



Earth Sciences
New Zealand

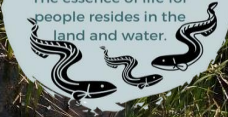


Ngaa Parenga Aroturuki Wai

Tahaaroa Lakes Catchment Monitoring Plan 2026-2031



Ko te whenua
ko te wai
ko te mauri o te tangata
The essence of life for
people resides in the
land and water.





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VERSION CONTROL TABLE

VERSION	DATE	AUTHOR	RATIONALE
1.0	February 2026	Ngahuia Herangi	Draft publication

KARAKIA

Tunaroa te tupua
Tunaroa te tawhito
Matua o ngā tuna rā
E kau nei
Whakarongo mai i te rētō wai
Whakaoko mai i te kōpua wai
E te tuna huna rā
E te tuna puta pō
Taku aho hara mai
Taku here nau mai
Whiria te hīnaki
Whiria te kupenga
Kia mau, kia ū
Ki tōku ringa nei
Ko te whenua
Ko te wai
Ko te mauri o te iwi
Haumi e, hui e, tāiki e!

Tunaroa the ancestor
Tunaroa the ancient one
Father of all eels
Swimming here
Listen from the deep water
Listen from the deep pool
Hiding during the day
Coming out at night
Here is my line
Here is my cord
Enter my trap
Enter my net
I will grab and hold you
In my hands
The land
The water
Carry the life of the people
It is done!

nāa Taituwaha King



MIHI WHAKATAU

Tahaaroa Lakes Catchment Monitoring Plan 2026-2031

Ngaa Parenga Aroturuki Wai sets out a hapuu-led freshwater monitoring plan for the Tahaaroa lakes catchment for the period 2026-2031. It translates mana whakahaere and kaitiakitanga into practical monitoring actions across four interconnected domains: Tuna, Kaiaua, Tupu Wai and Wai.

Building on baseline monitoring undertaken between 2023 and 2025, this Plan establishes:

- Core and seasonal monitoring indicators
- Quarterly water quality and sediment sampling
- Maramataka-informed seasonal surveys
- Defined trigger thresholds for adaptive response
- Annual reporting and a five-year formal review

Monitoring integrates maatauranga Maaori and scientific methods. Wai monitoring includes temperature, dissolved oxygen, pH, conductivity, turbidity, water clarity and sediment grab sampling at fixed sites. Species monitoring tracks abundance, size structure, recruitment and habitat condition to assess the sustainability of mahinga kai.

Adaptive management is embedded through a continuous cycle of assessment, reflection and response. Where ecological change is detected, the Tahaaroa Lakes Trust (The Trust) may increase monitoring frequency, commission specialist advice, prioritise restoration initiatives or adjust methods.

By 2031, the Plan seeks to demonstrate:

- Protection and improvement of the mauri of ngaa roto o Tahaaroa
- Stable or increasing taonga species populations
- Continued customary harvest confidence
- Embedded hapuu-led monitoring capability
- Ongoing hapuu governance of freshwater data

This Plan affirms that monitoring is not an external compliance exercise, but an enduring expression of Ngaati Mahuta ki te Hauaauru (Ngaati Mahuta) responsibility to whenua, wai and uri whakaheke.

KARAKIA	iii
MIHI WHAKATAU	iv
1. HE TIROHANGA WHAANUI	2
2. TE TAKERE O TE ROTO	2
2.1. NGAATI MAHUTA KI TE HAUAUURU TRIBAL BOUNDARIES	3
3. TE KOOPUU O TE ROTO	4
4. TE PUNA ORANGA O TE ROTO	1
4.1. TE TAHA O TE ROTO	2
5. HE ANGA AROTURUKI WAI MAAORI	3
5.1. NGAA POU	4
5.2. NGAA HAU O TE HAUAUURU	4
5.3. OPERATIONALISING HE ANGA AROTURUKI WAI MAAORI	5
6. TE RERE O TE WAI	5
6.1. NGAA WAAHANGA AROTURUKI	6
6.2. MARAMATAKA	11
6.3. REPORTING, REVIEW AND ADAPTIVE MANAGEMENT	12
7. RESOURCING AND CAPABILITY	14
7.1. FINANCIAL RESOURCING	14
7.2. EQUIPMENT AND INFRASTRUCTURE	14
7.3. CAPABILITY DEVELOPMENT	15
7.4. PARTNERSHIPS	15
7.5. FUTURE DIRECTION	15
REFERENCES	16
APPENDIX A: Tuna Baseline 2025	18
APPENDIX B: Kaiaua Baseline 2024	19
APPENDIX C: Tupu Wai Baseline 2024	20
APPENDIX D: Wai Baseline	21
APPENDIX E: Photographic Record	22

1. HE TIROHANGA WHAANUI

Nga Parenga Aroturuki Wai is the hapuu-led monitoring framework developed by The Trust for Ngaati Mahuta. It guides freshwater stewardship across the Tahaaroa lakes catchment from 2026 to 2031.

This Plan builds upon baseline monitoring undertaken between 2023 and 2025 and documented in Nga taonga tuku iho o nga roto o Tahaaroa (2025). Where that report establishes ecological and cultural findings, this Plan sets out how monitoring will be sustained, interpreted and governed going forward.

The Plan:

- Embeds He Anga Aroturuki Wai Maaori as the guiding cultural framework
- Aligns monitoring with maramataka aa-hapuu
- Establishes a five-year adaptive monitoring cycle
- Prioritises taonga species and mahinga kai

2. TE TAKERE O TE ROTO

Nga Parenga Aroturuki Wai translates to mean, Tahaaroa Lakes Catchment Assessment Plan (Plan). This is a Ngaati Mahuta-led approach to assessing freshwater and lake health, encapsulating the aspirations of Ngaati Mahuta, to safeguard hauanga kai and the practice of mana whakahaere and kaitiakitanga in freshwater (and marine) ecosystems. The development of the Plan focussed on Lake Tahaaroa as a pilot, with the intention to implement and adapt for Lakes Numiti and Rotoroa or wider including streams and rivers within the catchment in future years.

The Tahaaroa lakes catchment is situated on the west coast of the North Island in the rohe of Ngaati Mahuta ki te Hauaaaru, indicative boundaries extend from Kaawhia to the southern region of Marokopa and out to sea, to Kaarewa/Gannet Island (Figure 2-1). Tahaaroa comprises of a unique cluster of shallow, coastal dune lakes – which have sustained the whenua and wai and nourished the people for many years. In fact, Tahaaroa is a shortened name.

The full name of Tahaaroa is Te Tahaaroa aa Ruapuutahanga, referring to the long calabash carried by the renowned Taranaki ancestress, Ruapuutahanga. The name acknowledges the puuraakau of Ruapuutahanga and her husband, Whatihua, our esteemed ancestor. According to this narrative, Ruapuutahanga journeyed back to Taranaki through Kaawhia and Tahaaroa to escape Whatihua's pursuit. Along her return, she marked out significant landmarks, including a spring where she stopped to refill her calabash. In an unexpected mishap, her calabash broke at this place, giving rise to the name Te Tahaaroa a Ruapuutahanga — 'the long calabash of Ruapuutahanga' (Te Ruunanga o Ngaati Mahuta, 2025).

