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Conservation
Te Papa Atawhai



NIWA
Taihoro Nukurangi



Vegetation Status in Waituna Lagoon: Summer 2025



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Author:

Mary de Winton
Iñigo Zabarte-Maeztu
Aleki Taumoepeau

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NIWA – National Institute of Water & Atmospheric Research Ltd
PO Box 11115
Hamilton 3251
Phone +64-7-856 7026

Website: www.niwa.co.nz

For more information please contact: mary.dewinton@niwa.co.nz

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DOC commissioned NIWA to undertake the 2025 summertime Waituna Lagoon survey to document the health of submerged vegetation and to provide an inter-annual comparison of its condition. This report summarises the key findings to guide further ecological management of the lagoon.

Key findings

Monitoring results for submerged vegetation in Waituna Lagoon are compared to six ecological targets (in bold below). No targets were met in 2025:

- The target for **Lagoon closure** was not met, due to an open state persisting after the lagoon was opened in response to high water levels in September 2024.
- Four targets relating to *Ruppia* status were not achieved.
 - Measures of lagoon-wide ***Ruppia* cover** and ***Ruppia* biomass index** were amongst the lowest values on record since 2009 and well below target levels.
 - Targets for ***Ruppia* reproductive success** and ***Ruppia* megacarpa status** were not met, with measures of zero.
- The target for **Macroalgae cover** was not achieved, being over the limit of <10% cover lagoon-wide.

The latest survey of submerged vegetation in summer 2025 was undertaken when the lagoon was open to the sea. The lagoon was also open to the sea during the 2024 vegetation survey, after being opened in response to a toxic algal bloom. This 2025 survey represents the second consecutive year that the lagoon did not meet the **Lagoon closure** target and results indicate poor growing conditions for *Ruppia* recently.

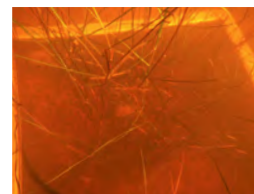
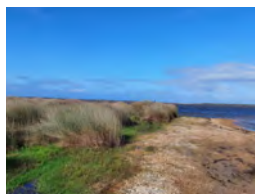
Purpose of this report

This report presents the 2025 annual summer monitoring data for submerged vegetation in Waituna Lagoon in relation to ecological targets that have been identified by the Lagoon Technical Group to guide ecological management. Results are compared to annual monitoring results since 2009. The document is supported by a technical report¹ that describes the water level regime, water quality (physico-chemical) and substrate conditions, submerged vegetation abundance and composition and *Ruppia* life-stage.

¹ de Winton, M., Zabarte-Maeztu, I., Taumoepeau, A. (2025). Technical Report on Vegetation Status in Waituna Lagoon: 2009–2025. NIWA Publication.



Waituna Lagoon is an internationally important example of a coastal waterbody that has remained in good ecological condition.



Background

The importance of Waituna Lagoon

Waituna Lagoon on the south coast of New Zealand is included within a Ramsar Wetland of International Importance. The lagoon is of cultural significance to Ngāi Tahu recognised by a Statutory Acknowledgement under the Ngāi Tahu Claims Settlement Act 1998². It is also significant for conservation of biological diversity and as a key recreational site.

The Department of Conservation has been monitoring submerged aquatic plants (including *Ruppia* spp.) in Waituna Lagoon since 2009 under the Arawai Kākāriki Wetland Restoration Programme.

Coastal lowland lakes like Waituna Lagoon are impacted by changes in land use in the catchment including sediment and nutrient loads from upstream run-off. It is now rare to find coastal lowland lakes with an intact ecological condition, but Waituna Lagoon remains highly valued for its associated plant, wetland, fish and birdlife.



² Ngāi Tahu Claims Settlement Act 1998 No. 97 (as at 23 May 2008), Public Act Schedule 73 Statutory acknowledgement for Waituna Wetland – New Zealand Legislation.



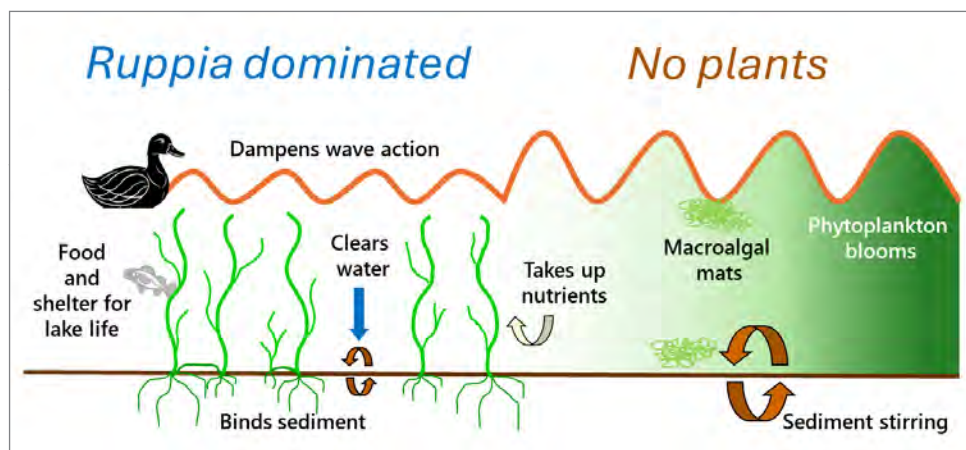
Ruppia safeguards the lagoon

When *Ruppia* grows densely in Waituna Lagoon it protects water quality, dampens wave action and stops the bed being stirred up.

