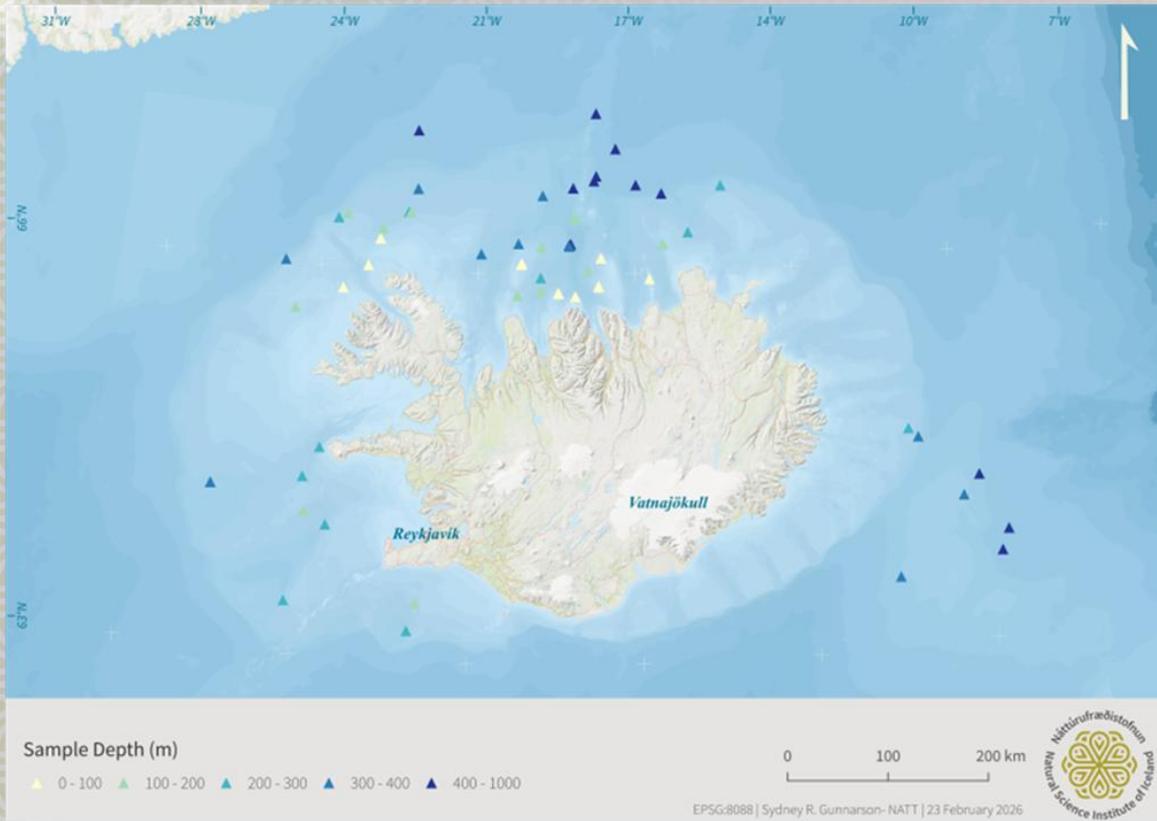**Náttúrufræðistofnun**

# WORKSHOP:
# Basic Vector analysis and map creation

We will create this map, a distribution of samples of the species *'Aquiloniella paenulata'* from the BIOICE campaign in March 2020.
*Instructions will be provided in the following slides and as a pdf.*

The data has been downloaded from the NATT gagnagrunnur and converted into a csv file with only one species for simplicity for this exercise.

Full dataset reference:
https://doi.org/10.5281/zenodo.3728257

The BIOICE station and sample list: revised compilation, March 2020.

Sigmar A. Steingrímsson[1] ;  Gudmundur Gudmundsson[2] ;  Gudmundur V. Helgason[3]

Show affiliations

# Náttúrufræðistofnun

## WORKSHOP:
## Basic Vector analysis and map creation



### Best practices with map creation
*Subject to change based on personal style and use case (e.g. report vs. scientific article vs. internal distribution)*

