Waikanae Ecological Monitoring: Inanga Spawning Survey 2025

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1 Introduction

The Department of Conservation (DOC) has undertaken ecological monitoring in the Waikanae River catchment as part of its Nga Awa program since 2021. The Nga Awa program seeks to 'work together with our communities towards healthy thriving rivers from source to sea'. The program partners with community members, Ātiawa ki Whakarongotai Iwi and local Government Agencies, including Kapiti Coast District Council (KCDC), and Greater Wellington Regional Council (GWRC) to form the Waikanae Ki Uta Ki Tai (WKUKT) project. As part of this project DOC engaged Stantec to undertake inanga (*Galaxias maculatus*) spawning surveys in the lower catchment. In addition to inanga spawning surveys, Stantec were also engaged to complete an aquatic weed survey in the Kotuku whenua – the wetland area associated with the Mazengarb Stream. This report summarises the work undertaken by Stantec in regard to inanga spawning during the 2025 monitoring season. The aquatic weed survey has been described in a separate report (Stantec, 2025).

1.1 Background on Monitoring to Date

DOC began physical monitoring during the 2020/21 summer season. This baseline information was gathered with a long-term purpose of informing an integrated monitoring approach to be developed collaboratively with WKUKT. This first survey included a comprehensive suite of methods that enabled reporting on components of ecological integrity in the Waikanae Catchment. This work was conducted by Aquanet, who subsequently produced a report detailing the results (Heath, 2022).

Following the survey by Aquanet, DOC commissioned a comprehensive review of aquatic biodiversity for the Waikanae Catchment. EOS Ecology were engaged to complete this review and produced a report (Dewson, 2022). The goal of this report was to identify and summarise the biodiversity values and describe the main pressures impacting biodiversity within the catchment. The report collated existing scientific information and monitoring data but did not include customary knowledge of the aquatic biodiversity of the Waikanae River. Information gaps in fish and macroinvertebrate distribution were identified in this report, particularly in the catchment headwaters.

The gaps identified by EOS Ecology led to a recommendation to expand fish and macroinvertebrate surveys to previously under studied areas. DOC developing a monitoring plan for the 2022/23 summer season that targeted the upper reaches of the Waikanae Catchment within indigenous forest. Nine sites were surveyed using a comprehensive suite of methods that aligned with DOCs national freshwater monitoring protocols. This monitoring was also used to engage and provide upskilling opportunities for Waikanae Jobs for Nature partners. Following monitoring, DOC engaged the Cawthron Institute to complete an analysis and produce a report on the data collected (Eveleens & Kelly, 2023). This report suggested future monitoring could examine the upstream extent of migratory fish distributions to determine the extent of available migratory species habitat within the Waikanae Catchment.

A monitoring plan for the 2023/24 summer season was developed based on information gathered from prior monitoring, and recommendations from Cawthron. The goal was to fill remaining information gaps to create a solid base to inform development of the integrated catchment plan. Two monitoring efforts were planned, one for the upper catchment, and one for the lower catchment. This monitoring was carried out between December 2023 and May 2024. This work is detailed in the Stantec (2024) report.

The monitoring plan for 2024/25 was developed following revision of all data to date. Following the establishment of a comprehensive baseline set of data, more targeted monitoring was proposed. This included conducting inanga spawning assessments in the lower catchment. There has been some

previous work in regard to inanga spawning, however this work is limited, and a more comprehensive survey is required to better understand where inanga spawning is occurring (Taylor & Marshall, 2016).

1.2 Monitoring Scope 2025

Restoration work in the lower Waikanae catchment is currently underway, especially around the DOC managed Kotuku whenua. Targeted inanga spawning surveys have been proposed to quantify the impact this work is having.

Stantec was engaged to undertake the following:

- Identify the high tide mark and likely habitat areas.
- Surveys at four sites during low tide including inanga spawning habitat assessments and egg searches.
- Provide updated maps of the sites, including suitable habitat areas and the locations of identified spawning habitats.