An extension of Ruapuutahanga's story is woven into the origins of the Tahaaroa lakes system, which is said to have formed when her calabash cracked during her journey home to Taranaki. Nga roto o Tahaaroa are vital to the survival and identity of Ngaati Mahuta ki te Hauaaaru (Ngaati Mahuta). These lakes sustain our cultural connection and provide essential resources for our people — wairua, waioara, and kaioara. Ngaati Mahuta remains the kaitiaki of six treasured lakes: Te roto o Tahaaroa, Te roto o Numiti, Te roto o Rotoroa, Te roto o Piopio, Te roto o Rototapu and Te roto o Harihari (Te Ruunanga o Ngaati Mahuta, 2025) (Figure 2-1, Figure 3-1). The map below situates Tahaaroa within the wider rohe of Ngaati Mahuta ki te Hauaaaru, affirming the mandate under which this Plan is exercised.



Photo 1: Appendix A.

2.1. NGAATI MAHUTA KI TE HAUAUURU TRIBAL BOUNDARIES



Figure 2-1: This map depicts Ngaati Mahuta ki te Hauaauru tribal boundaries and includes sites that are of cultural and historical significance. Recognising also shared interests and mana with neighbouring iwi, reflecting mutual historical association and whakapapa relationships (Te Ruunanga o Ngaati Mahuta ki te Hauaauru, 2025). [Map: Ruby Mckenzie Sheat, NIWA]

3. TE KOOPUU O TE ROTO

Te koopuu o te roto symbolises the nurturing basin of the Tahaaroa lakes. This section describes the geographical extent of the area — in particular, the Maaori land blocks with streams, rivers, wetlands that feed the Tahaaroa lake system within the catchment boundaries (Figure 3-1). Whenua and wai Maaori are intrinsically connected – inside, outside, above and below. This metaphor reminds us that the whole area is like a womb that holds and sustains the living land and waters. By understanding how these elements interact as a whole, we uphold and give effect to our values of mana whakahaere and kaitiakitanga. The next section explains the vision and purpose of The Plan.

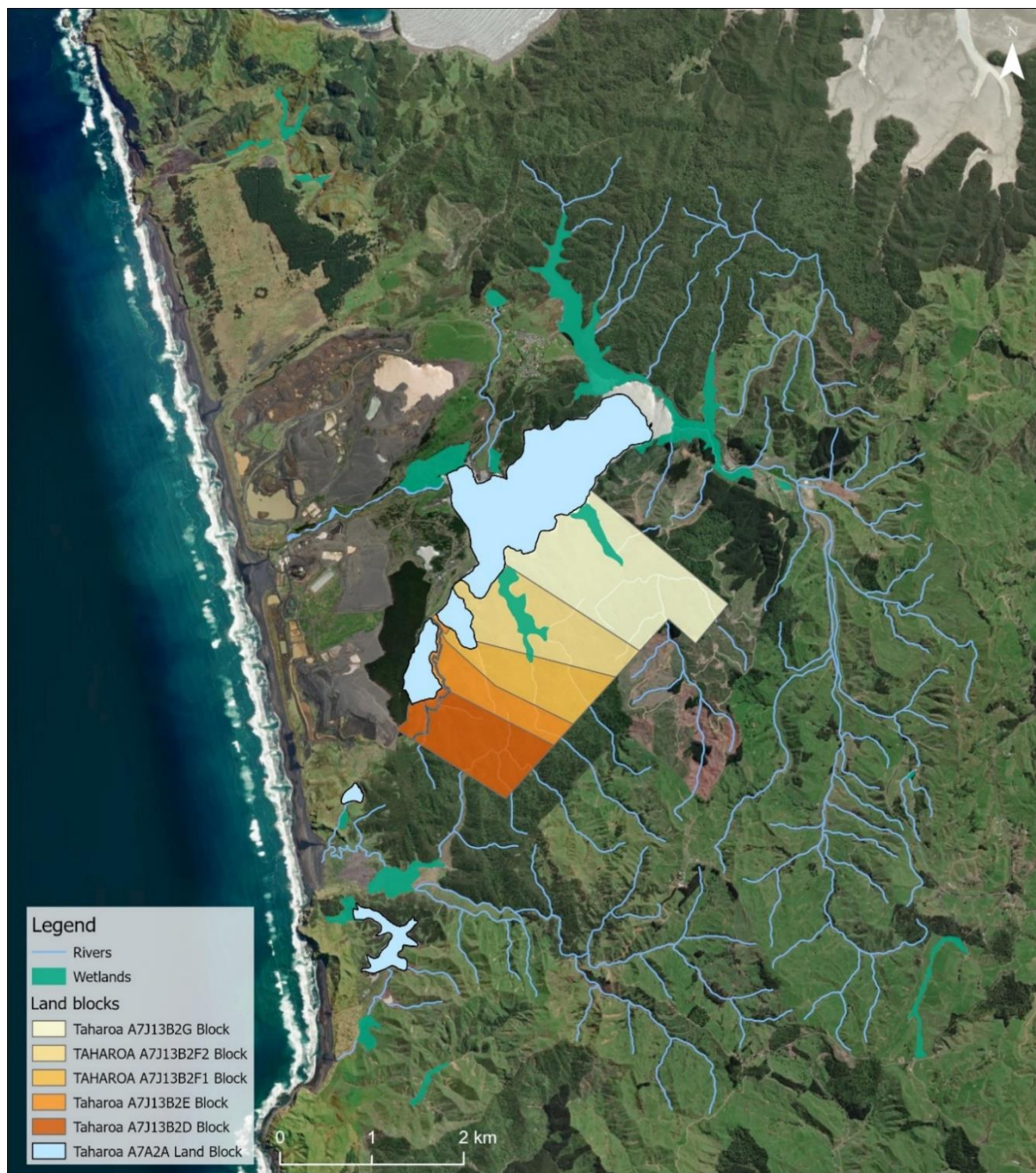


Figure 3-1: Map of catchment depicting Maaori land blocks including streams, rivers and wetlands that feed into the Tahaaroa lakes system. [Map: Ruby Mckenzie Sheat, NIWA]

4. TE PUNA ORANGA O TE ROTO

Te puna oranga o te roto symbolises the source of wellbeing for the lakes, the life force that sustains the mauri of the entire catchment. From this source flows not only the physical waters but also the mauri, responsibilities and aspirations of the Tahaaroa Lakes Trust (The Trust) and Ngaati Mahuta. The connection is expressed through a shared vision, captured in the following vision statement:

“E rere ana ngaa wai o ngaa roto o Tahaaroa hei oranga moo ngaa roto, te whenua, te taiao, te tangata, aa, me ngaa uri whakaheke o Ngaati Mahuta ki te Hauaauru.”

The waters of Tahaaroa lakes flow to sustain the lake, the land, the environment, the people, and future generations of Ngaati Mahuta ki te Hauaauru.