Risk of Waituna Lagoon shifting to a poor ecological condition

Submerged plants have an important role in keeping shallow lakes and lagoons clean and healthy (Figure 1). If submerged plant communities become too stressed, they can collapse. The lake or lagoon then enters a new, dirty water state, with high levels of resuspended sediment and development of macroalgal mats or phytoplankton blooms instead of plants. The submerged native plant species of *Ruppia* (horse's mane) safeguard water quality in Waituna Lagoon. *Ruppia* tolerates fluctuating levels of saltwater in lagoons better than other submerged plants, but does not occur in the sea. Other plants, including a nationally rare, salinity-tolerant charophyte, also occur at Waituna Lagoon.

Figure 1: *Ruppia* vegetation can safeguard water quality in the lagoon compared to a system with no plants.



Management of water level at Waituna Lagoon

Agencies, community and iwi are working together to manage and protect Waituna Lagoon. When water levels in the lagoon rise too high for land drainage, the management response has been to mechanically open the lagoon to the sea. Lagoon openings are usually undertaken once or twice a year to prevent catchment flooding and to flush nutrients from the lagoon, but lagoon closing only occurs naturally under certain sea conditions.

Management of these artificial openings is increasingly taking into account the lagoon's ecology. The timing and length of openings ideally should not negatively impact on the survival of *Ruppia* and other vegetation. This requires managing openings to avoid critical periods in the life-history of *Ruppia* including spring to summer growth and seed production.

Previously, the lagoon had been opened to the sea once the water level of Waituna Lagoon reached a certain trigger level³, which varied at different times of the year and had associated conditions. The coastal permit to open the lagoon expired in 2022. More recently, the optimal Resource Consent conditions for the ecological and cultural health of the lagoon ecosystem were assessed by an expert technical panel⁴ as a step towards better management of lagoon openings.

At the time of the 2025 vegetation monitoring, no coastal permit was in place to open the lagoon. However, an application had been submitted by Te Rūnanga o Awarua, Department of Conservation and Environment Southland for periodic opening of the lagoon. The proposed resource consent conditions utilise a combination of water level, ecological, water quality and fish passage triggers and thresholds to guide lagoon openings.

³ Resource Consent 20146407-01, 14 February 2017.

⁴ Robertson H., Atkinson N., de Winton M., Schallenberg M., Holmes, R., Rabel, A., Wilson, K., Jenkins, C., Whaanga, D. (2024). Technical review of conditions for opening Waituna Lagoon. Prepared for the Department of Conservation, Te Rūnanga o Awarua and Environment Southland. 60 pp.



Natural lagoon level

Once, Waituna Lagoon would have naturally breached to the sea after several years of filling with freshwater. Today it is regularly opened and infiltrated by the sea.

What do openings mean for conditions in Waituna Lagoon?

Monitoring of the waters of Waituna Lagoon over time⁵ has built up a picture of the key changes caused by opening events⁶. Water level is lower and salinity higher when the lagoon is open and temperature and nutrient concentrations are both reduced with flushing by the sea (Figure 2). These changes and their duration influence the vegetation of Waituna Lagoon.

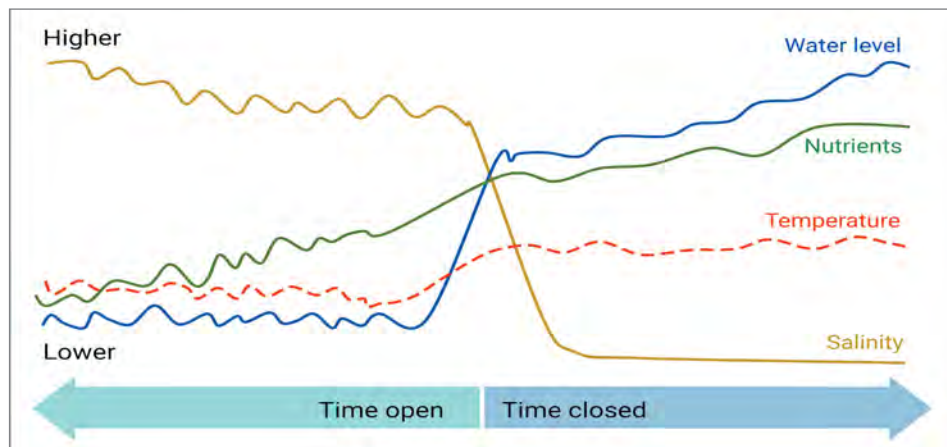


Figure 2: Key changes in the waters of Waituna Lagoon with time after opening or closing to the sea.