1.3 Inanga Life History

Inanga (*Galaxias maculatus)* are one of five native fish whose juveniles make up typical whitebait catches. They are currently considered At Risk – Declining under the current Threat Classification system (Dunn, et al., 2017). Juvenile inanga migrate upstream in spring and mature in freshwater habitats over summer. By late summer, schools of adults swim downstream to tidally influenced reaches to spawn on the spring high tides. Spawning activity peaks between March and April and can continue into early June. Inanga spawn in dense riparian vegetation that is inundated by tidal waters. Spawning typically occurs at the upper limit of saltwater intrusion but can occur within 500 metres of this point. Eggs develop outside the water, in humid microhabitats at the bases of riparian vegetation. When eggs are resubmerged during the next spring tide, hatching is induced and larvae are swept downstream into the ocean where they rear for six months, before migrating upstream to mature (Richardson & Taylor, 2004).

Spawning habitats are vulnerable to human activities, such as mowing of riparian vegetation (particularly in urban areas), or vegetation removal and installation of materials such as concrete for erosion protection. This is a common threat in residential areas. Stock access in rural settings also threatens spawning habitat as eggs can be crushed, or vegetation damaged underfoot.

2 Methodology

2.1 Site Selection

A study in 2016 discovered a small patch of inanga eggs on the true right bank of the Waikanae River, near the tip of the saltwater wedge. It was concluded that this was unlikely the main, or only spawning site in the catchment. Four additional sites were identified as potential habitat and flagged as sites to revisit in future studies. These potential spawning sites included the upstream end of Waimeha Lagoon, and an oxbow approximately 470 metres upstream of the confirmed spawning site.

The Mazengarb Stream and its main tributary were also identified as potential sites (Taylor & Marshall, 2016)

The 2025 monitoring sites were selected to build on the 2016 survey, confirm the suitability of these previously assessed sites, and complete eggs searches at each location.

The Waikanae River was assessed in three locations. For the purpose of this report these sites have been labelled as Waikanae River: A, B, and C. The upstream pool area of the Mazengarb Stream has been assessed separately to the downstream channel, due to the difference in habitat. The pool area has been labelled Mazengarb: A, the channel is Mazengarb: B, and the tributary has been labelled Mazengarb: C. Each site is displayed on Figure 2-1 below.