This vision guides all monitoring, interpretation and decision-making under Ngaa Parenga Aroturuki Wai. By 2031, the following outcomes will be demonstrated:

- The mauri of the Tahaaroa lakes is safeguarded and shows evidence of improvement through ecological and cultural indicators
- Tuna, kaiaua and tupu wai populations are stable or increasing, with trends tracked and reported annually
- No decline in CPUE across three consecutive monitoring cycles
- Presence of multiple size classes in each annual summary
- Confirmed Juvenile recruitment in kaiaua at least once every two years
- Whaanau are able to safely and confidently undertake hauanga kai within the catchment.
- Monitoring is embedded as an annual hapuu practice, supported by trained kaitiaki and intergenerational participation
- Freshwater data and cultural knowledge are governed, stored and accessed under hapuu-determined data sovereignty principles
- No sustained decline in water clarity relative to 2023-2025 baseline
- Dissolved oxygen levels remain within ecologically supportive ranges across seasonal profiles
- No increasing trend in sediment plume frequency over consecutive years
- No sustained upward trend in total nitrogen or total phosphorus relative to baseline

These outcomes reflect both ecological health and cultural wellbeing, recognising that the mauri of the lakes and the oranga of our people are inseparable.

For us as kaitiaki, understanding the condition of our whenua and wai is not optional, it is an inherited responsibility. The baseline work undertaken in recent years provides a foundation, but this Plan sets out how that responsibility will continue to be exercised through sustained, hapuu-led monitoring and adaptive management. This commitment is reflected in the hands-on monitoring undertaken by whaanau and kaitiaki, as shown in Figure 4, where tuna surveys are carried out within the lake margins of Tahaaroa.

The experience of The Trust's trustees has highlighted an ongoing gap between the aspirations of Ngaati Mahuta and the way freshwater monitoring and management are prioritised externally. Ngaa Parenga Aroturuki Wai addresses this gap by ensuring that assessment, interpretation and decision-making are grounded in hapuu values, tikanga and lived experience.

Monitoring under this Plan draws on both scientific methods and maatauranga Maaori. While scientific data provides important ecological insight, it is our whakapapa, stories and enduring relationship with the roto that define their true wellbeing. He Anga Aroturuki Wai Maaori ensures that our lakes are assessed through our own lens, not solely through externally determined metrics.



Photo 2: Appendix A.

4.1. TE TAHA O TE ROTO

Ko te taha o te roto symbolises the lake's edge, where wai meets whenua and relationships are strengthened. From 2026 onward, the focus remains on strengthening hapuu capability to assess and respond to the condition of our freshwater taonga, particularly tuna and kaiaua populations within Lake Tahaaroa and the wider catchment. Monitoring weaves together maatauranga Maaori and scientific approaches, ensuring that knowledge generation is both culturally grounded and ecologically robust.

The original objectives continue to guide this work:

1. To engage and excite whaanau to reconnect with our freshwater taonga.
2. To build the capacity and capability of Ngaati Mahuta to participate in the ongoing assessment of our freshwater taonga.
3. To develop and apply an assessment framework for our freshwater taonga in accordance with Ngaati Mahuta values.

Together, these objectives ensure that monitoring is not only about data collection, but about strengthening relationships, knowledge and intergenerational responsibility. They underpin this Plan through active whaanau engagement, sustained hapuu capability, and the continued application of a Ngaati Mahuta assessment framework grounded in our values

5. HE ANGA AROTURUKI WAI MAAORI

The Ngaati Mahuta assessment framework referenced in the previous section is expressed through He Anga Aroturuki Wai Maaori.

He Anga Aroturuki Wai Maaori draws from Mahuta Ake Te Rautaki, developed by Te Ruunanga o Ngaati Mahuta ki te Hauaaauru. In particular, the concept of Ngaa hau o te hauaaauru has been adapted to shape a place-based cultural assessment framework for the Tahaaroa lakes catchment.

This framework reflects the identity, values and aspirations of Ngaati Mahuta and provides the cultural lens through which freshwater monitoring and decision-making are interpreted.

The framework functions as a whare, a living repository that houses the Lakes Trust's maahere rautaki, huri taiaawhio (EMP), puuraakau, koorero tuku iho, waiata, karakia, maramataka and digital tools such as Tuuhono, Rongo App and the monitoring dashboard.

He Anga Aroturuki Wai Maaori sits above and guides Ngaa Parenga Aroturuki Wai, ensuring alignment between cultural values, freshwater monitoring and governance decisions (Figure 5-1).

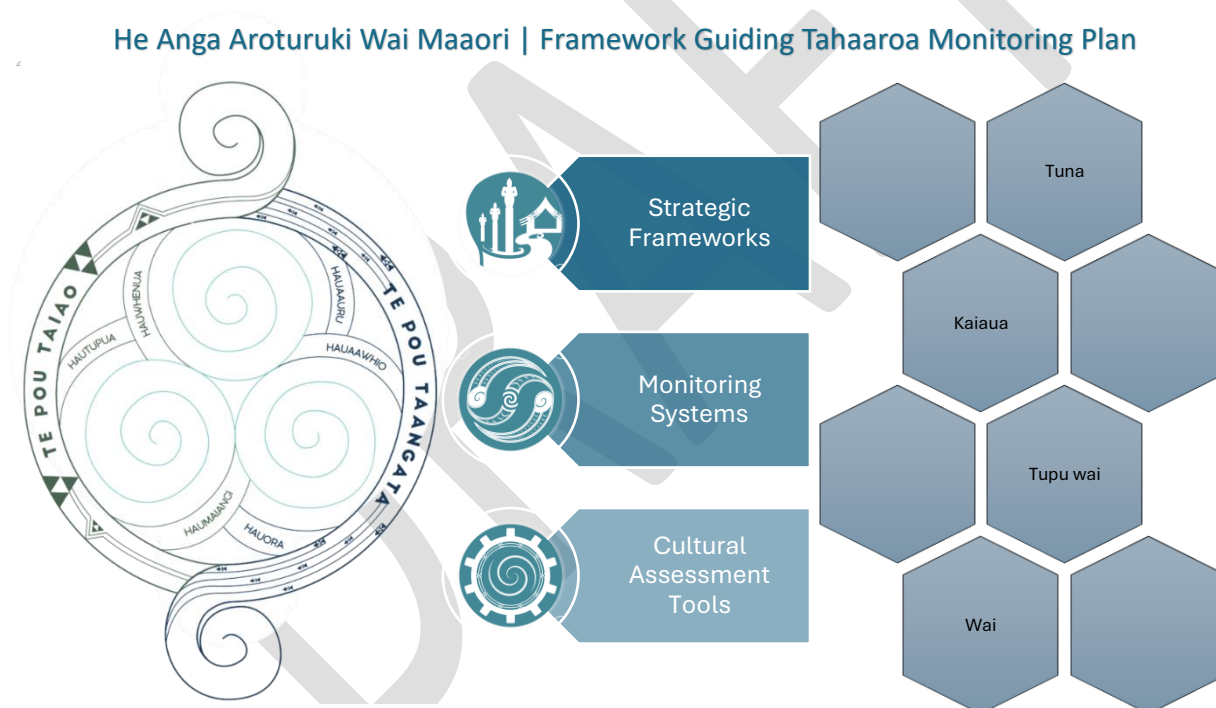


Figure 5-1: Illustrates how He Anga Aroturuki Wai governs the Tahaaroa monitoring plan. The three pou provide structural foundations, the six hau shape interpretation and adaptation, and the strategic, digital and cultural monitoring instruments operationalise this framework across the catchment.