Catchment management

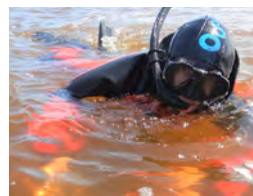
Agencies and the community aim to reduce sediment and nutrient inputs to Waituna Lagoon, focusing on strategies and initiatives for catchment management of contaminants, increasing biological processing of run-off and improving freshwater habitat. It is essential that these efforts meet the nutrient load reduction targets developed by the Lagoon Technical Group in 2013⁷ to ensure the long-term persistence of *Ruppia* vegetation and safeguard the lagoon ecosystem. However, opening the lagoon to disrupt algal blooms provides a short-term solution for the ecological health of the lagoon.



⁵ <https://www.lawa.org.nz/explore-data/southland-region/lakes/waituna-lagoon/>

⁶ de Winton, M., Mouton, T. (2018). Technical Report on Vegetation Status in Waituna Lagoon: 2009–2018.

⁷ Lagoon Technical Group (2013). Ecological Guidelines for Waituna Lagoon. Report prepared for Environment Southland.



What do we monitor?

Submerged aquatic plants

Ruppia acts as an ecological sentinel in Waituna Lagoon, providing an early-warning system to detect deterioration. Department of Conservation oversee the monitoring of *Ruppia* and other aquatic plants and algae to determine status and trends in ecological health of the lagoon. Past vegetation monitoring has increased our understanding of vegetation responses to artificial opening of the lagoon and has guided the proposed consent conditions sought to open the lagoon. Ongoing monitoring is proposed to inform future opening decisions.

Results of annual monitoring are compared with target conditions sought under the Ecological Guidelines⁸ for Waituna Lagoon. Two additional targets were suggested by an analysis of all monitoring data in 2018⁹. These ecological targets are listed in Box 1.

Box 1: Ecological targets for *Ruppia* in Waituna Lagoon:

- Lagoon closed during *Ruppia* growing season (spring and summer).
- >30–60% for average % cover of *Ruppia* (and other native macrophytes¹⁰).
- <10% cover of benthic and epiphytic filamentous algae (macroalgae).
- >1000 average for *Ruppia* 'biomass index' (% cover X cm height).
- ≥40% of *Ruppia* samples in a flowering or post-flowering life-stage.
- ≥20% of the sites record *Ruppia megacarpa*.



⁸ Lagoon Technical Group (2013). Ecological Guidelines for Waituna Lagoon. *Report prepared for Environment Southland*.

⁹ de Winton, M., Mouton, T. (2018). Technical Report on Vegetation Status in Waituna Lagoon: 2009–18.

¹⁰ Other native macrophytes comprised <35% of all occurrence records for all surveys.



Monitoring methods

The lagoon is monitored each year in late summer at 47-48 sites (Figure 3a). At each site, an assessment of environmental quality includes depth and water quality measurements (Figure 3b). Substrate characteristics are measured in four samples of the lagoon bed retrieved using a garden hoe, and the composition and abundance of vegetation is also described, including *Ruppia* life-stage as flowering or vegetative. Submerged native plants and dominant macroalgae are shown in Figure 4.



Figure 3a: Map showing the location of sampling sites (47-48).

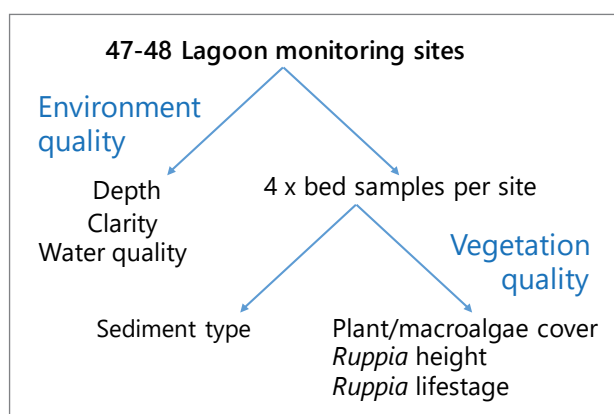


Figure 3b: Sampling design diagram.

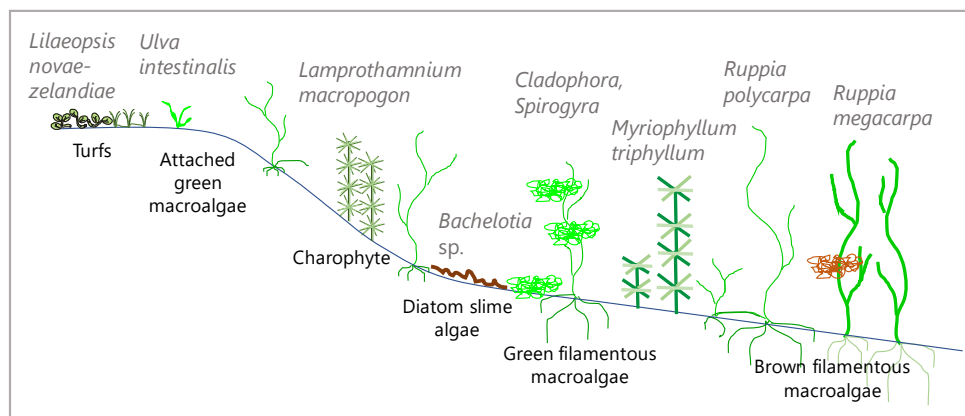


Figure 4: Common submerged plants and macroalgae types in Waituna Lagoon.