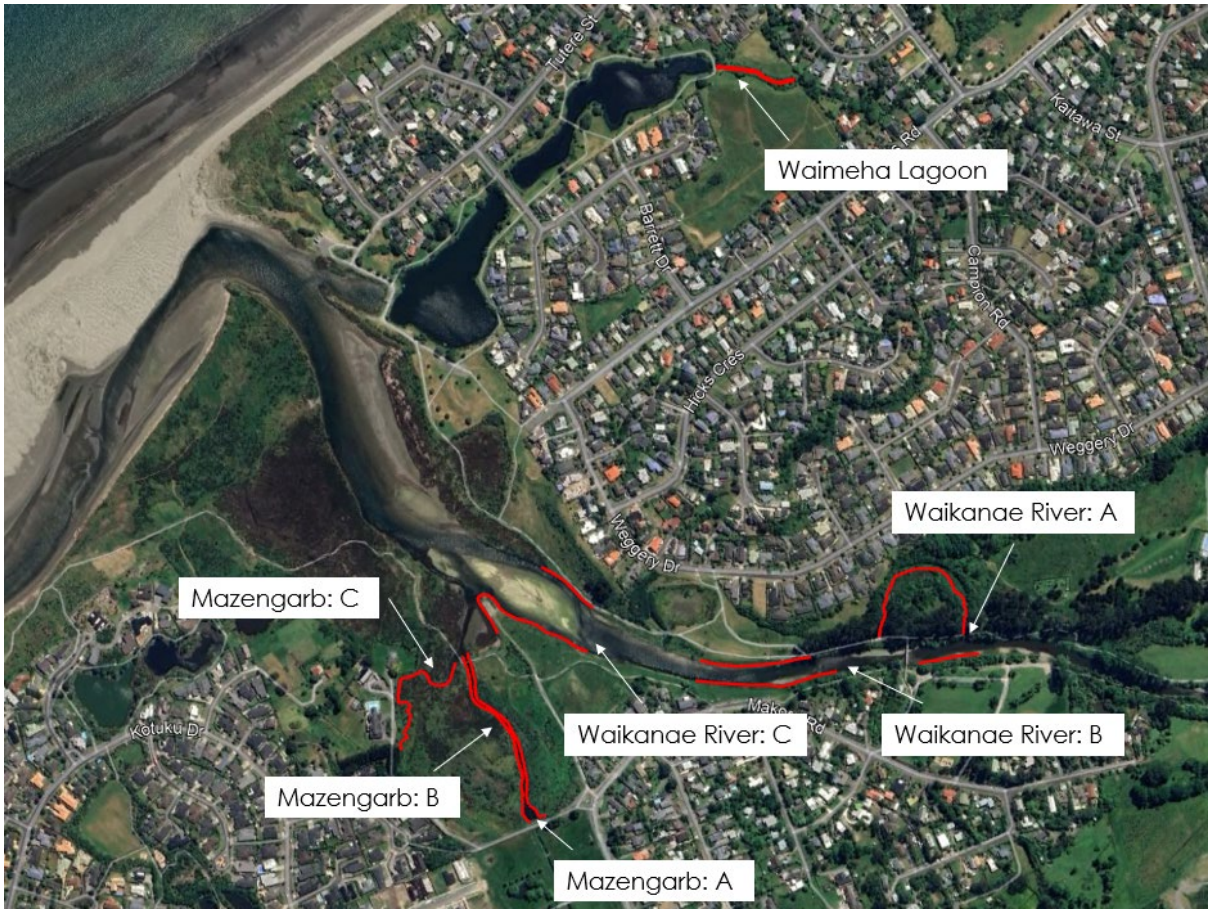

Figure 2-1: Location of sites assessed during 2025 survey

2.2 High Tide Assessment

Egg searches need to be completed at low tide, with the vegetation at the high-water mark searched. To establish where the high-water mark was, and high tide site visit was conducted in April, prior to the low tide egg searches. This involved visiting each site and taking photographs of the areas intended to be assessed to determine which areas of the banks required searching.

The saltwater wedge extend was not re-examined during this study, as the sites had already been selected based off previous understanding of the extent.

2.3 Habitat Assessments

Habitat assessments were conducted at each site to determine suitability for spawning. The habitat assessment designed by contributors to Whitebait Connection (Whitebait Connection, 2024) was used as a guide for this survey. It is easily accessible and can be applied to inanga spawning zones across New Zealand. It assesses spawning zones across 12 key attributes, including fish access, bank slope, and vegetation (as shown in Table 3-1). Each attribute gets a score of either 0, 5, or 10, with the final score grading the spawning zones. Attributes with lower scores can be targeted for restoration efforts. Scores between 90 and 120 indicate the habitat is in good condition for spawning. Scores between 55 and 90 indicate the habitat is in moderate condition, and spawning may occur, but there could be improvements. However, if any attribute has a score of 0, then spawning is unlikely to occur.

There is natural variance in habitat at every site, so sites were scored using the most representative condition. One habitat assessment was conducted per site, except for Waikanae River: A, where two assessments were completed, one for the true left bank (TLB) and one for the oxbow. This was due to the large difference between habitat types in the oxbow and the TLB of the main river.

2.4 Egg Searches

Spawning surveys were conducted between May 5 and May 9, 2025, within 2 hours of low tide, using the Whitebait Connection (2024) egg search methodology. Areas of high and moderate habitat suitability were systematically searched for eggs, using a team of two to three people. Each search inspected the stems and root mats of vegetation at the high-water mark. When eggs were located, photographs were taken, and the approximate area of each egg patch was established. All habitat in the immediate area of eggs was thoroughly searched to determine the size of the egg patch.

Eggs were found in very dense vegetation, and counts were estimated using the 10 x 10cm quadrats. To gain an accurate measure and count of each egg patch would have most likely resulted in undue disturbance to the eggs, and potential destruction of patches. Given eggs were in sparse concentrations, it was decided that the risk of destroying eggs was too high, and counts were estimated.

3 Results

The habitat assessment was conducted prior to egg searches occurring. All sites scored in the moderate to high range, however, many sites scored 0 for at least one attribute and are therefore considered unsuitable for spawning.

Three sites are considered suitable for spawning: Waimeha Lagoon, Waikanae A (TLB), Mazengarb A, and Mazengarb C, with scores between 100 and 115. All other sites either had a total score less than 90 or scored a 0 on at least one attribute. The primary issues impacting potential spawning are

bank angle, vegetation type, root mat thickness, and ground moisture. These results are summarised in Table 3-1 below.

