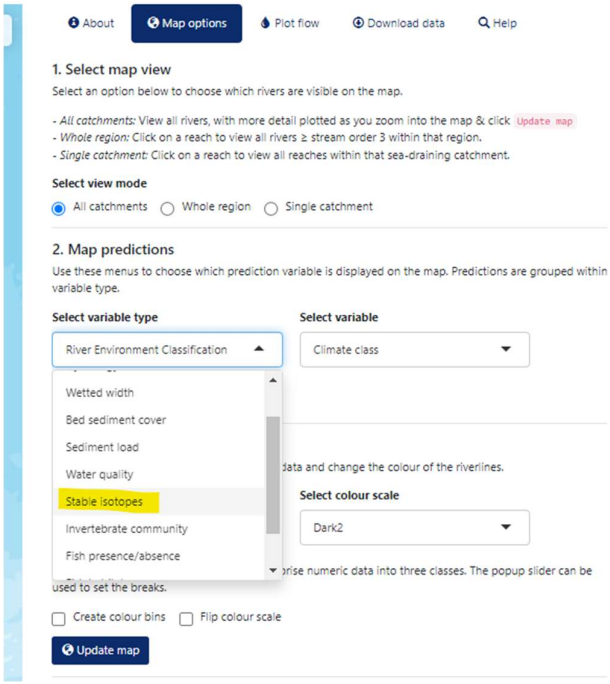
Using NZ River Maps to visualise and download stable isotope data and compare to point measurements

Visualise stable isotope data

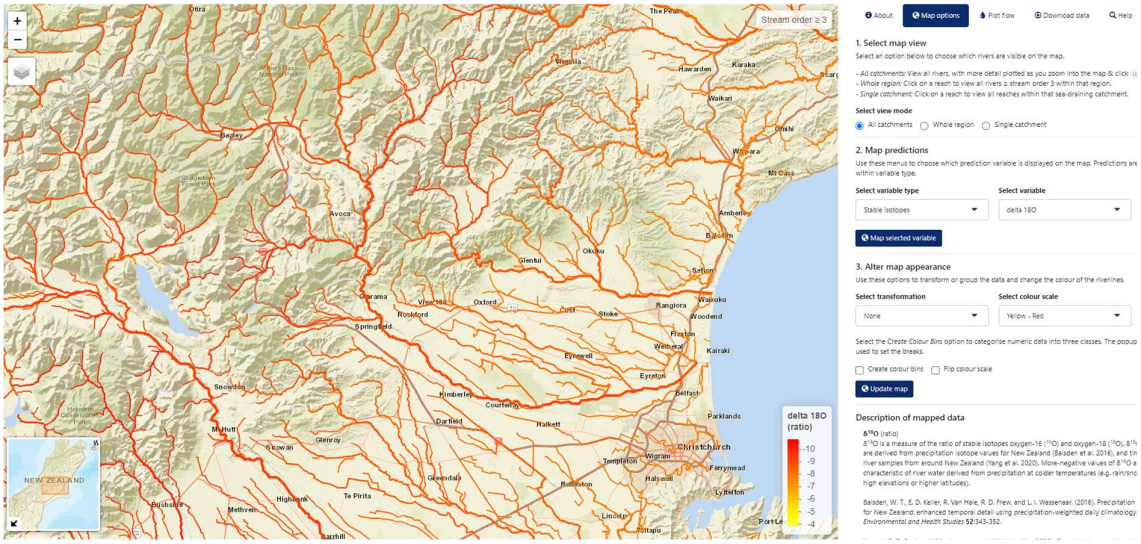
1. Navigate to NZ River Maps at https://shiny.niwa.co.nz/nzrivermaps/
2. On the Map options tab, Choose Stable isotopes from the Select variable type dropdown menu



3. Choose the stable isotope variable (e.g., $\delta^{18}O$) you want to visualise on the Select variable dropdown menu.
4. Press the Map selected variable button to produce a map that will look something like below.

Altering the map appearance

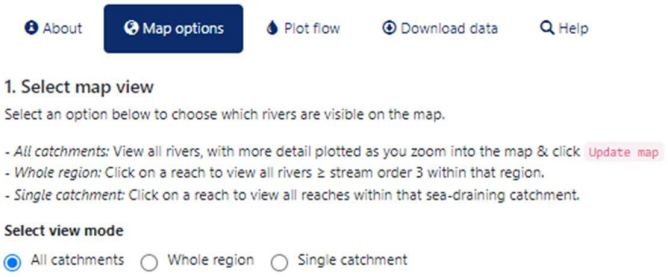
You can alter the map appearance by zooming into the map, applying transformations to the data or changing the colour scheme using the 3 Alter map appearance options on the Map options tab. Each time you change a setting or zoom level, you need to press the Update map button to visualise the changes on the map. For example, you can set the colour scheme to a yellow-red gradient and zoom in to make a map that looks like the one below.