Did Waituna Lagoon achieve ecological targets in 2025?

The results of annual summer monitoring of the submerged vegetation in Waituna Lagoon are analysed and compared to the six ecological targets to track the health of the *Ruppia* community.

Target lagoon closure was not achieved in 2025, nor was it in 2011, 2013, 2014, 2017, 2020, 2021 and 2024.

1. Lagoon closure

A closed lagoon over spring and summer (defined as the three months before monitoring) is an ecological target that provides stable conditions for the *Ruppia* growing season (Box 1). Whether the lagoon is closed or open has a strong influence on conditions that affect plants, such as depth, salinity, and temperature.

The target for lagoon closure was not met in 2025 (Table 1). The lagoon was opened in late September 2024 and remained open and tidal up to the 2025 summer vegetation monitoring. This is the second year in a row that closed conditions were not achieved over the critical spring-summer growth period for *Ruppia* growth and reproduction (Table 1). Previous consecutive monitoring years when this target was not met occurred over 2013 and 2014, and 2020 and 2021 (Table 1).



Table 1: Months that the lagoon has been closed (positive numbers) or open (negative numbers) prior to each monitoring event. Occasions that the target is met are shown as bold, in highlighted cells.

Year	Months closed before monitoring
2009	4.7
2010	4.6
2011	-5.6
2012	4.6
2013	-3.9
2014	-6.2
2015	6.2
2016	3.2
2017	1.0
2018	13.7
2019	3.5
2020	-4.1
2021	-4.8
2022	4.5
2023	16.6
2024	0.5
2025	-3.9





2. *Ruppia* cover

A healthy *Ruppia* community occupies a large habitat area in Waituna Lagoon. This is measured by calculating the percentage cover of *Ruppia* across all sites in the lagoon. The ecological target is >30–60% cover for *Ruppia* across the whole lagoon (Box 1).

The lagoon-wide cover of *Ruppia* in 2025 was 2% (Table 2) and did not meet the ecological target. Plants of *Ruppia* species were recorded at fewer than half of the monitoring sites and *Ruppia* cover did not exceed an average cover of 30% at any monitoring site.

The occasions when the *Ruppia* cover target has been met are shown as bold, in highlighted cells in Table 2. The years 2016, 2019 and 2023 that met this target (Table 2, Figure 5) were the second of two consecutive years of lagoon closure during the critical spring-summer growth period for *Ruppia*.

Table 2: *Ruppia* measurements including % sites, average cover at sites and % sites where >30% cover, and overall averaged lagoon-wide cover. Occasions the target is met are shown as bold, in highlighted cells.

Year	% Sites where <i>Ruppia</i> present	Average cover (sites where present)	% Sites with >30% cover	Lagoon-wide average cover
2009	73	33	23	24
2010	52	31	21	16
2011	25	7	2	2
2012	60	14	8	9
2013	33	22	13	7
2014	19	16	2	3
2015	70	29	23	21
2016	87	46	53	40
2017	74	12	6	9
2018	100	26	12	26
2019	96	37	43	36
2020	68	8	4	5
2021	30	9	0	3
2022	72	19	19	13
2023	100	52	68	52
2024	40	6	2	2
2025	36	6	0	2

The target lagoon-wide *Ruppia* cover was not achieved in 2025, and previously has only been achieved in 2016, 2019 and 2023.

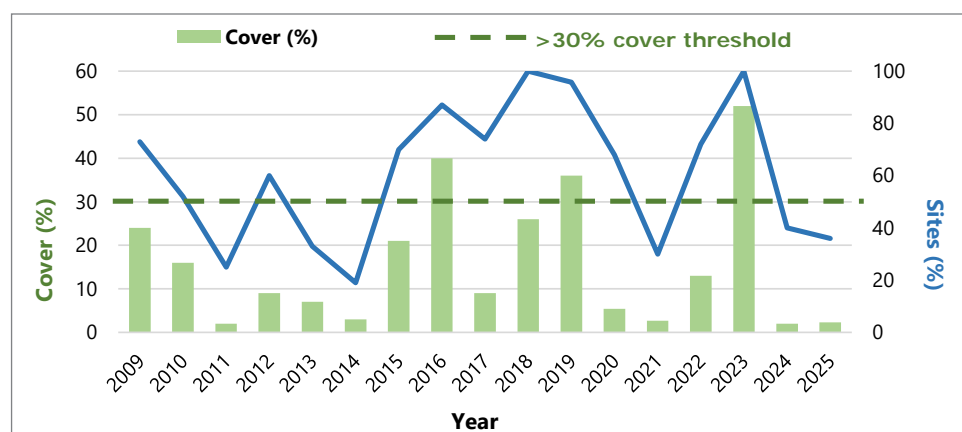


Figure 5: Lagoon-wide cover of *Ruppia* is shown as green bars and percentage of sites at which *Ruppia* was present as a blue line.