The natural variance at each site means that while some sites have been assessed as unsuitable overall, there are pockets of suitable habitat occurring sporadically within each site. Sites considered suitable also had areas of unsuitable habitat.

Eggs were located at two sites: Waikanae River: C, and Mazengarb: A. All eggs were found within the dense root mats of tall fescue (*Festuca arundinacea*).

A summary of each site is provided in Table 3-2 below. Detailed, site-specific descriptions, including photographs, and maps highlighting the area assessed, suitable spawning habitat, and locations of egg deposits are provided in Sections 3.1-3.3 below.

Table 3-1: Results of Spawning Habitat Assessments

Attributes	Waimeha Lagoon	Waikanae: A (Oxbow)	Waikanae: A TLB	Waikanae: B	Waikanae: C	Mazengarb: A	Mazengarb: B	Mazengarb: C
Fish Access	5	10	10	10	10	10	10	10
Saltwater Access	5	10	10	10	10	10	10	10
Bank Angle	10	0	10	0	0	5	10	10
Bank Material	10	10	5	5	5	10	10	10
Vegetation Cover	10	5	5	10	10	10	5	5
Vegetation Height	10	5	10	10	10	10	0	10
Vegetation Type	5	0	10	10	10	10	0	5
Root Mat Thickness	5	0	5	10	10	10	0	5
Ground Moisture	10	10	10	0	0	10	10	10
Fish Cover	10	5	10	5	5	10	5	5
Bank Maintenance	10	10	10	10	10	10	10	10
Livestock Access	10	10	10	10	10	10	10	10
Total Score	**100**	**75**	**105**	**90**	**90**	**115**	**80**	**100**

Table 3-2: Summary of available habitat, and egg search results

Site	Suitability for spawning	Description of Habitat	Issues	Eggs found
Waimeha Lagoon	Lower half of stream suitable on both banks. Variable suitability in the upstream half.	Dense vegetation and gentle sloping bank in the lower half of the reach. Vegetation becomes more variable and sparser in the upper half.	Potential barrier to fish passage due to culvert at the downstream end. The upper half of the reach has less suitable vegetation. Water level may not support adult populations at low tide (this is unconfirmed).	No
Waikanae: A (Oxbow)	Unsuitable for spawning.	Oxbow connected to main river via embedded culverts. No fish passage barriers. Riparian area has been replanted with native vegetation. Habitat is suitable for adult fish.	Steep and mostly unvegetated banks. Some large woody species overhang the banks, but do not provide adequate spawning grounds.	No
Waikanae: A (TLB)	Suitable for spawning.	Bank opposite oxbow. Banks are gently sloping here and have suitable grassy vegetation.	Vegetation not especially dense, and there are some gaps at the bases, exposing soil.	No
Waikanae B	Mostly unsuitable for spawning.	Left and right bank, downstream of oxbow. Banks are vegetated with tall fescue. There may be pockets of suitable habitat, however none were observed during this assessment.	Banks are undercut, and the high tide does not reach the dense root mats. The bases of vegetation are dry.	No
Waikanae C	Mostly unsuitable for spawning.	Similar to Waikanae River: B. A lot of active erosion, especially on the true right bank. Erosion occasionally creates suitable habitat.	Undercut banks, making root mats inaccessible. Bases of vegetation very dry. This area is being modified in July 2025 as part of GWRC flood protection work and the river will no longer flow against the vegetated banks, but down the middle of the channel between two gravel beaches.	Yes – one small deposit on true right bank.
Mazengarb: A	Suitable for spawning.	Pool habitat at the upstream end of the stream. Banks densely vegetated with tall fescue.	Potential water quality issues from wastewater treatment plant discharge and farm drainage.	Yes – multiple deposits on true left and true right bank.
Mazengarb: B	Mosty unsuitable for spawning.	Main Mazengarb Stream channel, downstream of the pool habitat. Soft	Vegetation is mostly unsuitable for spawning. A lot of woody shrubs like gorse,	No

		bottom, slow flowing stream with gently sloped banks. Banks have a variety of vegetation, primarily large woody shrubs.	and flax. Some pockets of grass and sedge species, but these are very limited and spread far across the channel, between banks.	
Mazengarb: C	Mostly suitable for spawning.	Narrow tributary to the Mazengarb Stream. Variable bank habitat, transitioning from estuarine species in the lower half to wetland species in the upper half.	Variance in suitability of vegetation. Some areas of very dense sedges are suitable. However herbaceous plants become more common further upstream, particularly around the saltwater wedge.	No