You can also alter the map background by clicking on the icon on the top left of the map.

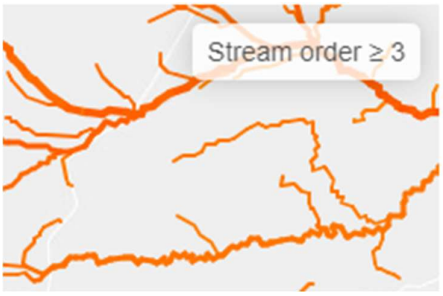
Selecting the map view

There are three scales to visualise data on the map – all catchments, whole regions or single catchment. These are selected using the 1. Select view mode options on the Map options tab and are described in more detail below.



All catchments

By default, NZ River Maps displays reaches on the digital river network at the national scale, with the level of detail determined by the zoom level. You can change the zoom level by using the +/- buttons in the top left corner of the map or using the scroll wheel on your mouse. Don't forget to press the Update map button (as described under *Altering the map appearance* above) to update the map. The level of detail is indicated in the top right corner of the map as the stream orders displayed.



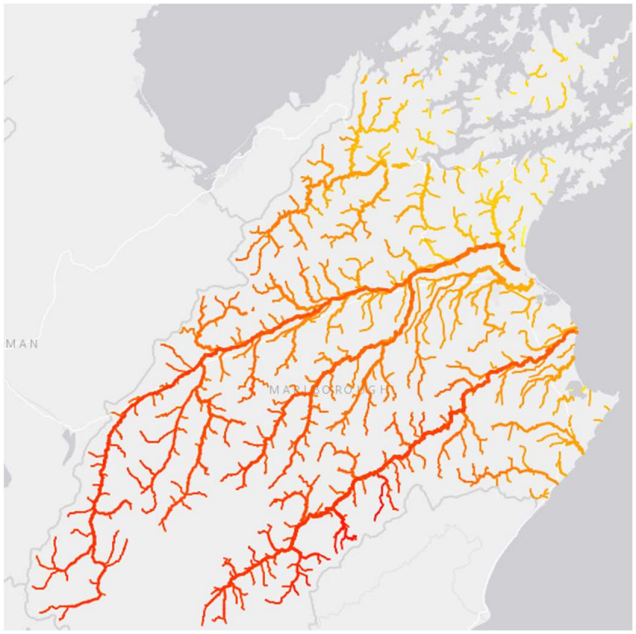
To reset the map view after using the Whole region or Single catchment options, you can select the All catchments option.

Whole region

The whole region setting is designed to visualise data across one of 15 territorial regions in New Zealand.

1. Navigate to the region that you wish to visualise data for.
2. Select the Whole region option under the Select view mode and then click on a reach within your region of interest. Note that you may need to zoom in and Update map to be able to