3. *Ruppia* biomass index

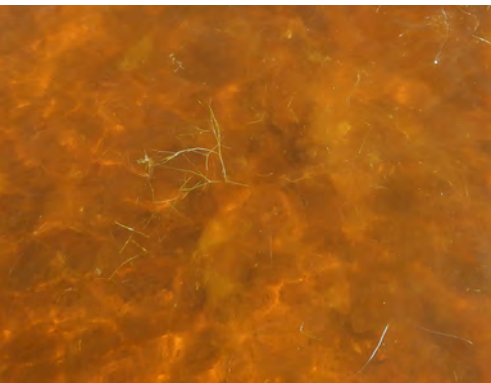
Although *Ruppia* biomass is not sampled annually, a proxy for biomass can be derived by multiplying *Ruppia* cover by height as a ‘biomass index’. In a healthy *Ruppia* community a biomass index >1000 is expected (Box 1). This might be visualised as a 10% cover of plants that are 100 cm tall or by a 100% cover of plants that are 10 cm tall, and other combinations.

Average *Ruppia* biomass index did not exceed 1000 at any of the monitoring sites in 2025, therefore, the lagoon-wide target was not achieved (Table 3). The biomass index averaged across the lagoon was one of the lowest values recorded (Table 3). To date, the years where the target biomass index has been achieved are also those when the lagoon closure target has been met (Table 1). In addition, consecutive years of meeting the lagoon closure target have resulted in higher values in the second year (2015–2016, 2018–2019, 2022–2023).

Table 3: *Ruppia* presence at sites, number of sites where target biomass index was achieved and average biomass index calculated lagoon-wide. Occasions the target is met are shown as bold, in highlighted cells.

Year	% Sites where <i>Ruppia</i> present	% Sites with >1000 biomass index	Lagoon-wide average biomass index
2009	73	25	734
2010	52	21	899
2011	25	0	9
2012	60	4	177
2013	33	2	98
2014	19	2	114
2015	70	23	1252
2016	87	32	1362
2017	75	6	697
2018	100	19	1324
2019	96	45	1872
2020	68	4	199
2021	30	4	103
2022	72	4	462
2023	100	66	4246
2024	40	0	53
2025	36	0	38

Target lagoon-wide *Ruppia* biomass index was not achieved in 2025. Previous years this target was met were 2015, 2016, 2018, 2019 and 2023.





Limits for lagoon-wide macroalgae cover were exceeded in 2025, and also in 2013, 2015 to 2017, and 2019 to 2022.



4. Macroalgae cover

Nutrient enrichment of waterbodies may result in excessive macroalgae growth that smothers and shades *Ruppia* plants. One ecological target (Box 1) recognises that macroalgae on the lagoon bed (benthic), on plants (epiphytic) and floating mats should be no more than minor (<10% cover).

The target for macroalgae cover was not met in 2025 (Table 4, Figure 6). The lagoon-wide cover of 15% occurred when the lagoon was open to the sea during monitoring. Macroalgal development at the time of monitoring (Table 4) does not strongly reflect the status of the lagoon closure target (Table 1). However, macroalgae abundance is known to respond quickly to favourable short-term conditions such as high water temperature and still conditions.

Table 4: Percentage of sites recording macroalgae, their average cover, percentage of sites achieving <10% cover and average lagoon-wide cover. Occasions the target is met are shown as bold, in highlighted cells.

Year	% Sites where macroalgae present	Average % cover (sites where present)	Sites with >10% cover (%)	Lagoon-wide average cover (%)
2009	19	17	6	3
2010	8	29	6	2
2011	17	3	0	<1
2012	23	16	8	4
2013	27	52	19	14
2014	27	17	11	4
2015	89	50	70	45
2016	79	36	49	28
2017	64	27	26	17
2018	11	2	0	<1
2019	89	73	85	66
2020	79	31	32	25
2021	25	28	12	15
2022	85	63	66	54
2023	32	16	9	5
2024	13	<1	0	<1
2025	45	33	28	15