The framework illustrated above weaves together core cultural concepts underpinning our approach to assessing freshwater taonga. He Anga Aroturuki Wai Maaori is embedded within a wider cultural foundation grounded in three pou: Taiao, Taangata and Taawhirimaatea.

Together, these pou provide the structural and philosophical foundations of our monitoring approach, ensuring that both environmental and cultural dimensions are upheld in a way that reflects Ngaati Mahuta ki te Hauaaauru values and responsibilities (Figure 5-2).

5.1. NGAA POU

5.2.1. He Pou Taiao – Focuses on the interconnectedness of whenua, wai and ecosystems. It ensures our assessments remain attuned to the mauri of the natural world and the integrity of taiao relationships. Through this pou, monitoring protects ecological balance and safeguards the life-supporting systems of the lakes catchment.

5.2.2. He Pou Taangata – Affirms the role of our people as holders of maatauranga and kaitiaki of the whenua. It reminds us that monitoring must serve and be led by whaanau, hapuu and iwi, upholding identity, intergenerational wellbeing and whanaungatanga.

5.2.3. He Pou Taawhirimaatea – Represents balance, change and resilience. It reflects our ability to adapt to environmental disruption, climate variability and evolving knowledge systems. This pou ensures flexibility in our monitoring methods while remaining grounded in kaupapa Maaori.

5.2. NGAA HAU O TE HAUAURU

While the three pou form the structural foundation of He Anga Aroturuki Wai Maaori, Ngaa Hau o te Hauaauru provide the guiding currents that move through and influence the framework.

Adapted from Mahuta Ake Te Rautaki, these six hau express key drivers that shape how monitoring is applied, interpreted and evolved over time.

Each hau represents a dimension of responsibility and aspiration:

5.2.1. Te Hauwhenua – Strength and protection of life, reminding us to safeguard both natural and human systems that sustain the lakes.

5.2.2. Te Haumaangi – Innovation and adaptability, encouraging responsiveness to change and the integration of new knowledge.

5.2.3. Te Hautupua – Ancestral wisdom, ensuring our decisions remain grounded in whakapapa and koorero tuku iho.

5.2.4. Te Hauaawhio – Collective leadership and unity, strengthening intergenerational capability and cohesion.

5.2.5. Te Hauora – Health and wellbeing, recognising that environmental and human wellbeing are inseparable.

5.2.6. Te Hauaauru – Identity and direction, grounding our work in who we are as Ngaati Mahuta ki te Hauaauru. By connecting these pou and hau, He Anga Aroturuki Wai Maaori becomes more than a monitoring framework. It is a living expression of mana whakahaere, guiding how we assess, interpret and respond to the condition of ngaa taonga o ngaa roto o Tahaaroa. This expression is evident in practice, as shown in Photo 3, where whaanau work collectively to process tuna during monitoring activities at Lake Tahaaroa

5.3. OPERATIONALISING HE ANGA AROTURUKI WAI MAAORI

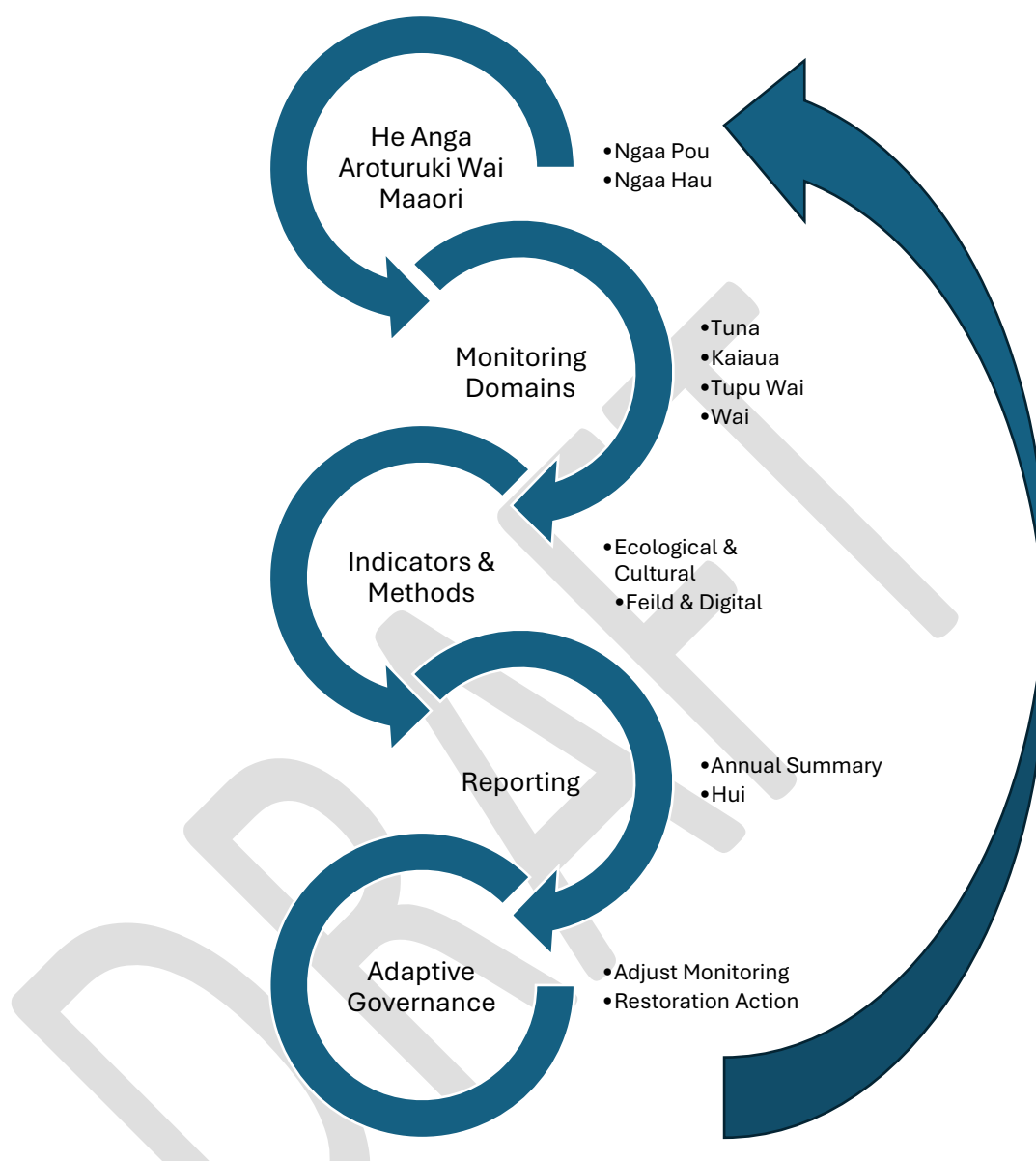


Figure 5-2: Adaptive monitoring cycle illustrating the continuous process of assessment, reflection, response, and renewal that underpins Ngā Parenga Aroturuki Wai.