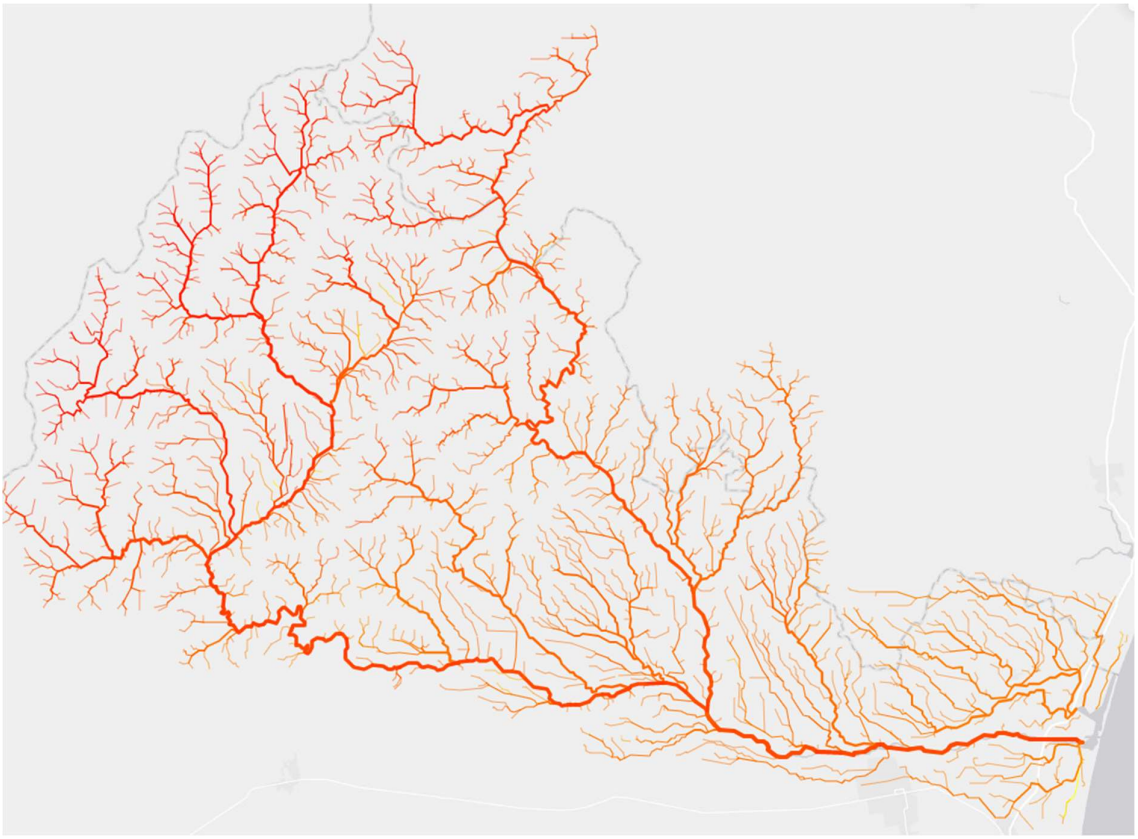
view a reach for clicking first. The map will zoom to the scale of the region and map the data. This may take a few seconds as the dataset might be quite large, so please be patient. The level of detail is restricted to Stream order ≥ for most regions to reduce the computational burden for drawing the map.



Single catchment

The single catchment view mode is designed to plot all reaches within a given catchment.

1. Navigate to the catchment that you wish to visualise data for.
2. Select the Single catchment option under the Select view mode and then click on a reach within your catchment of interest. Note that you may need to zoom in and Update map to be able to view a reach for clicking first. The map will zoom to the scale of the catchment and map the data. This may take a few seconds for large catchments, so please be patient. All stream orders will be plotted under this setting.



Download data from NZ River Maps

NZ River Maps offers the option of downloading data for use in other applications under the Download data tab. The data provided in NZ River Maps is made available to download free of charge to allow you to use it for your own research. All data unless specifically stated is licensed under a Creative Commons Attribution 3.0 New Zealand License and must be attributed back to its original creator. We ask that you also acknowledge the use of NZ River Maps using the suggested citation.

Whitehead, A.L., Booker, D.J. (2020). NZ River Maps: An interactive online tool for mapping predicted freshwater variables across New Zealand. NIWA, Christchurch. https://shiny.niwa.co.nz/nzrivermaps/

To download data:

1. Select your desired metrics. All predictions within a selected metric will be added shown in the table below and will be added to file for downloading.
2. Choose the desired spatial scale for the download. Visible on map will only download data for those reaches currently shown on the map. You can alter the map view using Select view mode on the Map options tab.
3. Click the Download data button to download a csv file of the selected data.
4. Click the Download metadata button to get an html file with information about the downloaded data, including units and the original data source.

The data is provided as a .csv file. If you wish to use this data to make your own maps, then you will need to combine it in a Geographic Information System with the New Zealand digital river network

which is available from the NIWA website (https://niwa.co.nz/freshwater-and-estuaries/management-tools/river-environment-classification-0). The joining column in the two datasets is labelled *nzsegment*.

Comparison with point measurements of river water isotopes

Table 1 provides site information for National River Water Quality Network sites from which stable isotope data has been collected since 2017. These isotope data are stored online through the IAEA GNIR programme. It can be downloaded from the WISER database at https://nucleus.iaea.org/wiser

These data can be compared to modelled isotope values and geographical predictor information by combining it with New Zealand digital river network and NZ River Maps data using the nzsegment joining column.

Table 1. Site information for NRWQN isotope sampling sites.

