

# *Galaxias* “Nevis” (*Nevis galaxias*) habitat description



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New Zealand Government



Cover: *Galaxias* “Nevis” habitat, Coal Creek, Nevis River catchment. Photo by Nicholas Dunn

DOC-7707169

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Recommended citation:

Dunn, N.R.; Boddy, N.C. 2024: *Galaxias* “Nevis” (Nevis galaxias) habitat description. Unpublished report DOC-7707169.

Department of Conservation, Wellington, New Zealand. 6 p.

In the interest of forest conservation, we support paperless electronic publishing.

# Abstract

*Galaxias* “Nevis” occupy habitat typified by large gravel and cobble substrata predominantly in riffle and run habitats or slow bedrock dominated runs, separated by cascade-riffle chutes of short, steep, narrow tributary streams of the Nevis River. These habitats are vulnerable to sedimentation and the increasing distribution of salmonids.

## 1. Introduction



Figure 1. *Galaxias* “Nevis” (*Nevis galaxias*). Left photo by Nixie Boddy, right photo by Rod Morris.

*Galaxias* “Nevis” (*Nevis galaxias*) is an iteroparous, spring spawning, non-diadromous, undescribed taxon endemic to Otago on South Island. *Galaxias* “Nevis” has a highly fragmented distribution within wetland and stream habitat types wholly located in the Nevis River catchment, within the Clutha River catchment. *Galaxias* “Nevis” has a conservation status of Threatened: Nationally Endangered (Dunn et al. 2018).

Qualitative habitat descriptions based on field observations and measurements are given for *Galaxias* “Nevis”, complimenting quantitative descriptions following Instream Flow Incremental Methodology (IFIM) assessments of Sinton et al. (2021). Descriptions are designed to typify the range of instream habitat conditions adult *Galaxias* “Nevis” occur in, at a mesohabitat scale.