3.1 Waimeha Lagoon

The Waimeha lagoon formed when the Waimeha Swamp was drained in the 1970s. It is now being restored through planting and weed and pest control. It is known to host a range of species, including, paradise ducks (*Tadorna variegata*), royal spoonbills (*Platalea regia*), and eels (*Anguilla* sp.) (Kapiti Coast District Council, 2025).

At the upstream end, the lagoon is fed by a small stream. It passes through a culvert before entering the lagoon. At the time of the survey KCDC were completing work on a weir at the downstream end of the lagoon. To conduct this work, the weir was opened to allow for tidal flushing, seeing the water levels in the lagoon drop lower than normal. Low tide, combined with the already lower water levels meant the small stream had very low flow. The culvert connecting the stream to the lagoon would likely be a major barrier to fish passage during low level flows such as this. This is due to the very shallow water depth through the culvert. It is unclear whether normal low tides would create a similar issue.

Approximately 120 metres of stream was assessed (Figure 3-1). This section of stream is between two culverts. Upstream of this area the stream flows through private land. The riparian area of the assessment reach is a focus of the local care group, and it has been re planted with a variety of native vegetation such as ti kōuka (*Cordyline australis)*, kōwhai (*Sophora microphylla*), and titoki (*Alectryon excelsus*).

The lower section of the stream was the most suitable spawning habitat, with low gradient banks covered in dense long grasses, such as tall fescue (*Festuca arundinacea*), a plant favoured by inanga (Figure 3-2, Figure 3-3). Suitable habitat became sparse moving further upstream toward the second culvert. Often the banks were unvegetated and muddy (Figure 3-4, Figure 3-5). Small areas of suitable habitat existed in the upper section; however, it was not consistent.

Egg searches were conducted in all areas deemed suitable for inanga spawning. No inanga eggs were found during the searches.

Figure 3-1: Waimeha Lagoon survey reach, showing area of suitable spawning habitat

Figure 3-2: Downstream extent of assessment reach, looking upstream from culvert

Figure 3-3: Suitable habitat, near downstream end of reach

Figure 3-4: Marginal habitat approximately halfway along the reach

Figure 3-5: Unsuitable habitat, approximately halfway along reach

Potential Issues

It is unclear how much the opening of the lagoon weir impacted the stream level. The water level at the time of the survey would be unlikely to sustain adult inanga populations, due to the shallow depth. Adult inanga prefer slow flowing habitats with a depth of at least 30cm. The water level at the time of assessment was less than 5cm in many sections of the reach. Some refuges existed; however, these were minimal compared to the length of shallow habitat. No inanga were observed in these refuges, however one eel/tuna was observed at the upstream end of the reach, immediately below the culvert. It is possible there is adequate habitat available for adult inanga upstream of this culvert, however this was not assessed during this survey. During high tide, the stream is suitable to support adult inanga populations (Figure 3-6,Figure 3-7).

Wading birds, such as Pukeko, had clearly foraged along the stream length, with footprints throughout the muddy bed and banks. If the stream level retreats to similar levels at all low tides, it leaves inanga (adults and eggs) very vulnerable to avian predation.

Figure 3-6: Downstream end of the reach at high tide

Figure 3-7: Approximately halfway along reach, at high tide

3.2 Waikanae River

Three areas in the main Waikanae River were assessed. This included the TLB near Otaihanga Domain, and the oxbow opposite (Waikanae River: A), the TLB and TRB downstream of the oxbow (Waikanae River: B), and previously confirmed spawning locations, near the Mazengarb Stream confluence (Waikanae River: C, TLB and TRB). Consistently suitable spawning habitat was only

found on the TLB of Waikanae River: A. Some suitable habitat was found dispersed across Waikanae River: C. Egg deposits were found on the TRB of Waikanae River: C (Figure 3-8).