1. Scale bar

2. Basemap  OR inset map for context

3. Labels to help with understanding

4. North Arrow

5. Legend

6. Grid for coordinate system (outside border)

7. Name / Coordinate reference system/ Affiliations (NOT for scientific articles)

8. Figure caption: Title, description of what map shoes, reference to basemap (e.g. Náttúrufræðistofnun, 2025).

**Náttúrufræðistofnun**
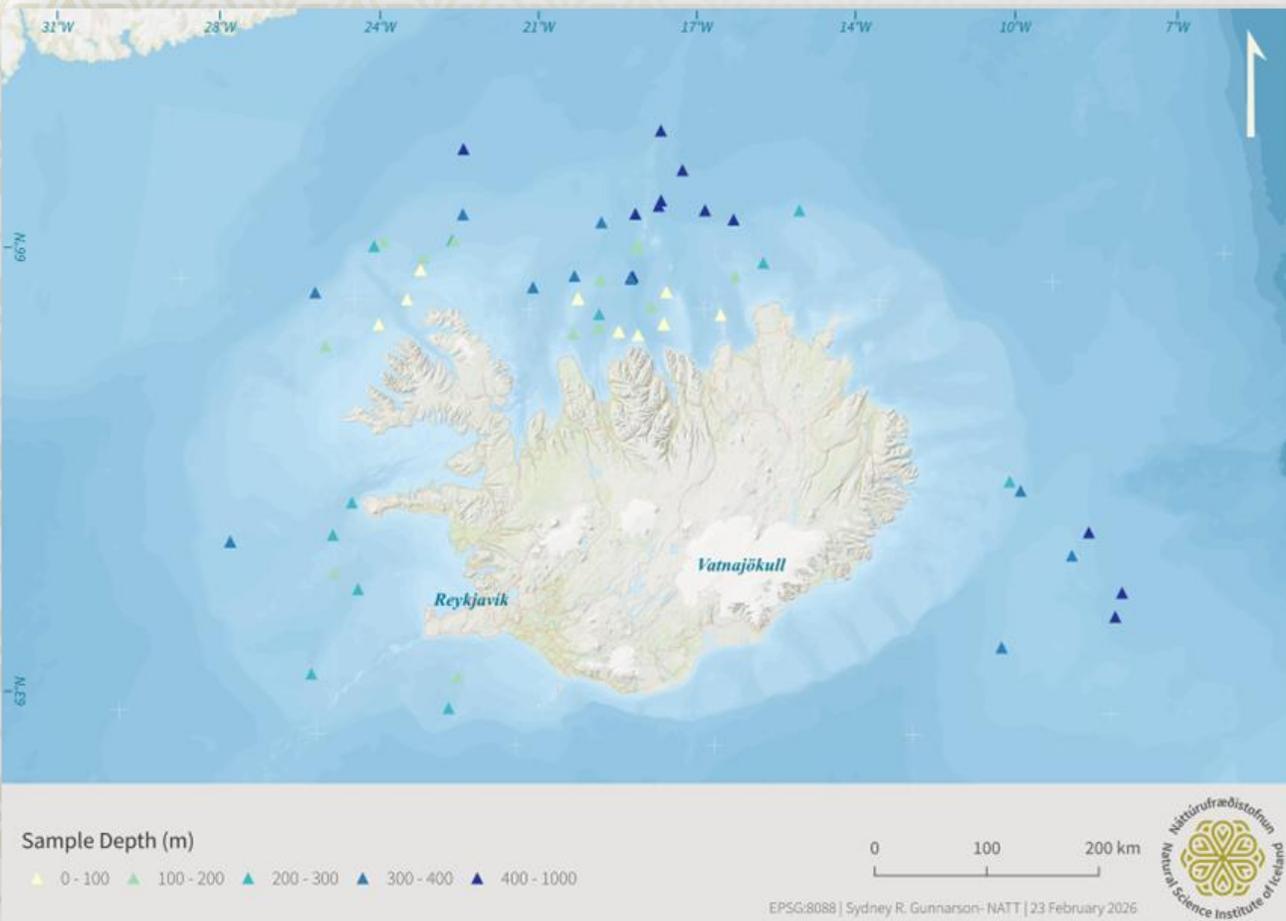
## WORKSHOP:
## Basic Vector analysis and map creation
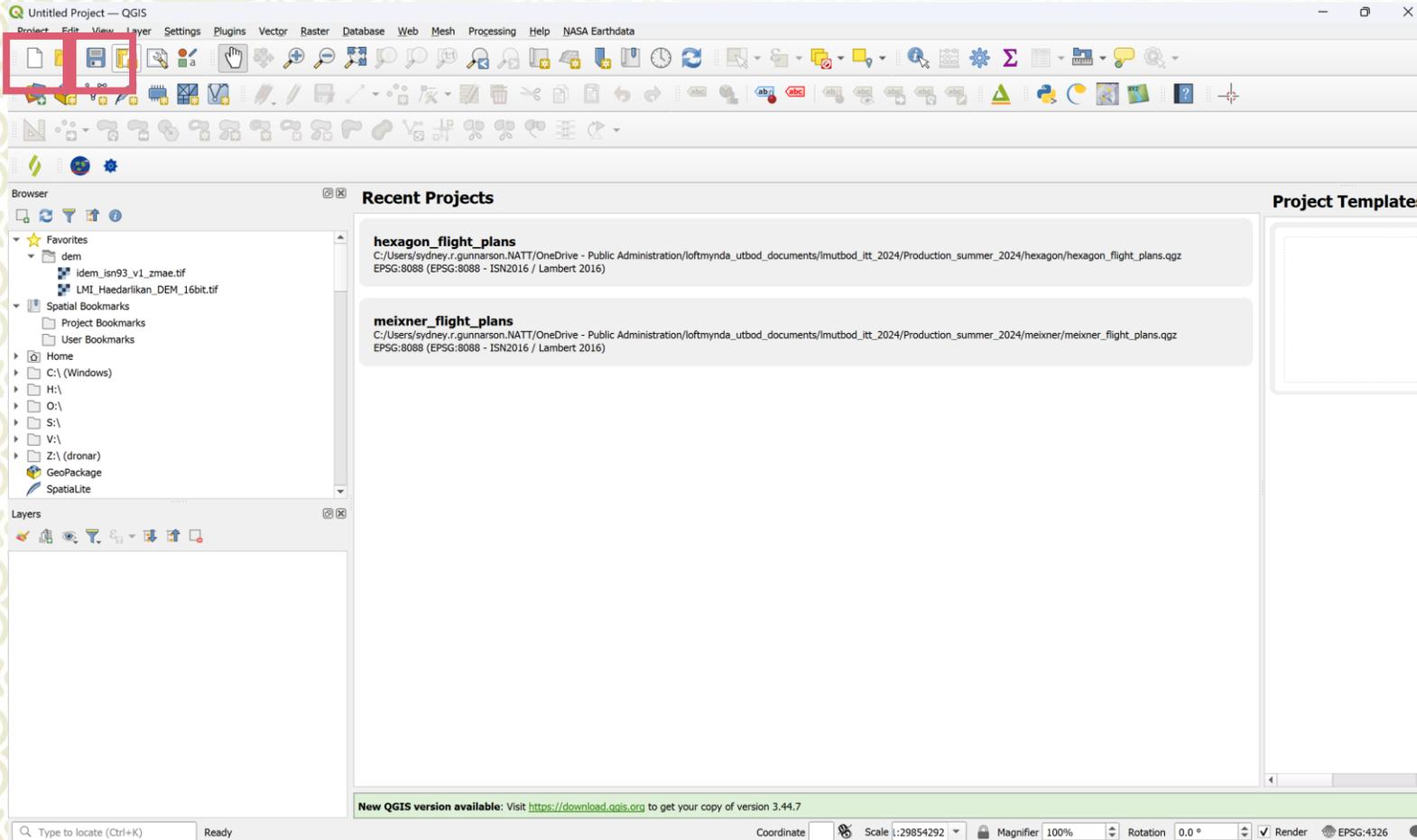
1. Start a new project