6. TE RERE O TE WAI

Te rere o te wai sets out how monitoring will be carried out in the field and how results will inform decision-making.

- Mana whakahaere – Ngaati Mahuta-led direction and decision-making
- Kaitiakitanga – active protection of wai Maaori and mahinga kai
- Kotahitanga – collective responsibility and shared stewardship
- Mauri – recognition of the interconnected spiritual and ecological dimensions of the lakes

Under Te Rere o te Wai, the monitoring domains, methods, reporting cycles and adaptive review processes are brought together as a coordinated and sustained programme of action.

6.1. NGAA WAAHANGA AROTURUKI

Monitoring is organised across four interrelated domains: Tuna, Kaiaua, Tupu Wai and Wai. Each domain integrates scientific measures and maatauranga Maaori indicators, recognising that ecological condition and cultural function are inseparable. Together, they provide a coordinated and adaptive programme for assessing, responding to and upholding the mauri of the Tahaaroa lakes.

Within each monitoring domain, indicators are classified as core or seasonal. Core indicators are assessed at each scheduled monitoring cycle. Seasonal indicators are assessed during defined ecological periods or when triggered by observed change.



Photo 3: Appendix A.

1. Tuna

Purpose

To monitor the abundance, condition, habitat of tuna within the Tahaaroa lakes catchment, ensuring the species continues to sustain mahinga kai, uphold tikanga, and reflect the mauri of the wai. Tuna are both a taonga species and a key ecological indicator.

What We Monitor

Core Indicators

The following are assessed at each monitored cycle.

- Presence and distribution at traditional sites
- Catch per unit effort trends
- Size class distribution
- Visible condition and parasite load
- Confidence in safe harvest

These indicators provide a practical and repeatable measure of tuna population health and harvest sustainability.

Seasonal Indicators

When resourcing allows or when triggering by observed change, monitoring may also include:

- Prey availability
- Reproductive assessment
- Tissue contaminant analysis
- Migration tracking

These are useful but not required every quarter.

How We Monitor

Monitoring will draw on:

- Fyke-net surveys at culturally significant sites
- Visual condition assessment
- Cultural Health Index scoring
- Rongo App observations
- Whaanau participation and reflection

Scientific and maatauranga approaches are applied together to ensure ecological integrity and cultural meaning are both upheld.

Frequency

Monitoring will occur quarterly, aligned where possible with maramataka aa-hapuu and seasonal tuna movement.

2. Kaiaua

Purpose

To monitor the presence, abundance and condition of kaiaua within the Tahaaroa lakes catchment, recognising their role as both taonga species and an indicator of lakebed and water quality health.

What We Monitor

Core Indicators

The following indicators are assessed at each monitoring cycle:

- Presence at established monitoring sites
- Relative abundance
- Shell condition (erosion and integrity)
- Evidence of juvenile recruitment

These indicators provide a practical measure of population stability and habitat condition.

Seasonal Indicators

Where resourcing allows or when triggered by observed change, monitoring may also include:

- Detailed transect density assessment
- Host fish assessment
- Reproductive condition analysis
- Sediment composition testing

How We Monitor

Monitoring will draw on:

- Timed kaiaua searches at culturally significant sites
- Transect surveys across depth gradients
- Shell condition grading
- Cultural Health Index scoring
- Rongo App observations

Monitoring integrates ecological assessment with cultural interpretation.

Frequency

Monitoring will occur quarterly, aligned where possible with maramataka aa-hapuu and seasonal conditions.



Photo 4: Appendix A.

3. Tupu Wai

Purpose

To monitor the composition, extent and condition of tupu wai (aquatic vegetation) within the Tahaaroa lakes catchment, recognising their role in supporting tuna habitat, stabilising lakebed environments and reflecting the mauri of the wai. Tupu wai monitoring acknowledges both the ecological importance of macrophytes and the cultural relationships that exist with lake-edge and lakebed environments.

What We Monitor

Core Indicators

The following indicators are assessed at each monitoring cycle:

- Dominance of native versus invasive species
- Extent of macrophyte cover at fixed sites
- Depth distribution of key species
- Suitability of habitat for tuna

These indicators provide a practical measure of vegetation health and ecological balance.

Seasonal Indicators

Where resourcing allows or when triggered by observed change, monitoring may also include:

- LakeSPI assessments
- Sediment nutrient sampling
- Expanded species inventory
- Mapping of invasive spread

How We Monitor

Monitoring will draw on:

- Shoreline transects using the Lakeside Monitoring Toolkit
- Percentage cover estimates at defined intervals
- Hoe grab sampling where appropriate
- LakeSPI methodology where appropriate
- Rongo App photographic and narrative records

Ecological assessment is integrated with cultural understanding of habitat and mauri.

Frequency

Monitoring will occur seasonally aligned where possible with maramataka aa-hapuu, observing natural growth cycles in plant growth, invasive spread and habitat change.

4. Wai

Purpose

To monitor the physical and chemical condition of wai within the Tahaaroa lakes catchment, ensuring water quality supports taonga species, safe customary harvest and the overall mauri of the lakes. Monitoring acknowledges that clarity, purity and balance are not only measurable parameters, but lived indicators of wellbeing for whenua, taonga species and people.

What We Monitor

Core Indicators

The following indicators are assessed at each monitoring cycle:

- Water clarity
- Temperature
- Dissolved oxygen
- pH

- Conductivity
- Turbidity
- Visible sediment inputs or discolouration

These indicators provide a practical measure of ecological suitability and seasonal variability.

Seasonal Indicators

Where resourcing allows or when triggered by observed change, monitoring may also include:

- Surface temperature trend tacking
- Lake level observation
- Nutrient laboratory analysis
- Continuous data loggers
- Algal species testing
- Chlorophyll-a
- Sediment source tracing methods (e.g., compound specific stable isotope analysis)

How We Monitor

Monitoring will draw on:

- Field measurements using water quality meters
- Clarity tubes or Secchi depth measures
- Sediment grab samples at fixed GPS sites
- Visual catchment assessments
- Rongo App observations and photographic records
- Integration of regional datasets where appropriate

Monitoring combines scientific measurements and maatauranga observations to ensure water quality assessment reflects both ecological function and lived experience.

Frequency

Quarterly monitoring will be undertaken to capture seasonal variation and respond to storm events or unusual ecological signals. Additional sampling may occur following significant rainfall or observed water quality changes. Where routine sediment monitoring indicates increasing pressure, The Trust may commission specialist source-tracing investigations to identify contributing land uses or erosion pathways (Figure 6-1).