Figure 3-8: Waikanae River survey sites, suitable habitat, and egg deposits

3.2.1 Waikanae River: A (Oxbow and TLB)

Like the Waimeha Lagoon, a local community restoration group, Friends of Waikanae River, have restored the riparian area surrounding the oxbow, as well as sections of the bank downstream of the oxbow. Opposite the oxbow on the TLB, the banks are primarily comprised of long grass species such as tall fescue. Large exotic trees are also present.

The oxbow is connected to the main river via culverts underneath a popular walking path. The culverts are embedded, and not a barrier to fish passage. It is highly likely inanga, and other fish, use the habitat available in the oxbow. While it had been planted with native vegetation, it was primarily large woody species, leaving very little overhanging vegetation at the waterline. Furthermore, banks were steep in the oxbow, in some areas they were close to vertical. These two features severely limit the ability for inanga to spawn. No suitable habitat was found within the oxbow.

The TLB was suitable for inanga spawning, as had previously been indicated. The bases of the grasses dominating the banks became are submerged during high tides and remain damp. No eggs were found in this location.

3.2.2 Waikanae River: B

Tall fescue is the dominant species downstream of the oxbow, on both the true left and true right banks (TRB). This species dominates as far as Waikanae River: C.

Both banks appeared to be suitable, however, closer inspection revealed very undercut banks, providing little access to the bases and root systems of the vegetation (Figures 3-9, 3-10). Only the long stems and leaves of the grass overhung the water. The bases of these plants were set back behind the high tide mark. The vegetation available to inanga was not suitable for spawning as it provided little shelter and became dry during low tide. The inability to harbour damp conditions to

foster egg development outside of water makes it unlikely eggs would survive here, if they were deposited.

No eggs were found during searches of this area.

Figure 3-9: Large exotic trees present near the oxbow

Figure 3-10: Undercut on true right bank below oxbow

3.2.3 Waikanae River: C

The TLB habitat was similar to Waikanae River: B with banks dominated by tall fescue. Some small native shrubs were sporadically growing, but they were not within the high tide line. The bank was eroding, and undercut. While vegetation was overhanging, it was just the stems and leaves, and the bases of the plants were above the waterline. The vegetation accessible during high tides, was very dry, and would not support egg growth. This was consistent along this entire section (Figures 3-11,3-12). Some suitable habitat was found at the downstream end of this reach, at the Mazengarb Stream mouth. Banks here were gently sloped and densely covered in sedges. No eggs were found on the TLB.

On the TRB, there was some habitat suitable for spawning. This is consistent with prior surveys, which had located eggs here before. The bank was highly unstable, however. It appeared the constant slumping of the bank was creating occasional platforms of tall fescue (Figure 3-13). The suitable areas were very sporadic and only made up a small proportion of this section. The rest of this area was severely undercut. It is likely the suitable areas would erode further, given the instability along this bank, to a point where they are no longer suitable.

One very small patch of eggs was found at the base of tall fescue. The platform appeared to have recently slumped from the bank and had become accessible for inanga during the most recent high tide. The eggs were not tightly clustered together and were not in high densities. Approximately 30 to 40 eggs were present. It is likely the mobile nature of the habitat has destroyed some eggs (Figure 3-14).

The bank erosion currently poses a risk to surrounding infrastructure, including residential homes. The river channel is therefore being reshaped by GWRC as part of their flood protection work. GWRC plan to relocate the river channel by digging a new path through the gravel island and moving the gravel to the current riverbanks (Greater Wellington Regional Council, 2025). This will impact spawning habitat, as vegetation will take time to reestablish on the riverbanks.

Figure 3-11: True left bank near Mazengarb Stream, unsuitable for spawning

Figure 3-12: Undercut banks near Mazengarb Stream

Figure 3-13: Slumped tall fescue where eggs were located

Figure 3-14: Inanga eggs in the root mats of tall fescue

3.3 Mazengarb Stream

The Mazengarb Stream is a small, lowland tributary of the Waikanae River. The lower half of the stream is within a wetland that is currently being restored with native replanting. This wetland area supports a range of native birds, including Australasian bittern (*Botaurus poiciloptilus)* and fernbirds (*Bowdleria punctata vealeae*) (Department of Conservation, 2022). The stream flows into the wetland via a culvert, upstream of which the catchment is primarily residential and farmland. The stream receives treated discharge from the Paraparaumu Wastewater Treatment Plant. Inanga are known to be relatively abundant in the stream reach from Mazengarb Reserve to the estuary (Stantec, 2021).. The salt water wedge extent has been located at the upstream end of the wetland channel near the end of Makora Road. Inanga eggs have been found in this area previously.