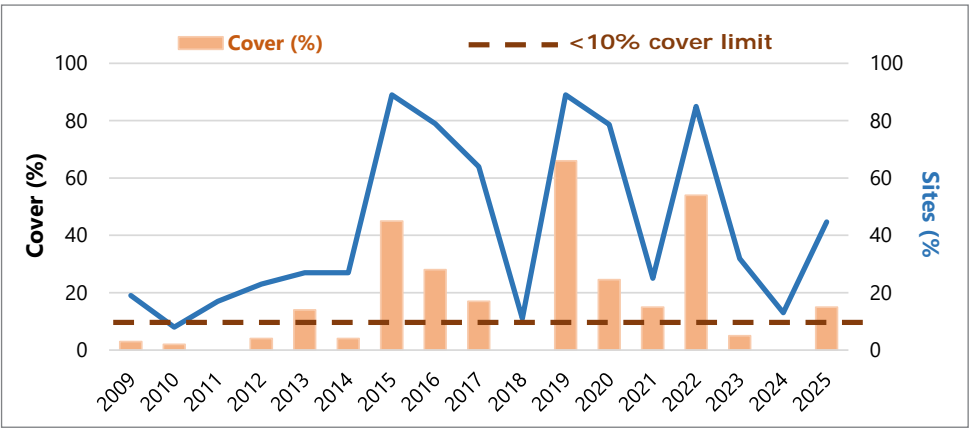
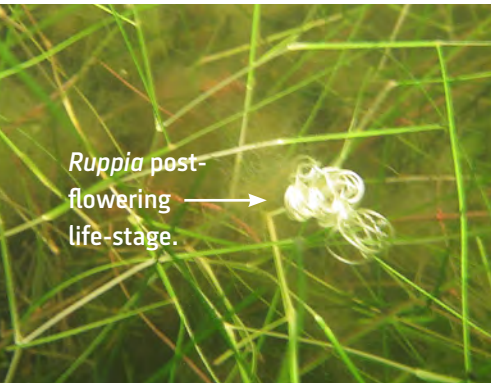


Figure 6: Lagoon-wide cover of macroalgae is shown as orange bars and percentage of sites at which macroalgae was present as a blue line.



5. *Ruppia* reproductive success

This ecological target focuses on the reproductive success of *Ruppia* and the likely replenishment of the seed bank which is vital for vegetation recovery after any major disturbance (e.g., extended lagoon opening). The target is $\geq 40\%$ of *Ruppia* samples at sites in a flowering or post-flowering life-stage, to incorporate sites with both *Ruppia* species (*R. polycarpa* and *R. megacarpa*).

In 2025, the reproductive success target was not achieved as all surveyed *Ruppia* plants were vegetative (Table 5). This is the second consecutive year without reproductive plants being observed during the summer monitoring. However, previous results in 2023 indicated a very high reproductive success (Table 5).

Table 5: Percentage of sites recording reproductive success for *Ruppia* as either flowering or post-flowering status. Occasions the target is met are shown as bold, in highlighted cells.

Year	% Sites recording reproduction
2009	18
2010	32
2011	0
2012	53
2013	9
2014	10
2015	59
2016	71
2017	3
2018	44
2019	46
2020	6
2021	4
2022	30
2023	94
2024	0
2025	0

The target for *Ruppia* reproductive success was not met in 2025, but was earlier met in 2012, 2015, 2016, 2018, 2019 and 2023.





The target for status of *Ruppia megacarpa* was not met in 2025 but was achieved in five of the previous seven years.

6. Status of *Ruppia megacarpa*

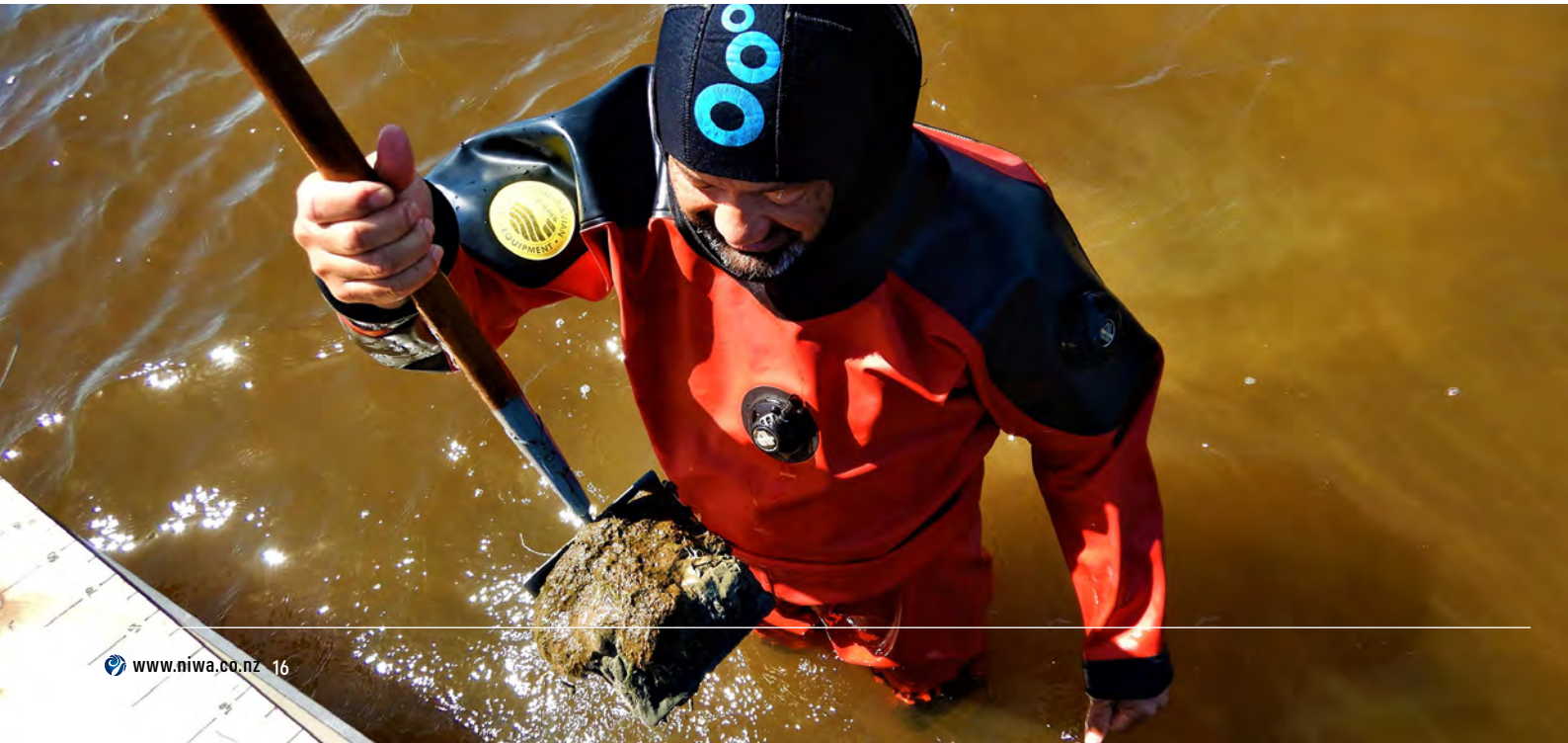
Ruppia megacarpa is associated with taller, denser submerged vegetation in Waituna Lagoon. This plant acts as a strong ‘ecosystem engineer’, promoting environmental conditions that further vegetation development. The target states $\geq 20\%$ of the sites should record *R. megacarpa*. A threshold of 20% of sites is recommended because this represents known sampled areas that are favourable for this species¹¹.

