality at ALKA Kaulan 001 Anchialine Pool

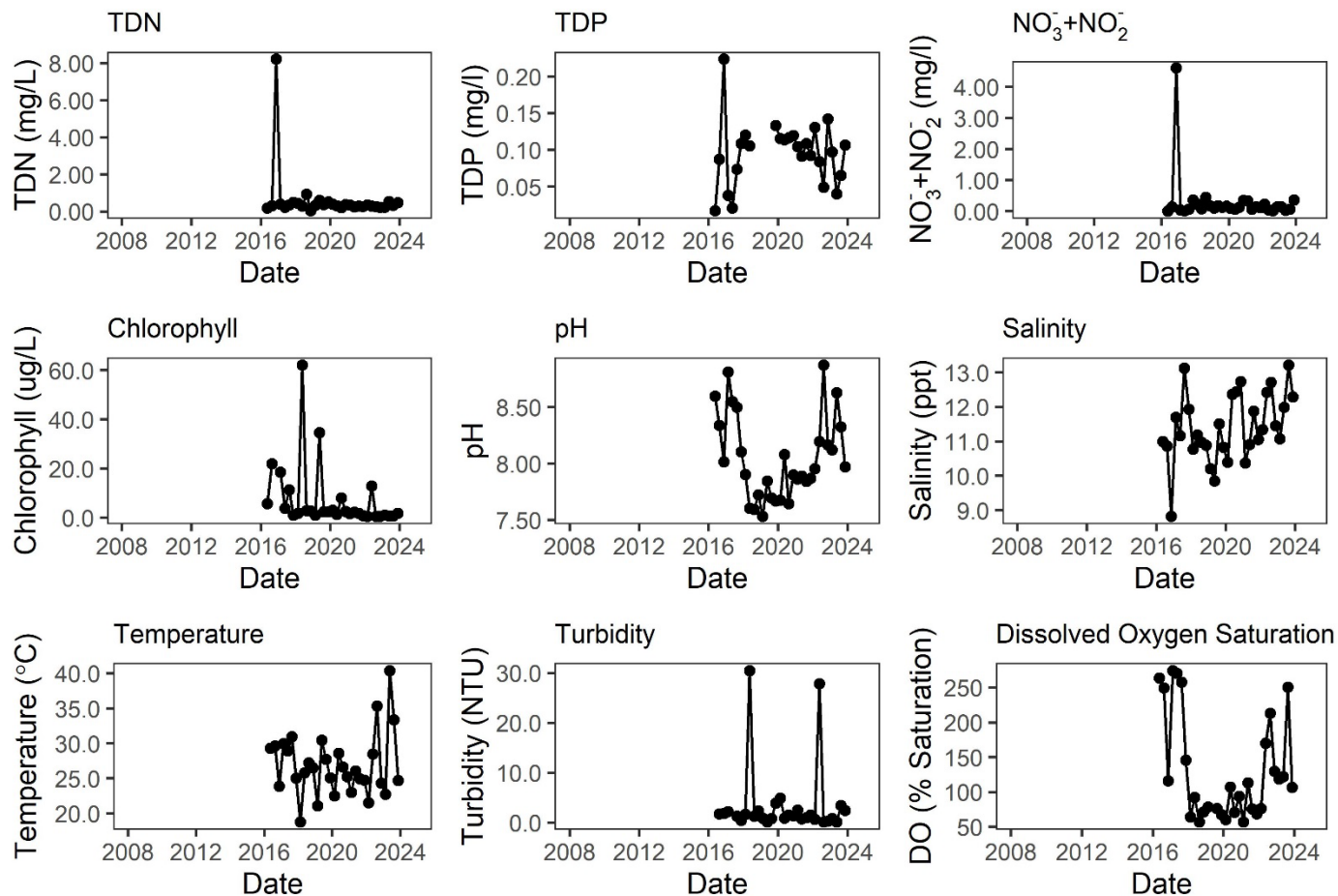


Figure 8. Water quality at Kekaha Kai State Park anchialine pools along the Ala Kahakai National Historical Trail (ALKA), 2008–2023. TDN is total dissolved nitrogen, TDP is total dissolved phosphorus, NO₃ + NO₂ is nitrate and nitrite. Y-axis values are means of all sample sites. Error bars are ±1 standard error.