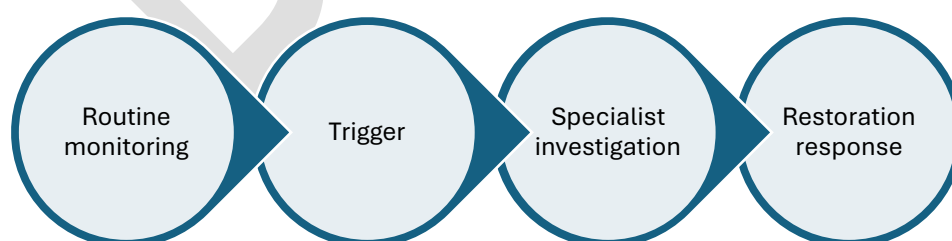


Figure 6-1: This diagram illustrates the progression from routine hapuu-led monitoring through trigger identification, specialist investigation where required, and implementation of restoration responses. It reflects the adaptive management approach, where ongoing assessment informs targeted action to uphold the mauri of ngaa roto o Tahaaroa.



Photo 5: Appendix A.

6.2. MARAMATAKA

Monitoring under Te Rere o te Wai is aligned, where appropriate, with maramataka aa-hapuu to ensure that assessment occurs in rhythm with ecological cycles rather than external reporting calendars alone.

Maramataka provides guidance on tuna movement, plant growth, spawning behaviour and seasonal variability, strengthening both cultural integrity and ecological accuracy (Figure 6-2)Figure 6-2.

Monitoring will:

- Align tuna surveys with heke and peak movement periods
- Observe tupu wai growth and dieback cycles seasonally
- Capture water quality variation across warmer and cooler phases
- Incorporate waananga reflection at key annual points such as Matariki

6.2.1. Monitoring Schedule

Season	Maramataka focus	Monitoring Activities	Purpose
Matariki	Reflection	Annual review hui	Adaptive planning
Spring	Growth phases	Tupu wai transects	Assess vegetation composition
Late Summer	Tangaroa phases	Tuna and kaiaua surveys	Assess abundance and condition
Quarterly	Variable	Water quality sampling	Track seasonal variability

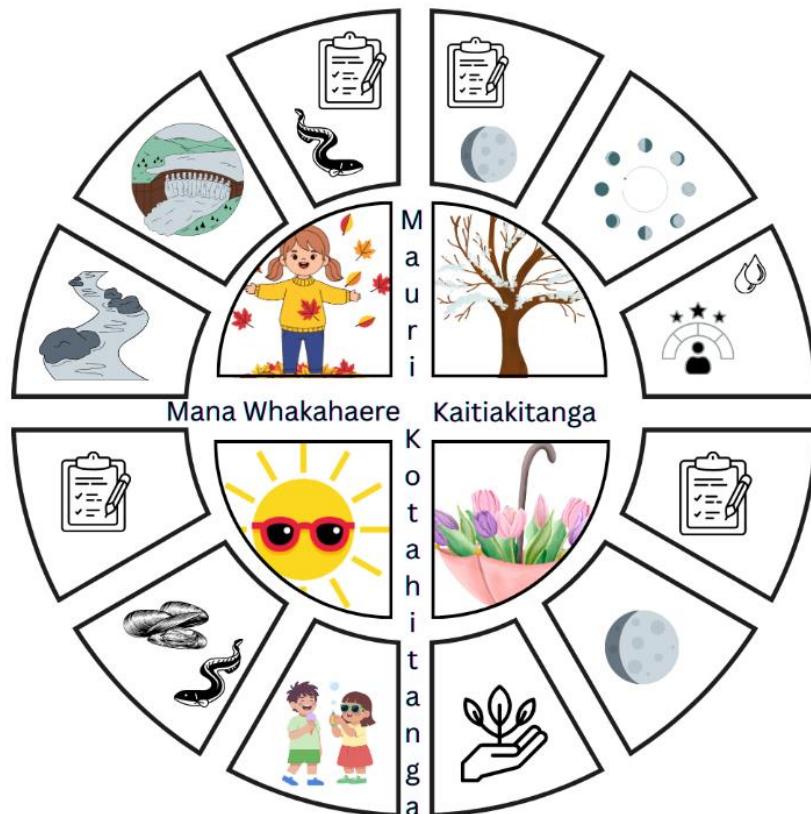


Figure 6-2: Conceptual illustration of the annual monitoring cycle aligned with seasonal and maramataka patterns. The circular structure reflects the continuous flow of assessment, observation, and renewal across the Tahaaroa lakes catchment, culminating in annual reflection and adaptive planning.

6.3. REPORTING, REVIEW AND ADAPTIVE MANAGEMENT

Ngaa Parenga Aroturuki Wai is intended to be a living and responsive monitoring framework. While this Plan covers the period 2026–2031, its purpose extends beyond a fixed timeframe. It exists to uphold the mauri of ngaa taonga o ngaa roto o Tahaaroa and to strengthen the capacity of The Trust and hapuu to exercise mana whakahaere into the future. This section outlines how monitoring findings are interpreted, reported and used to inform adaptive management decisions.

6.3.1. Annual Monitoring Summary

All monitoring data collected under the Plan remains under hapuu governance. No external publication or data sharing will occur without The Trust’s approval. Request from agencies or research partners will be considered by formal Trust resolution.

The annual summary will:

- Collate results across all monitoring domains
- Identify trends and areas of improvement or concern
- Integrate ecological data and cultural observations

- Highlight emerging pressures within the catchment
- Provide recommendations for the following year's monitoring focus

Findings will be presented at an annual hui, aligned where appropriate with the Matariki period, to support collective reflection and forward planning.

6.3.2. Thresholds and Triggers for Action

Where monitoring identifies significant change or concern, The Trust may initiate additional action. Refer to Appendices A-D for baseline data. Triggers may include:

- CPUE decline of >20% relative to 2025 baseline across two monitoring cycles
- Evidence of reduced kaiaua recruitment
- Increasing invasive macrophyte or hornwort dominance
- Sustained reduction in Secchi depth of ≥ 0.5 m relative to 2023-2025 median
- Loss of culturally recognised tohu
- Reduced confidence in customary harvest

Where triggers are identified, The Trust may:

- Increase monitoring frequency
- Commission specialist assessment
- Prioritise restoration initiatives
- Engage with relevant agencies where appropriate

6.3.3. Adaptive Decision-Making

Adaptive management is guided by He Pou Taawhirimaatea, recognising the need for resilience and responsiveness.

The Trust may:

- Adjust monitoring sites or frequency
- Refine indicators and methods
- Incorporate new knowledge or technologies
- Reprioritise restoration or management focus

6.3.4. Five-Year Review

The five-year review ensures that Ngaa Parenga Aroturuki Wai remains a living and responsive framework from 2026 to 2031.

The review will:

- Assess progress toward the 2031 Strategic Outcomes
- Evaluate effectiveness of monitoring methods
- Review alignment with He Anga Aroturuki Wai Maaori
- Incorporate new ecological, cultural or technical knowledge
- Determine priorities for the subsequent planning period



Photo 6: Appendix A.