The pool at the top of the main channel was assessed (Mazengarb: A), as well as the main channel downstream of the pool (Mazengarb: B). Mazengarb: C, refers to the small tributary on the true left, which was also assessed.

Mazengarb: A was the most suitable site for spawning and had the highest density of eggs. Mazengarb: B was mostly unsuitable, but some small pockets of habitat were present, no eggs were located. Mazengarb: C was suitable for spawning, but no eggs were located

Figure 3-15: Mazengarb Stream survey sites, suitable habitat, and egg deposits.

3.3.1 Mazengarb: A

The banks of the pool are comprised of dense tall fescue. The tall fescue has created platforms that are inundated during high tides. The bases of the grasses have formed dense root mats that are easily accessible, and remain very damp during low tide, ideal for supporting egg development (Figures 3-16, 3-17).

All accessible banks were searched for eggs, only a small section was not accessible due to deep water near the base of the culvert. Eggs were found on both the true left and true right banks of the pool (Figure 3-18). Most eggs were found on the true left, with the patch (defined as all egg deposits

within one metre of each other) extended along approximately 10 metres of the bank. The patch was in a very narrow (approximately 10-30cm) band, with deposits sporadically clustered along the 10 metre length.

The deposits were in very dense clusters, near the base of tall fescue clumps. After the first deposit was found, it was clear there were many hidden among the layers of vegetation (Figure 3-19). Locating eggs required gently parting very dense vegetation. This was difficult, and risked damaging and disturbing eggs. It is highly likely that many more deposits were present, beyond those located during the search. An estimated 200-300 eggs were observed here.

Eggs (approximately 50) were also located on the true right bank, however, this was a much smaller area than the true left bank (Figure 3-20). Only one deposit was observed (Figure 3-21.). It was in similar habitat, at the base of very dense tall fescue. There was less suitable habitat overall on this bank.

Figure 3-16: Tall fescue dominating upstream end and true left of the pool

Figure 3-17: True left bank where egg deposits were located

Figure 3-18: Egg deposit on the true left bank

Figure 3-19: Egg deposit on the true left, with another cluster (circled) set further back in the vegetation

Figure 3-20: Location of egg deposit on true right bank

Figure 3-21: True right bank egg deposit

The habitat immediately upstream of the pool is within farmland and has previously been considered for spawning surveys. The farmland habitat is connected to the pool via a twin culvert. At low tide, this culvert becomes perched, creating a temporary barrier to fish passage. During high tide, the culvert is not a barrier.

The section upstream of the pool was not in scope for the 2025 survey, and landowner permission will be required to complete any physical survey work here. While not in scope for this survey, photographs of the habitat were taken to be used for reference for potential future studies. The available habitat upstream of the culvert is very different to the pool, with steep banks that appear to be regularly mowed or grazed (Figure 3-22). It is unclear whether inanga attempt to use this area for spawning, however stock grazing likely renders in unsuitable for a successful spawning site.

Figure 3-22: Mazengarb Stream upstream of the pool

3.3.2 Mazengarb: B

The bank vegetation changes moving downstream of the pool. There is more flax species and woody shrubs. These species are not suitable for spawning. There are very limited patches of tall fescue, which may support spawning, but the primary spawning habitat is in the upstream pool area. The channel is below the saltwater wedge terminus, so it may be less suitable for spawning (Figures 3-23, 3-24, 3-25, 3-26).

No eggs were found.

Figure 3-23: Unsuitable woody shrubs

Figure 3-24: Unsuitable habitat

Figure 3-25: Unsuitable habitat

Figure 3-26: Large section of unsuitable habitat on both banks

3.3.3 Mazengarb: C

The unnamed tributary is narrow in comparison to the primary channel. Tall fescue is uncommon in this reach. Instead, native sedges such as *Isolepis prolifera,* and herbaceaous wetland plants like *Cotula coronopifolia*, and *Persicaria decipiens* are common. Sedges can support successful spawning, but herbaceous plants are not ideal as they don't have the dense root mats preferred by inanga. The vegetation type, particularly where herbs dominated, meant the general cover of banks was more sparse, with areas of muddy substrate often visible (Figure 3-27, Figure 3-28, Figure 3-29).