2. Download, unzip and save natt_qgis_training_2026-02-26 somewhere locally (e.g. in Documents or similar)

3. Save this QGIS project in the same folder

4. We will use this project in future lectures so keep it

Náttúrufræðistofnun

# WORKSHOP:
# Basic Vector analysis and map creation

Change the project Coordinate reference system to ISN2016 (EPSG:8088)

**Náttúrufræðistof...** ...nd map creation

**Import a basemap via WMS in ISN2016**

- In this case, we will use a basic basemap from Natt
- We will get it from the Natt WMS service:

https://gis.natt.is/mapcache/isn2016/wms

**WORKSHOP:**
**Basic Vector analysis and map creation**

Create a New WMS/WMTS Connection

Connection Details

Name: NATT WMS Raster ISN2016

URL: https://gis.natt.is/mapcache/isn2016/wms

Authentication

Configurations | Basic

Choose or create an authentication configuration

No Authentication

Configurations store encrypted credentials in the QGIS authentication database.

HTTP Headers

Referer:

▶ Advanced

WMS/WMTS Options

WMS DPI-Mode: all

WMTS server-side tile pixel ratio: Undefined (not scaled)

☐ Ignore GetMap/GetTile/GetLegendGraphic URI reported in capabilities

☐ Ignore GetFeatureInfo URI reported in capabilities

☐ Ignore reported layer extents

☐ Ignore axis orientation (WMS 1.3/WMTS)