7. RESOURCING AND CAPABILITY

Effective implementation of Ngaa Parenga Aroturuki Wai requires sustained resourcing, capability development and strategic partnerships. Monitoring under this Plan is designed to be practical and scalable, while maintaining cultural integrity and scientific robustness. Resourcing will be aligned to the four monitoring domains and the adaptive management cycle outlined in Section 6.

7.1. FINANCIAL RESOURCING

The Trust will seek to secure and maintain funding through grant applications, strategic partnerships and collaborative initiatives where there is alignment with The Trust's priorities.

Implementation of the Plan requires funding to support:

- Field monitoring activities across all domains
- Equipment purchase, maintenance and replacement
- Specialist ecological and laboratory assessments where required
- Data management systems and digital platforms
- Waananga and annual review hui
- Reporting and dashboard development

7.2. EQUIPMENT AND INFRASTRUCTURE

Equipment requirements correspond directly to the four monitoring domains outlined in Section 6, including fyke nets, water quality meters, turbidity meters and sediment sampling equipment. This ensures safety, reliability and continuity of monitoring.



Photo 7: Appendix A.

7.3. CAPABILITY DEVELOPMENT

A central objective of this Plan is to strengthen hapuu capability. Where specialist knowledge is required, technical partners may provide support alongside kaitiaki to build long-term internal capability.

Monitoring will serve as a vehicle for:

- Building kaitiaki skills in ecological and cultural assessment
- Supporting intergenerational knowledge transfer
- Increasing familiarity with digital monitoring platforms
- Developing confidence in interpreting and presenting data
- Strengthening governance literacy in environmental decision-making

7.4. PARTNERSHIPS

While The Trust retains governance authority, partnerships may be established to support implementation.

Partnerships may include technical research providers, regional or national environmental agencies, educational institutions, and funding bodies. All partnerships must respect The Trust's governance, recognise data sovereignty, align with the aspirations of Ngaati Mahuta and operate in a support capacity.

7.5. FUTURE DIRECTION

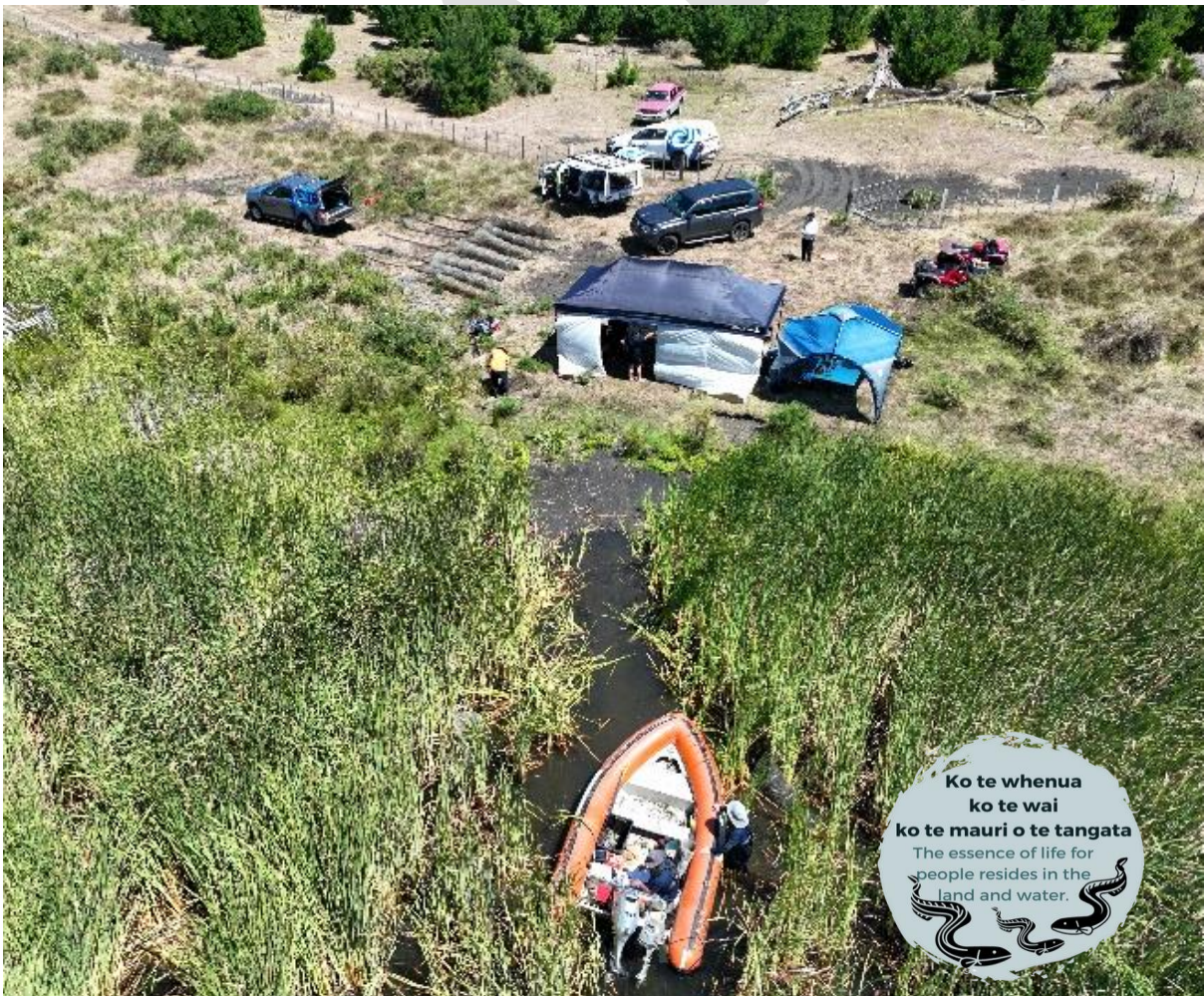
The long-term aspiration remains unchanged: that the wai of Tahaaroa continue to sustain whenua, taonga species and descendants of Ngaati Mahuta. Looking beyond 2031, monitoring will continue to evolve in response to environmental change, emerging knowledge, new scientific insight and hapuu priorities. Sustained resourcing will be essential to support this growth and ensure the continuity of hapuu-led monitoring.

This may include:

- Commissioning targeted scientific investigations where monitoring identifies knowledge gaps
- Extend monitoring to additional lakes and streams within the catchment as capacity allows
- Using monitoring results to prioritise and guide restoration actions on whenua and within roto margins
- Improving the use of mapping, dashboards and digital tools to track trends and support decision-making
- Strengthening alignment of monitoring activities with maramataka aa-hapuu and ecological cycles
- Growing hapuu capability through training, rangatahi involvement and succession planning for monitoring leadership
- Improving scientific tools to better understand sediment sources and catchment pressures
- Including understanding climate-driven variability in temperature and water levels

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- Te Ruunanga o Ngaati Mahuta. (2025) Huri Taiaawhio Ko Ngaati Mahuta E – Environmental Management Plan.



**Ko te whenua
ko te wai
ko te mauri o te tangata**
The essence of life for
people resides in the
land and water.

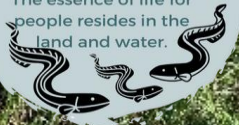


Photo 8: Appendix A.