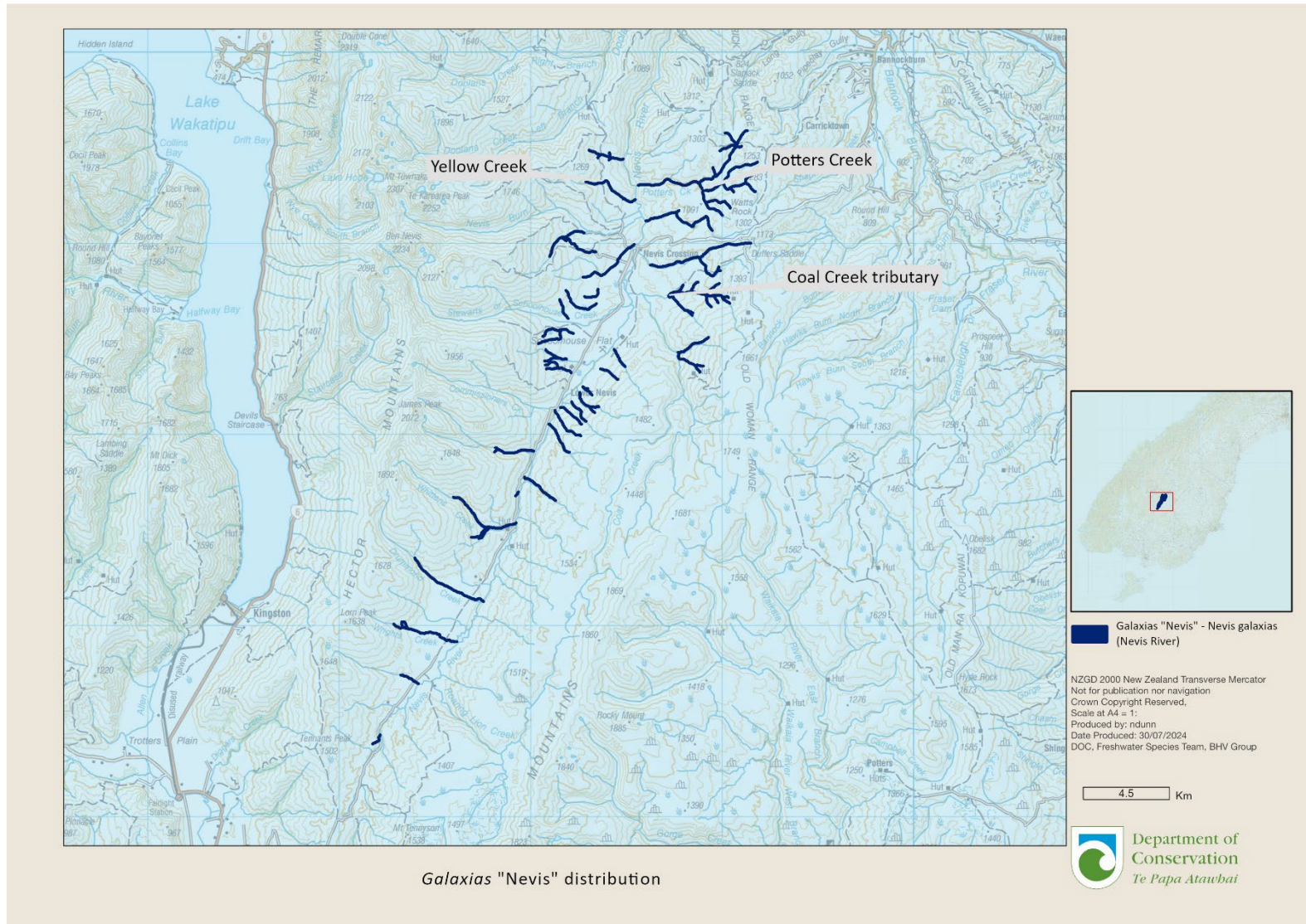


Figure 2. Known *Galaxias* “Nevis” habitat fragment distribution with sites included in the current study indicated.

## 2. Methods

Three tributaries of the Nevis River were sampled in February 2021 (Table 1): Coal, Potters, and Yellow creeks, being the same sites as reported on by Sinton et al. (2021). Site selection was based on *Galaxias* “Nevis” being previously known at these locations, with timing designed to coincide with the summer low-flow period, and to not interfere with spawning and larvae/post-larval/juvenile rearing periods.

Table 1. Location of study streams for *Galaxias* “Nevis” in the Nevis River catchment. Coordinates are for the midpoint of sampled sites.

Stream	NZTM Easting	NZTM Northing
Coal Creek tributary	1287200	4987252
Potters Creek	1289007	4992822
Yellow Creek	1283701	4993155

In each stream a sampling reach containing a variety of instream habitat types was selected. Starting at the downstream end of reaches, transects were marked at 3.0 m intervals. Within each transect a 0.75 m x 0.75 m quadrat was carefully placed within the stream to cover the dominant flow, water depth and substrata conditions. A 1.0 m wide push net was placed along the downstream edge of the quadrat and three-pass electrofishing of the quadrat was conducted using a Kainga EFM 300 backpack electrofishing machine (NIWA Instrument Systems, Christchurch). Each pass consisted of 5 seconds of electrofishing time in a downstream direction, stopping for a minimum of 5 seconds between passes. Captured fish were identified to taxon and measured to the nearest 0.5 mm, then placed in an aerated bucket of water to recover before being released.

Locations of quadrats were recorded by GPS and water depth and velocity measured at the centre points of quadrats. Water velocity was measured at 0.6 depth using a Marsh McBirney Flo-Mate 2000 electromagnetic current meter. Percentage substrata composition was estimated within the quadrat using modified Wentworth scale size classes: bedrock (>4096 mm), boulder (256-4096 mm), cobble (64-256 mm), large gravel (8-64 mm), fine gravel (2-8 mm), sand (0.06-2 mm) and silt (<0.06 mm). Percentages of algal and macrophyte cover within the quadrat were also estimated.