Standing Water Quality Update

Water Quality at PUHE Brackish Gulch

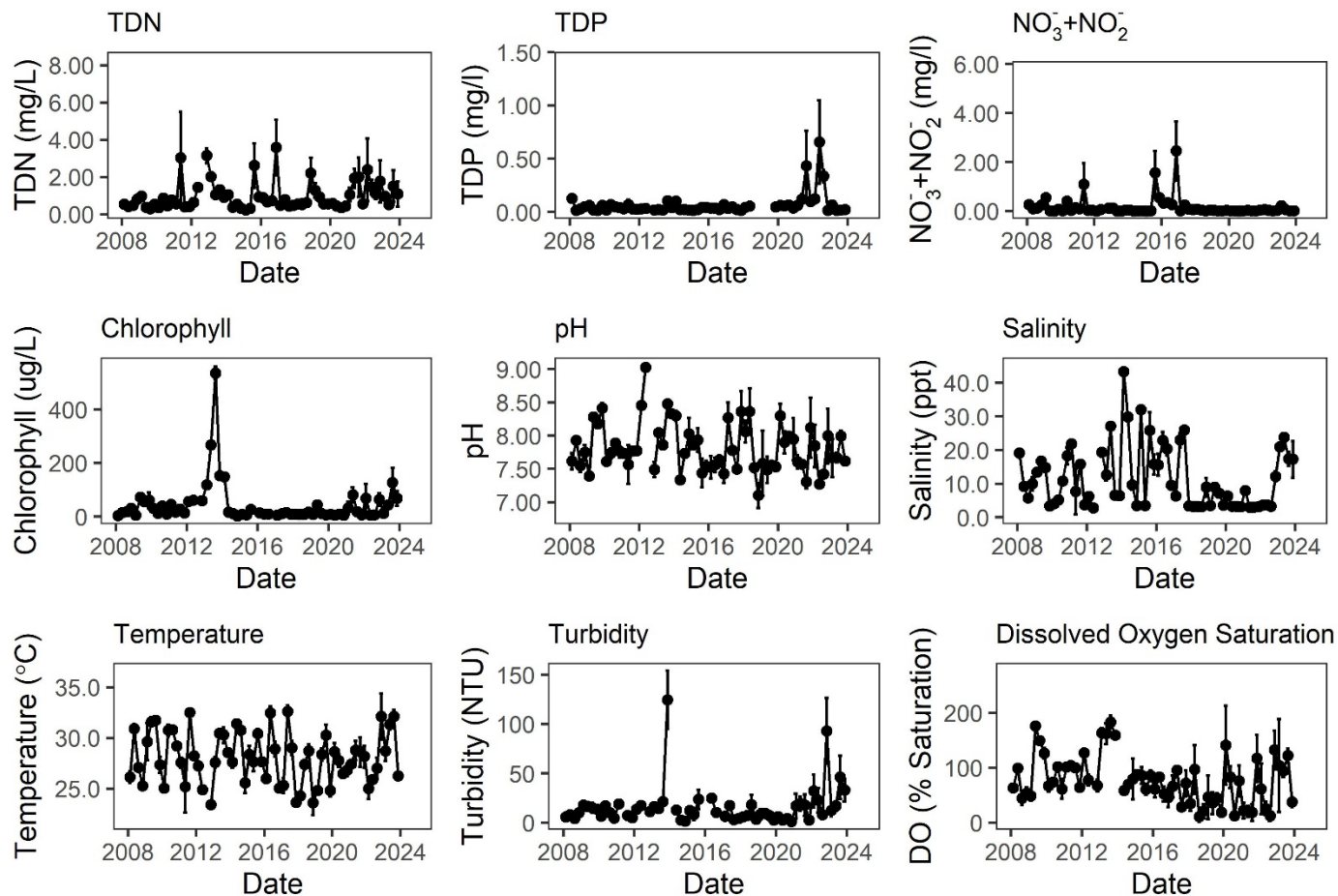


Figure 9. Water quality at brackish waters at Pu'ukoholā Heiau National Historic Site (PUHE), 2008–2023. TDN is total dissolved nitrogen, TDP is total dissolved phosphorus, NO₃ + NO₂ is nitrate and nitrite. Y-axis values are means of all sample sites. Error bars are ±1 standard error.