☐ Invert axis orientation

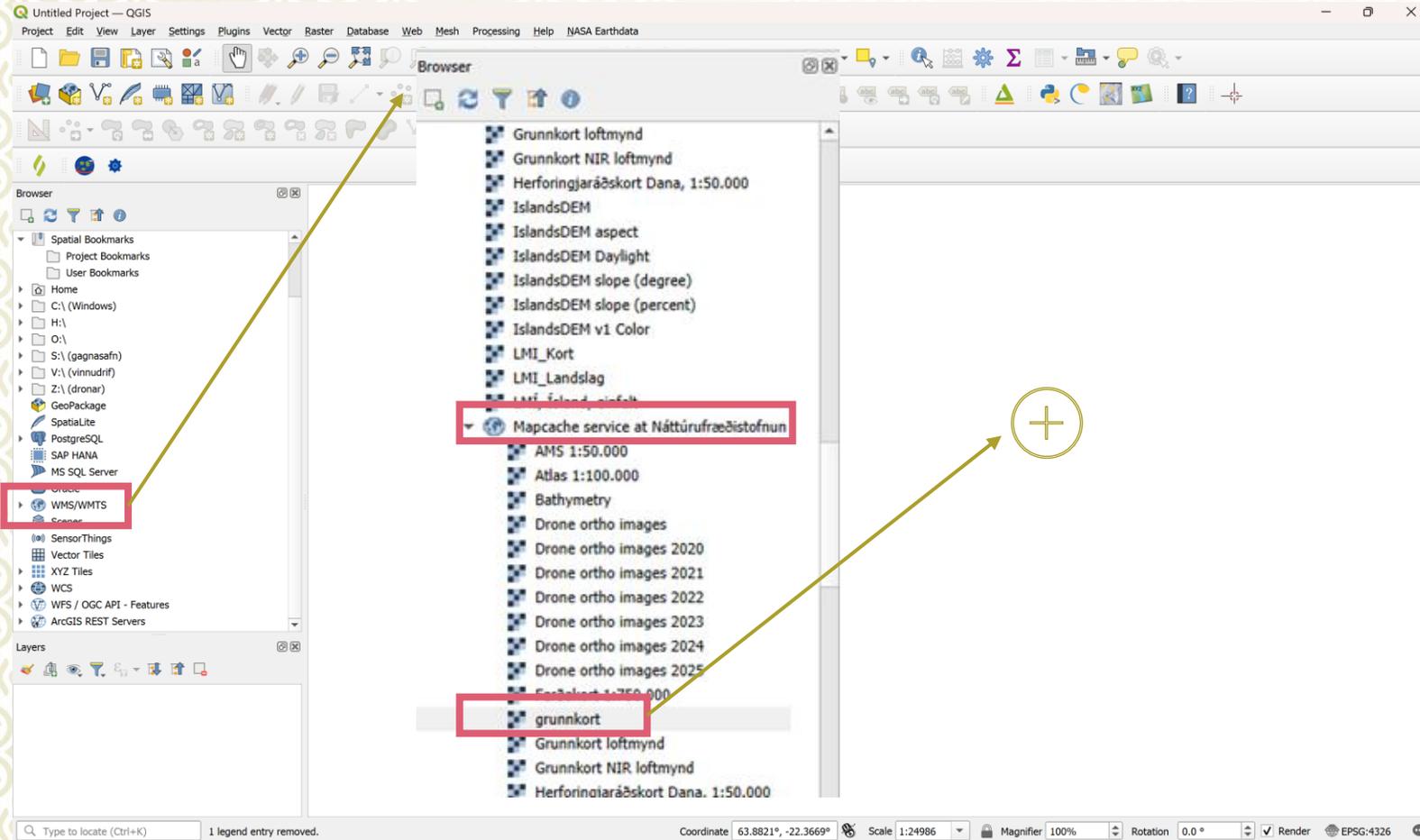☐ Smooth pixmap transform

Give it a name. E.g.:

NATT WMS ISN2016

Copy and paste the link here:

https://gis.natt.is/mapcache/isn2016/wms

No authentication needed

**Náttúrufræðistofnun**

# WORKSHOP:
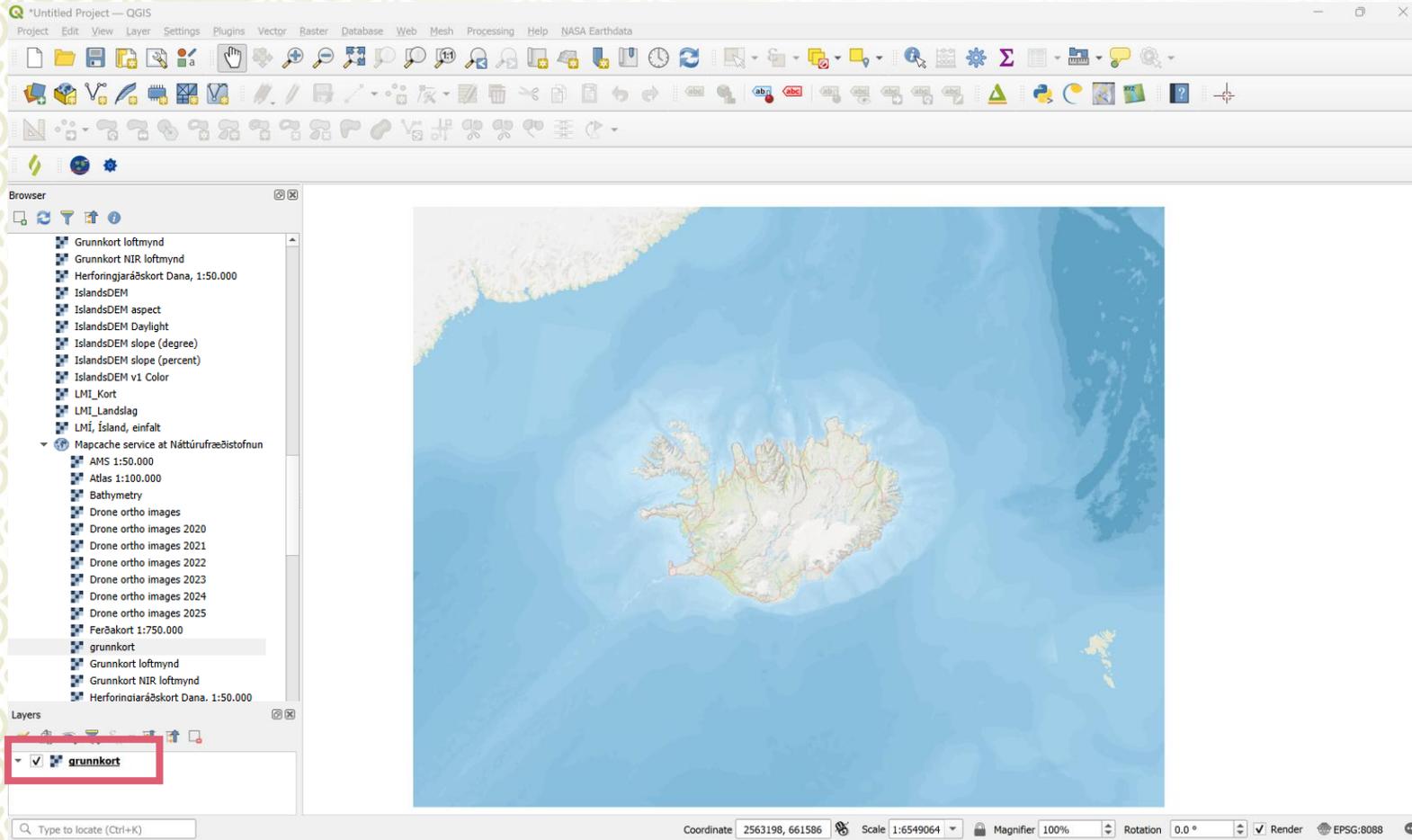# Basic Vector analysis and map creation

Import a basemap via WMS in ISN2016

- Expand layers in WMS in Browser

- Click and drag "grunnkort" into the map

# WORKSHOP:
# Basic Vector analysis and map creation

**Náttúrufræðistofnun**



**Import a basemap via WMS in ISN2016**

- Map shows up in the layers tab
- There are many other basemaps available in NATT WMS such as:

  - DEM
  - Basic outline of Iceland
  - Aerial imagery
  - Bathymetry
  - Atlas

WORKSHOP:
Basic Vector analysis and map creation

Import vector BioIce data as .csv file

- Import the .csv file 'natt_qgis_training_bioice_aquiloniella_paenulata.csv'

Náttúrufræðistofnun

**WORKSHOP:**
**Basic Vector analysis and map creation**

Import vector BioIce data as .csv file

- Encoding (utf-8 default)
  For files with Icelandic characters, use: ISO/IEC 8859-15

- Csv format

- The table has headers

- Lat/Long coordinates

- Here we can see a sample of the data. You can see the data is in Lat/long and therefore should be imported in WGS84