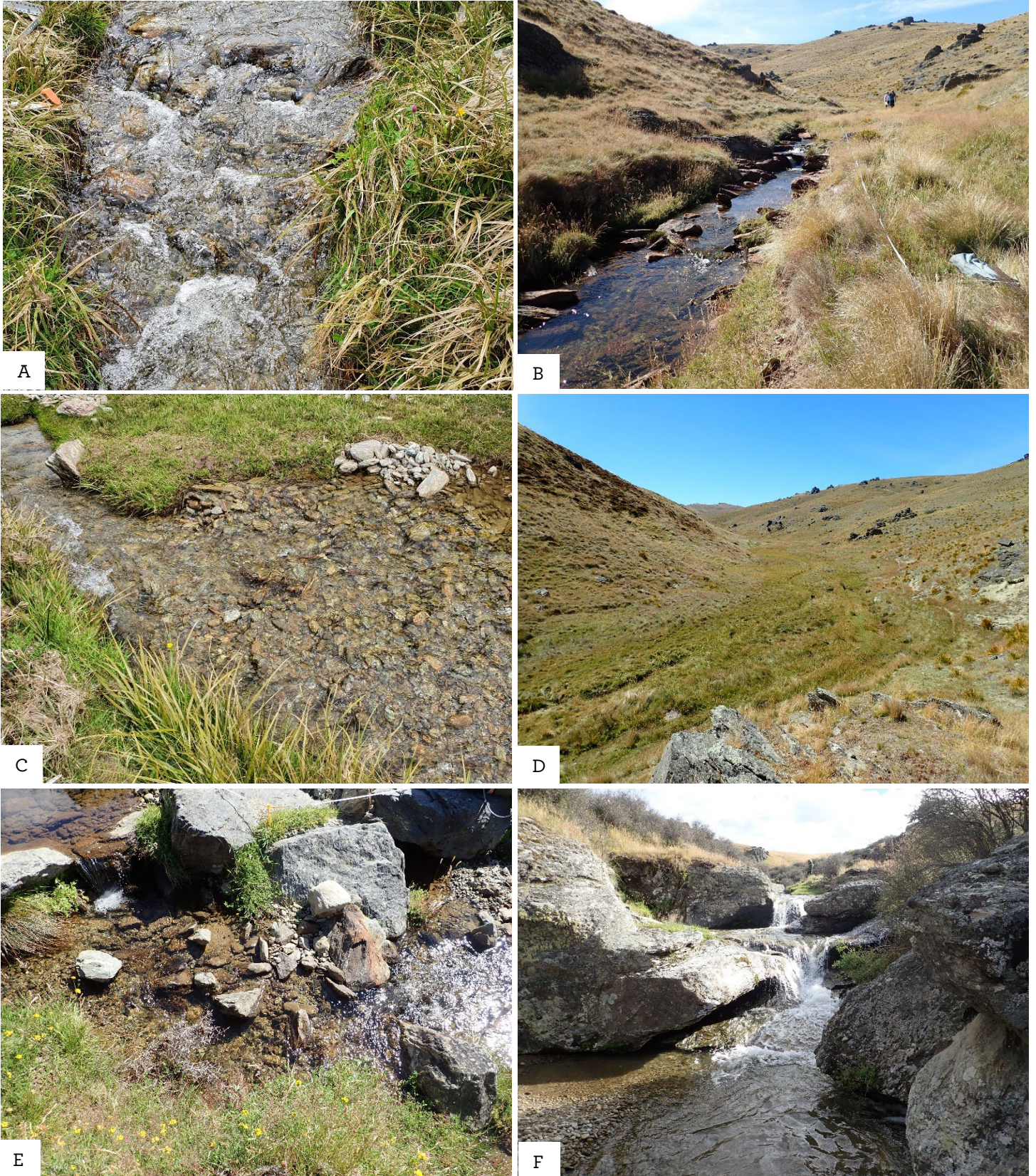


Figure 2. *Galaxias* “Nevis” habitat. (A) narrow cobble dominated riffle. (B) bedrock dominated run and cascade chutes. (C) gravel substrata dominated run-riffle sequence. (D) wetland valley flow. (E) steep pool-riffle sequence. (F) waterfall barrier with bedrock created chutes