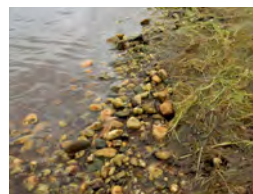
Ruppia megacarpa was not recorded in 2025 and the target was not met (Table 6). *R. megacarpa* was not recorded during summer monitoring in 2024 either. In 2023, this plant had the most widespread distribution ever recorded in the lagoon (Table 6).

Table 6: Percentage of sites recording *Ruppia megacarpa*. Occasions the target is met are shown as bold, in highlighted cells.

Year	% sites recording <i>Ruppia megacarpa</i>
2009	10
2010	23
2011	17
2012	2
2013	6
2014	0
2015	4
2016	9
2017	6
2018	30
2019	32
2020	21
2021	6
2022	23
2023	38
2024	0
2025	0

¹¹ de Winton, M. (2019). Vegetation Status in Waituna Lagoon: Summer 2019. NIWA Publication.





Conclusions

Ecological targets in 2025

None of the six ecological targets were achieved in 2025 (Table 7).

The **Lagoon closure** target was not met (Table 7). The lagoon was mechanically opened to the sea in late September 2024 under emergency powers provided by the Resource Management Act. This opening followed a period of high water level in late August-September 2024, when levels were >2.3 m for 31 consecutive days, including 12 days at or above 2.5 m.

None of the four *Ruppia*-related targets were met in 2025 (Table 7). This failure followed a similar result in the previous 2024 monitoring, when the **Lagoon closure** target was also not met. Therefore, 2025 represented a second consecutive year of poor conditions for *Ruppia* development over the key spring-summer period.

The **Macroalgae cover** target was also not met in 2025 (Table 7). Lagoon-wide average cover of macroalgae was over the stated limit of <10%.

Table 7: Summary of 2025 results for all ecological targets.

Ecological target	Targets met?	Comment
Lagoon closure	✗	Lagoon was open for almost 4 month prior to monitoring over the spring-summer <i>Ruppia</i> growing season.
<i>Ruppia</i> cover	✗	Lagoon-wide <i>Ruppia</i> cover did not meet the target (>30% cover).
<i>Ruppia</i> biomass index	✗	<i>Ruppia</i> biomass index did not meet the target (>1000).
Macroalgae cover	✗	Macroalgae development exceeded the limit of 10% cover.
<i>Ruppia</i> reproductive success	✗	No <i>Ruppia</i> reproduction was recorded.
Status of <i>Ruppia megacarpa</i>	✗	No <i>Ruppia megacarpa</i> was recorded.

No ecological targets were achieved in 2025.



Ecological targets over all monitoring years

- No ecological targets were met in 2025 (Table 8). This the fourth time in the 17 years of summer monitoring that zero targets have been achieved (Table 8).
- On eight monitoring occasions when only one or no targets have been met (Table 8), these were also years that did not meet the lagoon closure target (closed for 3 months prior to summer monitoring).
- Higher numbers of targets (≥ 4) tended to be achieved in the second of consecutive closed lagoon years (Table 8).
- The target of macroalgae cover (limit of $<10\%$ cover) has not shown strong links to lagoon closure target (Table 8).

Table 8: Summary of results for six ecological targets over all monitoring years. Darker rows indicate greater numbers of targets were met.