APPENDIX A: Tuna Baseline 2025

The 2025 tuna survey establishes the baseline for abundance, size structure, growth rates, and parasite prevalence for the 2026–2031 monitoring cycle (Herangi et al, 2025b). While catch rates have improved since 2007, reduced growth rates and moderate to high parasite burden indicate continued ecological pressure within the lake system.

1. Tuna Population Abundance Baseline

Catch rates have increased compared with 2007 and are comparable to earlier surveys, but remain below mana whenua aspirations.

Indicator	2025 Baseline Value	Interpretation
CPUE (both species)	27.11 eels/net/night	Comparable to early 2000s levels
Total catch	907 tuna	815 shortfin, 92 longfin across 42 net-nights
Total Catch Weight	225.35 kg	193.11 kg shortfin, 32.24 kg longfin

2. Size Structure Baseline

Species	Shortfin	Longfin	Interpretation
Mean Length (mm)	453.7	459.5	Shortfin dominate the population (90% of total catch number)
Mean Weight (g)	243.5	358.2	Stock now dominated by smaller individuals compared with 2007
Mean Condition (k)	2.69	2.44	Mean shortfin length ~70 mm shorter than 2007

3. Recruitment Baseline

Indicator	2025 Baseline Assessment
Juvenile recruitment	Present but not strong enough to rapidly rebuild stock
Population structure	Dominated by older, slower-growing individuals
Growth (shortfin)	17 mm/year (declined from 33 mm/year in 2007)
Parasites	Over half show moderate to heavy infestation
Cultural context	Stock unlikely to meet full customary aspirations

APPENDIX B: Kaiaua Baseline 2024

The 2024–2025 kaiaua surveys establish a baseline characterised by moderate densities at stable sandy sites (0.9–1.1 ind./m²), low densities in silty habitats (0.2–0.5 ind./m²), low observed mortality, limited juvenile recruitment, and an ageing adult-dominated population (Herangi et al, 2025a). Habitat condition, particularly substrate stability and macrophyte cover, is strongly correlated with kaiaua abundance and shell condition.

4. Kaiaua Population Baseline

Indicator	Baseline Value	Interpretation
Mean Density (ind./m ²)	0.2-1.1 ind./m ² (site range)	High densities recorded at firm sandy, charophyte-dominated sites (A = 1.1; C = 0.9). Lowest at muddy/soft substrate sites (E = 0.2).
Mortality Evidence	Low overall mortality at monitored sites	After Nov 2023, live individuals dominated counts. No large-scale mortality events observed.
Juvenile Recruitment	Limited	Very few individuals <30 mm recorded. Population dominated by adults 69-72 mm mean length.
Shell Condition	Majority Grade 1-2 (intact/minor erosion); persistent Grade 3 present	Moderate erosion indicates ageing population. No severe Grade 4 widespread.
Substrate Condition	Strong habitat dependence	Firm sandy substrate with native macrophytes supports highest densities; silty/muddy areas linked to poor condition and lower abundance.
Habitat Pressure Signals	Sedimentation and reduced water clarity influencing habitat quality	Linked to reduced macrophyte depth and increased siltation.

APPENDIX C: Tupu Wai Baseline 2024

The following tables establish the 2024 ecological baseline for tupu wai condition across Lakes Tahaaroa, Numiti and Rotoroa (Herangi et al, 2025c). These values provide the reference point for assessing change during the 2026–2031 monitoring period. Future trend analysis and adaptive triggers will be evaluated relative to these baseline values.

1. LakeSPI Baseline 2024

Lake	LakeSPI (%)	Native Condition Index (%)	Invasive Impact Index (%)	Maximum Vegetation Depth (m)	Ecological Status	LakeSPI 2024	Mauri State
Tahaaroa	33	38	68	4.4	Moderate	Stable but stressed	Mauri tuu
Numiti	29	29	66	3.0	Moderate	Continues to deteriorate	Mauri kino
Rotoroa	34	34	62	5.0	Moderate	Stable but stressed	Mauri tuu

2. Average Depth Extent of Vegetation

Lake	1983 Depth (m)	2014 Depth (m)	2024 Depth (m)	Long-Term Change
Tahaaroa	-	5.7	4.4	Contraction of ~1.3 m since 2014
Numiti	5.6	3.7	3.0	Long-term regression (~2.6 m since 1983)
Rotoroa	-	5.0	4.8	

APPENDIX D: Wai Baseline

LAWA data provide independent regional context regarding nutrient status, water clarity, and oxygen dynamics. Regional water quality data are limited for some lakes. Where monitoring records are sparse, ecological condition is interpreted primarily through LakeSPI, habitat assessment, and taonga species monitoring.

1. Trophic Level Index Baseline

Indicator	Trophic Level Index (TLI) Trend						Notes
	2014	2020	2021	2022	2023	2024	
Tahaaroa	-	-	-	-	-	-	No data available
Numiti	5.2	5.9	5.2	5.3	5.3	5.6	TLI classification >5.0 indicates supertrophic lake conditions, very poor water quality under LAWA branding.
Rotoroa	-	-	-	-	-	-	No data available

APPENDIX E: Photographic Record

Photo No.	Description	Location	Date	Photographer
Cover	(Top): Waananga ki Te Kooraha Marae. (Bottom): Connecting people and place at Maukore.	Lake Tahaaroa	October 2024 November 2023	Keith Kana
Inside cover	Driftwood creation (Artist unknown).	Lake Tahaaroa	November 2024	Ngahuia Herangi
1	(L): Jess Haunga and tamariki identifying and counting fish species (April 2025). (R): Waimiria Willison and Blake Herangi identifying and measuring tuna under the guidance of Tahaaroa Lakes Trustee, Rhonda Kerr.	Lake Tahaaroa	April 2025	Ngahuia Herangi
2	Inigo Maetzu-Zabarte from ESNZ and whaanau (Konohi Hunia, Fleur Passau, Rhonda Kerr and Mathew Ellam) retrieving one of two nets full of tuna from Lake Tahaaroa.	Lake Tahaaroa	November 2023	Ngahuia Herangi
3	Whaanau preparing the tuna processing workstation.	Lake Tahaaroa	November 2023	Keith Kana
4	Whaanau observing the tuna being processing.	Lake Tahaaroa	November 2023	Keith Kana
5	Whaanau preparing to bring the fyke nets in for tuna processing.	Lake Tahaaroa	November 2023	Keith Kana
6	Kaumaatua (Sonny Willison, Leo Tuaupiki and Mike Willison) watching from a distance, Inigo Maetxu-Zabarte in the foreground.	Lake Tahaaroa	August 2024	Ngahuia Herangi
7	Tuna processing station for customary tuna survey.	Lake Tahaaroa	February 2025	Keith Kana
8	(Top): Macrophyte and kaiaua survey with Aleki Taumoepeau, Inigo Maetzu-Zabarte, Michelle Melchior and Constantin Dransmann on the boat. (Bottom): Tuna processing station for customary tuna survey.	Lake Tahaaroa	November 2024 February 2025	Keith Kana