Standing Water Quality Update

Water Quality at AMME Mangrove Wetland

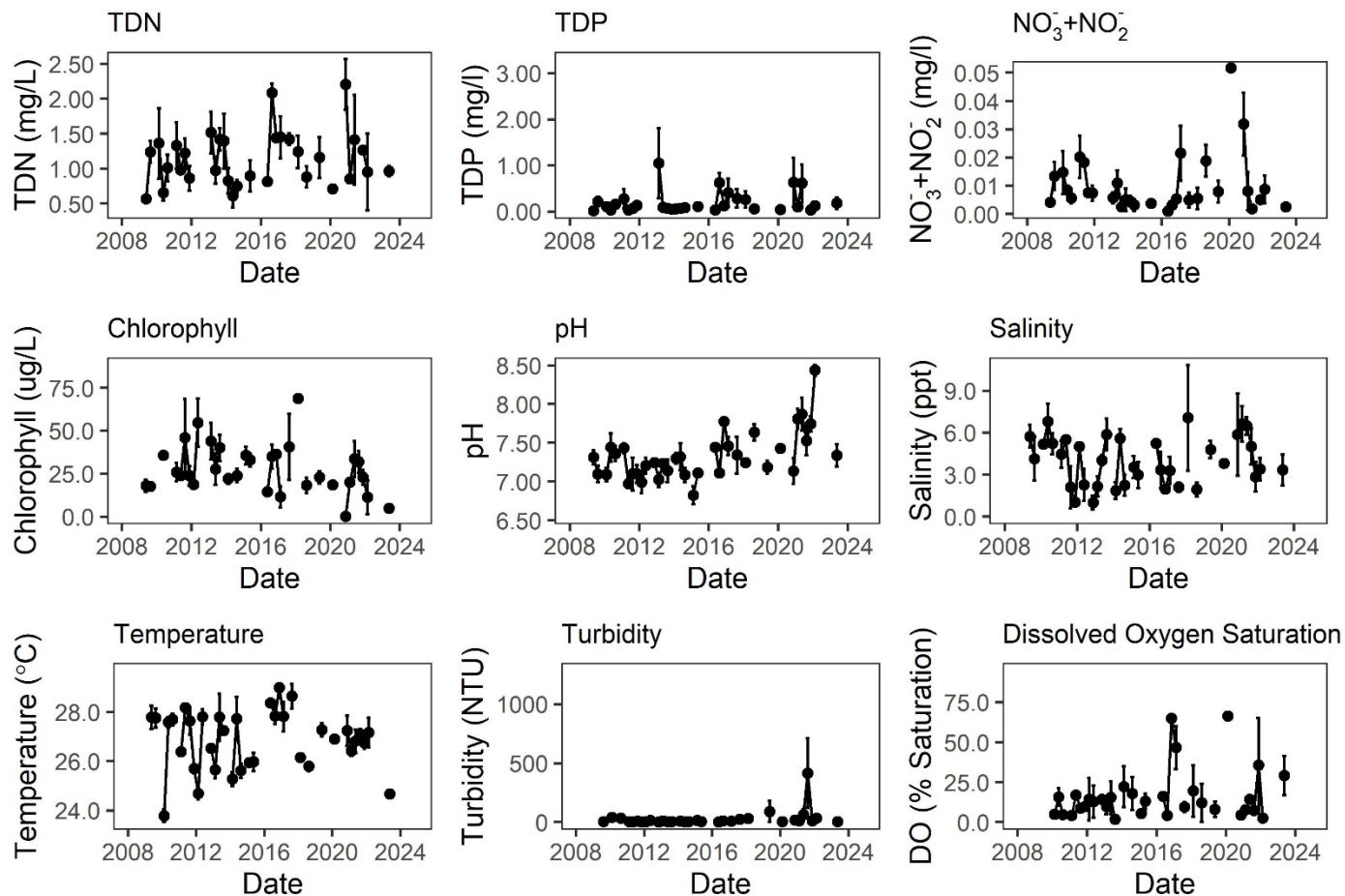


Figure 10. Water quality at mangroves, American Memorial Park (AMME), 2008–2023. TDN is total dissolved nitrogen, TDP is total dissolved phosphorus, NO₃ + NO₂ is nitrate and nitrite. Y-axis values are means of all sample sites. Error bars are ±1 standard error.