**Náttúrufræðistofnun**

# WORKSHOP:
# Basic Vector analysis and map creation
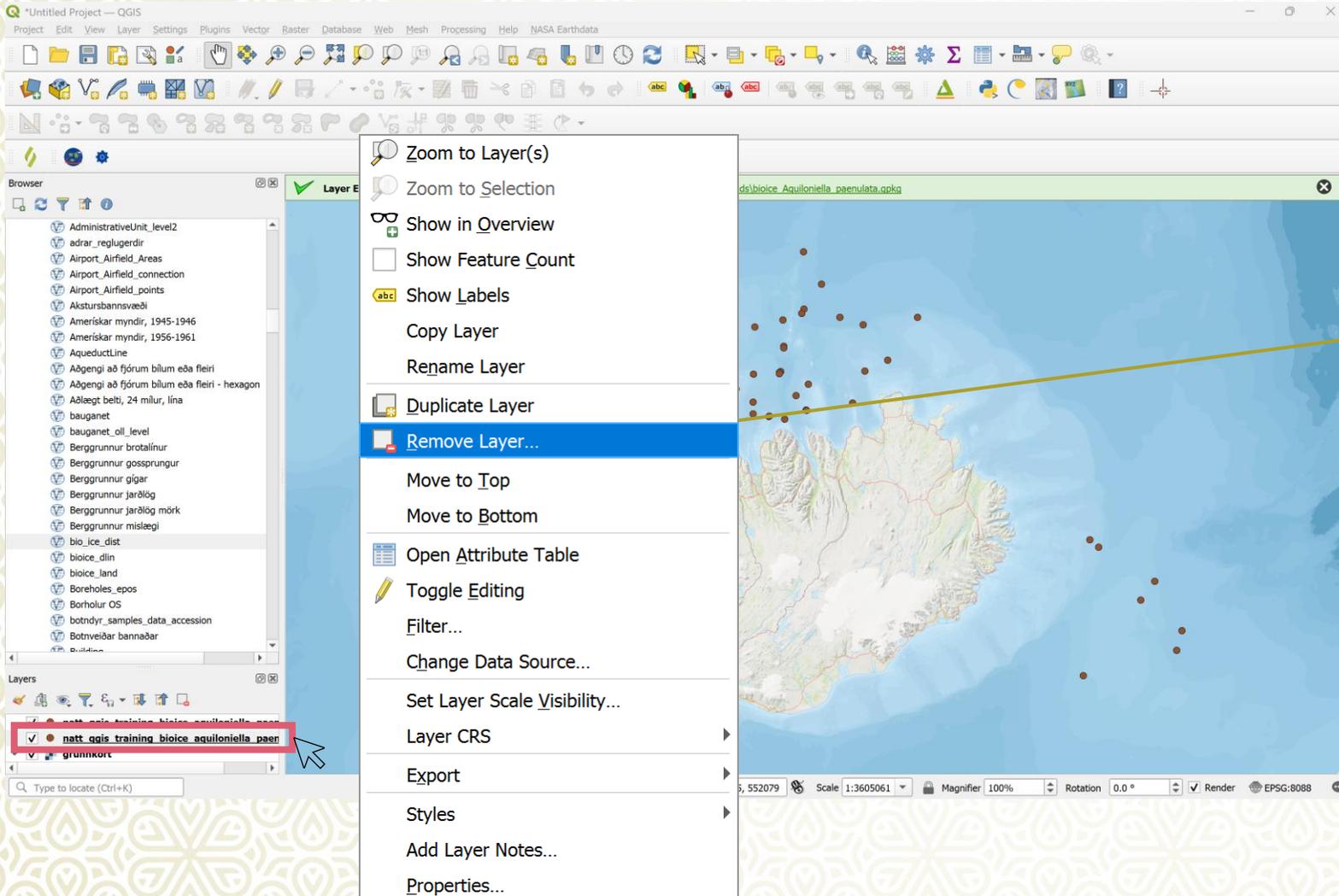
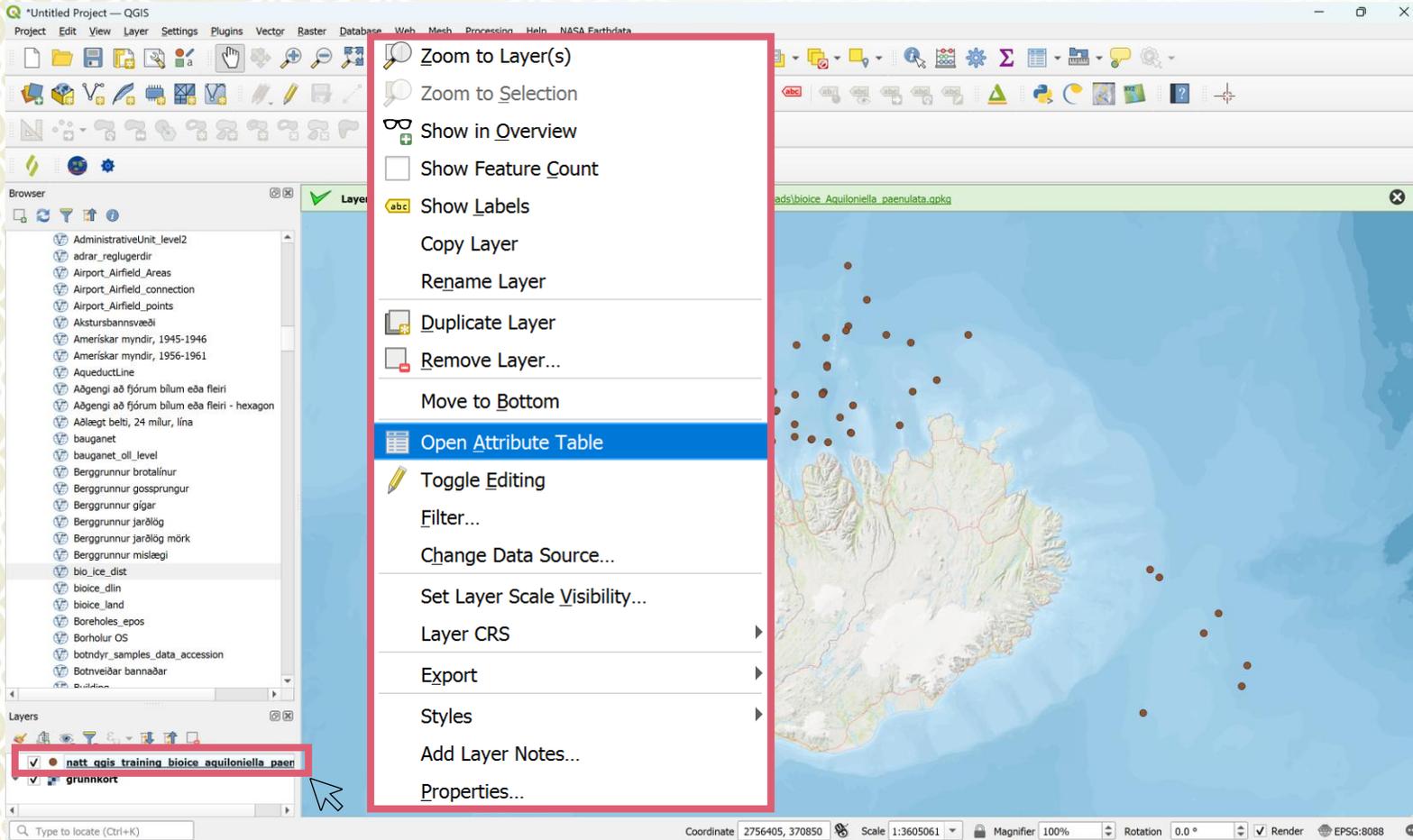Import vector BioIce data as .csv file