### 3. Results

A total of 98 quadrats were sampled across the three tributary sites, with *Galaxias* “Nevis” captured in 44 of these, spread similarly (12-19) across the three streams, although density was slightly higher in Potters Creek compared to other sites. Characteristics of the sites *Galaxias* “Nevis” were present at are summarised in Table 2.

*Galaxias* “Nevis” were recorded predominantly in moderately fast, moderately deep riffle-run-pool habitat with cobble substrata (Table 2). These observational findings contrast with the analyses of (Sinton et al. 2021) who found *Galaxias* “Nevis” showed weak preference for large gravel and cobble substrata, fast, moderately deep habitats.

Table 2. Habitat attributes recorded within the 44 quadrats where *Galaxias* “Nevis” were present. Units are as presented, and percentages were visually estimated.

Attribute	Mean	Range (min – max)
Stream width (m)	1.16	0.42 - 3.1
Flow velocity (ms <sup>-1</sup> )	0.42	0.01 - 1.08
Substrata size class (mm)	>64 <sup>1</sup> - <256 <sup>2</sup>	>16 <sup>3</sup> - >4096 <sup>4</sup>
Water depth (cm)	19.2	6 - 52
Riffle habitat (%)	39.7	0 - 100
Run habitat (%)	40.2	0 - 100
Pool habitat (%)	20.1	5 - 100
Macrophytes (%)	0.05	0 - 2.5
Algae (%)	7.8	0 - 90

<sup>1</sup> Cobble

<sup>2</sup> Boulder

<sup>3</sup> Large gravel

<sup>4</sup> Bedrock

### 4. Discussion

Based on field measurements and observations, *Galaxias* “Nevis” typically occur in small order hillslope stream habitats characterised by narrower, natural irregularly meandering channels. These habitats have moderate water velocities, shallow to moderately deep riffle-run units grading to small marginal pools with large gravel – boulder substrata, typically creating interstitial refugia. In Potters Creek, habitat is predominantly long slow velocity runs over bedrock with steep cascade-riffle chutes created by gradient changes and dominated by large boulders. Channel form is influenced by the short steep form of valleys, with channels being on flatter, sometimes wetland dominated valley floors, typically

being of a wide box or shallow ‘V’ form, tending to become narrower and incised in areas of steep valley sides.

In areas dominated by bedrock, silts overlies larger particles which are often coated in medium depth films of brown algae. In faster run and riffle habitats, cobble-boulder substrata are typically clean, visually lacking algal growths. Aquatic macrophytes and wetland vegetation tend to be absent from wetted channels lower in catchments but dominate in the formative channels higher in catchments.

Habitats sampled were located above natural waterfall barriers impeding invasion by *Salmo trutta* (brown trout), meaning observations do not necessarily describe the range of habitats *Galaxias* “Nevis”, potentially can occupy or true habitat preference, rather only those in salmonid-free refugia. Should the integrity of these barriers be compromised, further local extinctions of *Galaxias* “Nevis”, as documented elsewhere in the Nevis River catchment, are likely. Furthermore *Galaxias* “Nevis” habitats are prone to channelisation, sedimentation, and water abstraction.

## 5. Acknowledgements

We wish to thank Katie Fenton (then DOC) and Chris Kavazos (DOC) for assistance in the field, Daniel Jack (DOC) for discussions on *Galaxias* “Nevis”, and the owners of Ben Nevis Station for allowing access to their land on which the sampled streams are located.

## 6. References

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