Standing Water Quality Update

Water Quality at AMME Artificial Wetland

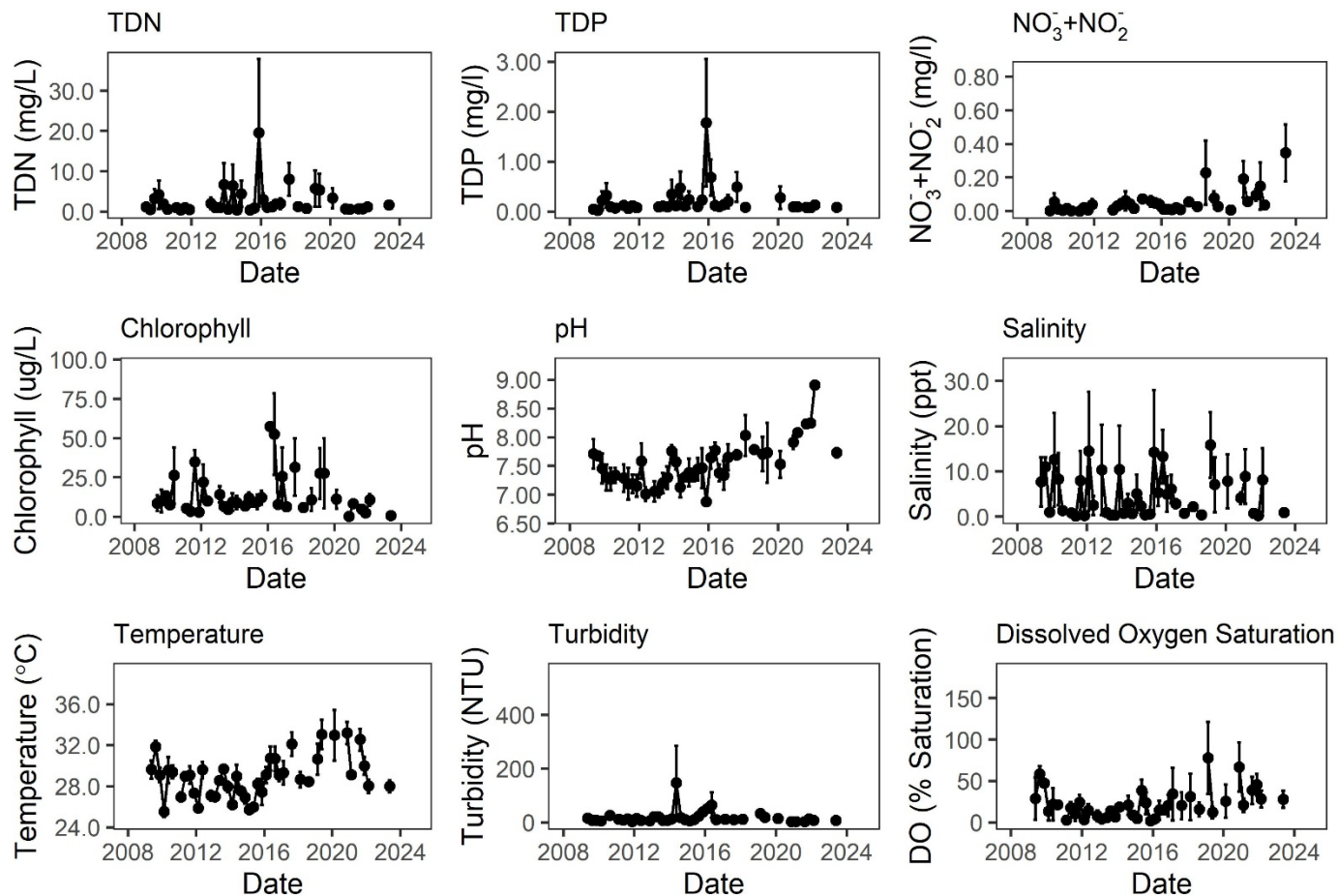


Figure 11. Water quality at artificial wetland, American Memorial Park (AMME), 2008–2023. TDN is total dissolved nitrogen, TDP is total dissolved phosphorus, NO₃ + NO₂ is nitrate and nitrite. Y-axis values are means of all sample sites. Error bars are ±1 standard error.