- Close the Toolbox for now

- Remove the old .csv file: Right click on the layer below the new geopackage layer, and 'Remove layer…'
- Leave only the new geopackage in ISN2016

# WORKSHOP:
# Basic Vector analysis and map creation

Style the vector layer by Attribute
Part One: What Attributes to use?

Right click on the layer, select
'Open Attribute Table'

WORKSHOP:
Basic Vector analysis and map creation

Náttúrufræðistofnun

**Style the vector layer by Attribute**
**Part One: What are my Attributes?**

- Here you can see all the information stored behind each point in the layer

- Take a look at 'depth', 'temp' and 'salinity'. Since these are values that work on a scale, we can style the layer with a graded color scale.

- Choose one of these three categories to style your layer and look at the values. You can sort the values from biggest to smallest or vice versa by clicking on the attribute column name

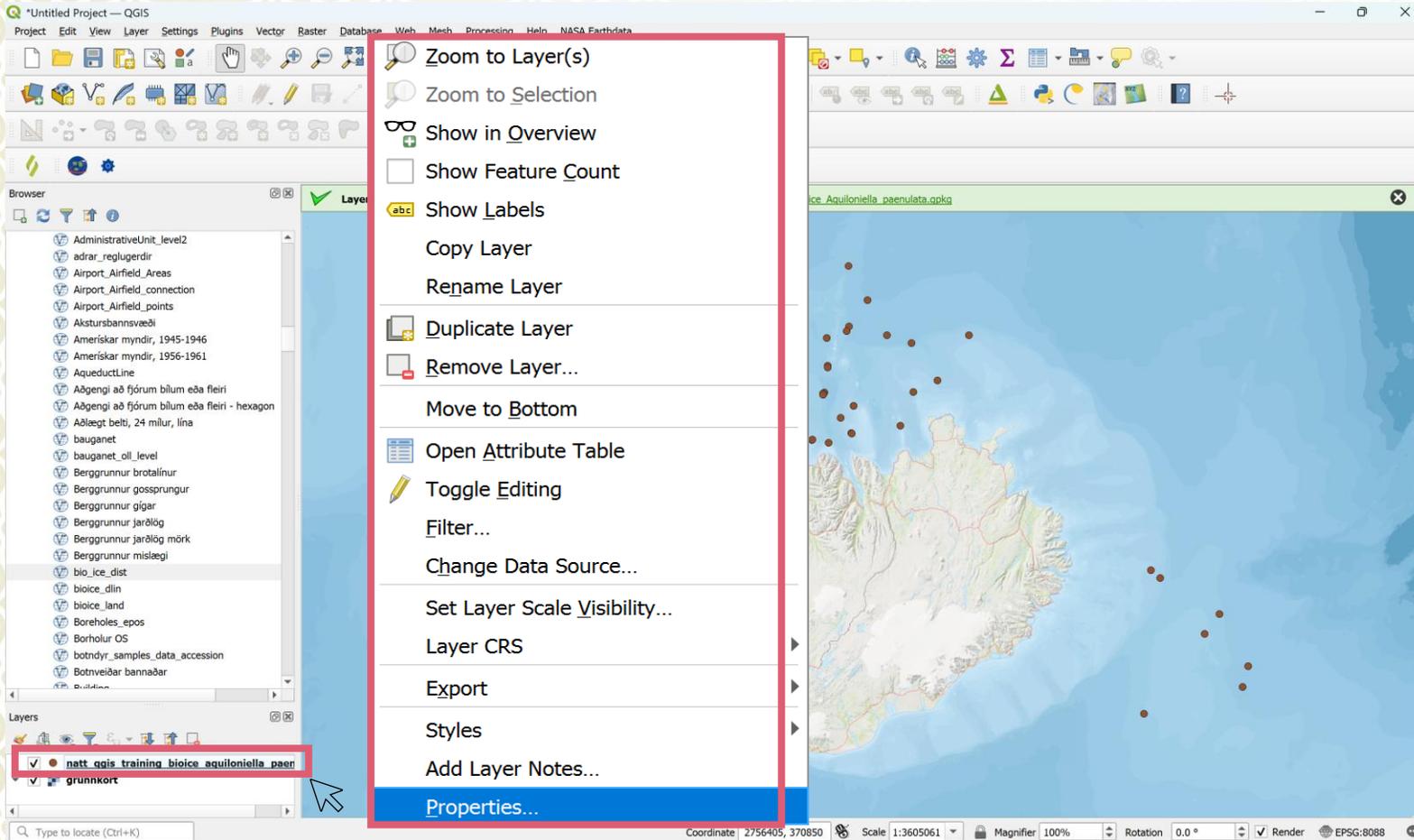- Close or minimize the attribute table when you're done.