Site Code	river	Catch. Area km2	Highest Catch. Elev (m)	Site Elev (m)	lat	long	nzsegment
AK1	Hoteo	270	107	15	-36.3862	174.5112	2001653
AK2	Rangitopuni	82	228	10	-36.7349	174.6182	2004545
AX1	Clutha	4453	973	305	-44.7328	169.2802	14014867
AX2	Kawarau	4302	1043	305	-45.0093	168.8785	14027448
AX3	Shotover	1079	1200	320	-44.9918	168.7163	14026862
AX4	Clutha	16548	902	91	-45.6632	169.4057	14055045
CH1	Hurunui	1060	976	442	-42.7922	172.543	13020391
CH2	Hurunui	2525	648	60	-42.902	173.1009	13023957
CH3	Waimakariri	2387	1034	244	-43.3621	172.0557	13040507
CH4	Waimakariri	3076	854	76	-43.423	172.634	13042388
DN2	Sutton Stm	151	672	220	-45.5979	170.094	14052240
DN4	Clutha	20582	790	9	-46.2384	169.746	14070057
DN5	Mataura	5139	470	15	-46.3877	168.7914	15059190
DN7	Oreti	1139	694	220	-45.7186	168.4308	15033324
GS1	Waipaoa	1571	385	55	-38.4684	177.8777	5010343
GS2	Waikohu	30.5	722	457	-38.4172	177.5601	5009160
GS3	Motu	293	622	425	-38.2024	177.6195	4016696
GS4	Motu	1376	607	11	-37.8616	177.636	4005116
GY1	Buller	6309	736	15	-41.8344	171.7013	12012463
GY2	Grey	3827	485	20	-42.4531	171.2992	12028095
GY3	Grey	642	774	171	-42.3616	171.7842	12025991
GY4	Haast	1027	1009	53	-43.9445	169.2987	12052272
HM1	Waipa	304	413	80	-38.2692	175.3501	3029370
HM2	Waipa	2822	201	10	-37.7992	175.1492	3017829
HM6	Ohinemuri	305	248	10	-37.417	175.7155	3010506
HV2	Tukituki	2438	342	26	-39.7164	176.9285	8026822
HV3	Ngaruroro	2001	663	2	-39.5879	176.8877	8024658

HV4	Ngaruroro	384	1108	488	-39.3803	176.3314	8021350
HV6	Mohaka	1040	820	320	-39.1823	176.6343	8017355
NN1	Motueka	1750	613	76	-41.2581	172.8223	10010534
NN2	Motueka	166	1049	376	-41.6336	172.9121	10022270
NN3	Wairau	521	1422	655	-41.8943	172.921	11029639
NN5	Buller	1404	888	183	-41.7664	172.3877	12010223
RO1	Tarawera	414	455	320	-38.1817	176.5049	4014379
RO2	Tarawera	914	374	6	-37.9309	176.7715	4005289
RO3	Rangitaiki	1144	599	185	-38.4572	176.6988	4022486
RO4	Whirinaki	509	528	205	-38.4799	176.7468	4022892
RO5	Rangitaiki	2818	482	3	-38.0412	176.8006	4009262
RO6	Waikato	3305	655	349	-38.6637	176.0815	3043220
TK1	Opihi	2373	542	4	-44.2754	171.3372	13064842
TK2	Opihi	406	627	180	-44.1698	170.9402	13063543
TK3	Opuha	458	1020	238	-44.0828	170.9779	13062111
TK4	Waitaki	9741	1047	250	-44.7063	170.4539	13520779
TK5	Hakataramea	896	695	198	-44.7299	170.488	13521044
TK6	Waitaki	11909	956	5	-44.9315	171.1009	13524234
TU1	Whanganui	2139	553	131	-38.9441	175.1881	7006225
TU2	Tongariro	786	1005	363	-38.9972	175.8137	3048532
WA1	Waitara	1114	257	15	-39.0561	174.2586	6002601
WA2	Manganui	19	725	320	-39.2828	174.2547	6006892
WA4	Whanganui	6567	423	18	-39.7753	175.1469	7026243
WA5	Rangitikei	2689	864	518	-39.8131	175.8077	7027408
WA7	Manawatu	716	371	152	-40.2411	176.116	7037199
WH1	Waipapa	122	237	30	-35.2771	173.6876	1007423
WH2	Waitangi	307	151	10	-35.2793	174.0473	1007625
WH3	Mangakahia	809	231	21	-35.7393	174.0507	1018663
WH4	Wairua	546	159	91	-35.6513	174.1538	1016617
WN2	Hutt	87	576	200	-41.0533	175.1911	9008427
WN5	Ruamahanga	78	829	268	-40.7609	175.6037	9000872