Year	Lagoon closure	<i>Ruppia</i> cover	<i>Ruppia</i> biomass index	Macroalgae cover	<i>Ruppia</i> reproductive success	Status of <i>Ruppia megacarpa</i>	Targets met
2009	✓	✗	✗	✓	✗	✗	2
2010	✓	✗	✗	✓	✗	✓	3
2011	✗	✗	✗	✓	✗	✗	1
2012	✓	✗	✗	✓	✓	✗	3
2013	✗	✗	✗	✗	✗	✗	0
2014	✗	✗	✗	✓	✗	✗	1
2015	✓	✗	✓	✗	✓	✗	3
2016	✓	✓	✓	✗	✓	✗	4
2017	✗	✗	✗	✗	✗	✗	0
2018	✓	✗	✓	✓	✓	✓	5
2019	✓	✓	✓	✗	✓	✓	5
2020	✗	✗	✗	✗	✗	✓	1
2021	✗	✗	✗	✗	✗	✗	0
2022	✓	✗	✗	✗	✗	✓	2
2023	✓	✓	✓	✓	✓	✓	6
2024	✗	✗	✗	✓	✗	✗	1
2025	✗	✗	✗	✗	✗	✗	0





Implications for lagoon health

- Fewer ecological targets for Waituna Lagoon are met when lagoon openings occur or extend over late spring to summer.
- Two or more consecutive years of openings during the main vegetation growth period should be avoided to ensure *Ruppia* can regenerate successfully.
- At least two consecutive years of a favourable closed lagoon over the main vegetation growth period enables higher *Ruppia* development.
- A perennial seed bank can fuel vegetation establishment after openings during the main vegetation growth period, but the *Ruppia* seed bank was last replenished in 2023.
- Ecological targets for lagoon-wide *Ruppia* cover and biomass index are likely to be met when *Ruppia megacarpa* is more prevalent, due to its ability to form tall, high cover beds.
- Drivers for macroalgae blooms are different to those for *Ruppia*, with openings having less obvious influence on macroalgae abundance. Macroalgal growth likely responds to warm, still conditions, when nutrients are available and some level of macroalgae is already present.
- There are trade-offs between a stable closed lagoon for good *Ruppia* development and risk of nutrient build-up fuelling macroalgae and phytoplankton blooms.
- The need to address severe macroalgae or phytoplankton blooms by emergency openings should be a priority over the risk for *Ruppia*, as extended blooms would subsequently impact on vegetation.





Summary of technical findings

The accompanying technical report¹² to this summary document outlines that:

- The addition of the 2025 dataset to the 17-year long dataset of annual vegetation monitoring at Waituna Lagoon continues to provide strong evidence that artificial lagoon openings that extend into the key spring to summer growing season are undesirable for *Ruppia*.
- The only other submerged plant than *Ruppia* recorded in 2025 was a charophyte species that was recorded at just 4.3% of sites.
- No reproductive *Ruppia* plants were seen during the 2025 monitoring, although a very successful reproduction event in summer 2023 was likely to have replenished the seed bank for germination over the next few years.
- During the 2025 vegetation monitoring, depth of the open lagoon was low, 47% of monitored sites were dry and salinity levels were high (averaged 80% seawater).
- Other water quality conditions appeared to be suitable for *Ruppia* development, with high temperature, dissolved oxygen in the healthy range and water clarity being moderately high during vegetation monitoring.
- Macroalgae were relatively common at sites (45%) in 2025, despite the number of dry sites, and dominated by green filamentous types.



¹² de Winton, M., Zabarte-Maeztu, I., Taumoepeau, A. (2025). Technical Report on Vegetation Status in Waituna Lagoon: 2009–2025.



Glossary

Term	Definition
Benthic	Relating to, or occurring at the bottom of a body of water.
Biomass index	An indicator of biomass for <i>Ruppia</i> species that is based on multiplying measured cover (%) by height (cm).
Catchment	The area of land bounded by watersheds draining into a basin.
Charophyte	A group of freshwater algae that superficially resemble higher submerged plants in that they are anchored to the substrate and have stems and whorls of 'branchlets'.
Ecosystem engineer	An organism that creates, significantly modifies, maintains or destroys a habitat.
Ecosystem health	A way to describe the state of a system relative to a desired management target or reference condition.
Epiphytic	Living on the surface of plants.
Life-stage	Stages in form and function through which an organism passes during its lifespan that include reproductive status.
Macroalgae	Collective term used for seaweeds and other benthic marine or freshwater algae that are generally visible to the naked eye.
Phytoplankton	Microscopic plants of marine and fresh waters
Resource consent	Official permission to carry out an operation that has an environmental impact.
Run-off	The draining away of water (or substances carried in it) from the surface of an area of land.
Submerged vegetation	Plants that grow entirely beneath the surface of the water, except for flowering parts in some species, including charophytes but excluding macroalgae.

Referral links

- [Awarua-Waituna Wetlands: \(doc.govt.nz\)](#)
- [Land, Air, Water Aotearoa \(LAWA\) – Waituna Lagoon at Lagoon Centre](#)
- [Waituna Lagoon • Living Water](#)
- [Home – Whakamana te Waituna](#)