The downstream half of the true left tributary had the most suitable habitat, with banks in this section dominated by sedges. The area at the predicted saltwater extent, however, was variable, and had a mix of herbaceous plants and sedge. Upstream of the wedge, herbaceous plants began to dominate the banks.

Egg searches were conducted in areas of habitat most suitable for spawning. No eggs were found.

Low tide saw pools form throughout the wetland, that became cut off from the main channel (Figure 3-31, Figure 3-32). Fish, likely adult inanga, were observed in these pools. The bank margins of these pools were dominated by dense sedges and provided good spawning habitat. These banks were searched, but no eggs were located.

Figure 3-27: Downstream section of the true left unnamed tributary

Figure 3-28: True left tributary habitat at the estimated saltwater wedge extent

Figure 3-29: True left tributary habitat upstream of the estimated saltwater wedge extent

Figure 3-30: Common herbaceous vegetation

Figure 3-31: Pool adjacent to true left tributary

Figure 3-32: Pool adjacent to true left tributary

4 Conclusions and recommendations

This survey located habitat suitable for inanga spawning in Waimeha Lagoon, on the Waikanae River true left bank near Otaihanga Domain and at the mouth of Mazengarb Stream, on the Waikanae River true right bank opposite the mouth of Mazengarb Stream, on the Mazengarb Stream near the end of Makora Road, and on a tributary of Mazengarb Stream near Petrel Place.

Inanga eggs were found on the Waikanae River true right bank opposite the mouth of Mazengarb Stream, and on the Mazengarb Stream near the end of Makora Road. Eggs had previously been located at both of these locations.

The stream immediately upstream of Waimeha Lagoon had a relatively large area of habitat suitable for inanga spawning, but it is not clear if this reach has sufficient water depth to support adult inanga, or if the saltwater wedge extends this far upstream due to the presence of a series of culverts and a weir within Waimeha Lagoon. of suitable spawning habitat If a stream does not support adult inanga, spawning will not occur, as adult fish migrate downstream to spawn. There may be adequate habitat upstream of the assessed reach to support adult populations. The restoration efforts in the riparian margins will be improving the available aquatic habitat by improving water quality, and maintaining cool water temperatures, aiding in the support of adult populations of inanga.

This site should be revisited during low tide, once work on the weir has been completed, to establish the extend of adequate adult habitat. If there is adequate habitat available, further spawning surveys would be beneficial. Prior to conducting egg searches, however, the exact extent of the saltwater wedge should be mapped. It should also be confirmed the stream is tidally influenced. Anecdotal information from a member of the public suggests it is not. If this is the case, spawning is unlikely to

occur in the stream and instead may occur within the lagoon itself. Following confirmation of these factors, potential spawning sites can be determined, and egg searches undertaken.

Very little suitable habitat was found in the main stem of the Waikanae River. The primary issue was undercut banks, leaving the dense root mats of vegetation above the high tide line. One small egg deposit was located on the TRB, just upstream of the Mazengarb Stream confluence. This area of the river is highly impacted by erosion, deeming it mostly unsuitable for a continually successful spawning location. This area is currently being reshaped by GWRC as art of their flood protection work. The new habitat will differ greatly from the assessed habitat and will likely reduce available spawning habitat.

The Mazengarb Stream supported the greatest density of spawning in the 2025 survey. Remapping the saltwater wedge extent in the Mazengarb Stream and its tributary should be a priority prior to conducting further spawning surveys.

It is possible the other areas surveyed in 2025 are used for spawning but were not in active use during the survey. Spawning can occur anywhere between late January and early June. Only one survey of each site was conducted in 2025. To garner a comprehensive understanding of the extent of spawning activity occurring in the catchment, regular surveys could be undertaken across the next spawning season. This will establish when spawning peaks in the Waikanae Catchment, and whether other locations are utilised at different times of the year. Regular surveys will be required moving forward to quantify the impact restoration efforts are having, as is the aim under the current monitoring plan.

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