**WORKSHOP:**
**Basic Vector analysis and map creation**



Style the vector layer by Attribute
Part two: Style by attribute

Right click on the layer, select
'Properties'

# WORKSHOP:
# Basic Vector analysis and map creation
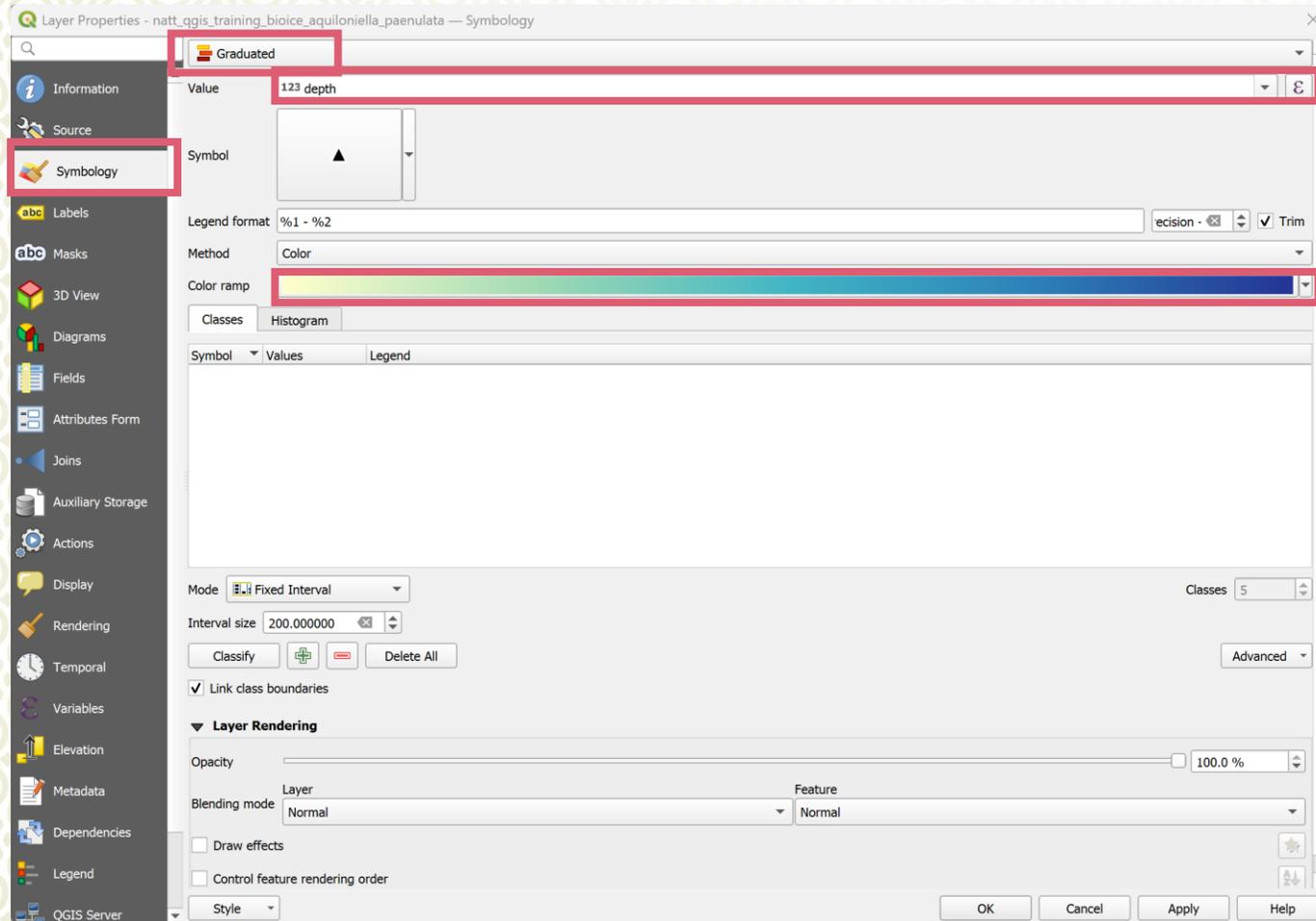


Style the vector layer by Attribute
Part two: Style by attribute

- Open 'Symbology'

- Change type to 'Graduated'

- Choose a value to categorize, either 'depth', 'salinity' or 'temp'

- Change color ramp to something you like

Style the vector layer by Attribute
Part two: Style by attribute

- Click to change the symbol type here

# WORKSHOP:
# Basic Vector analysis and map creation
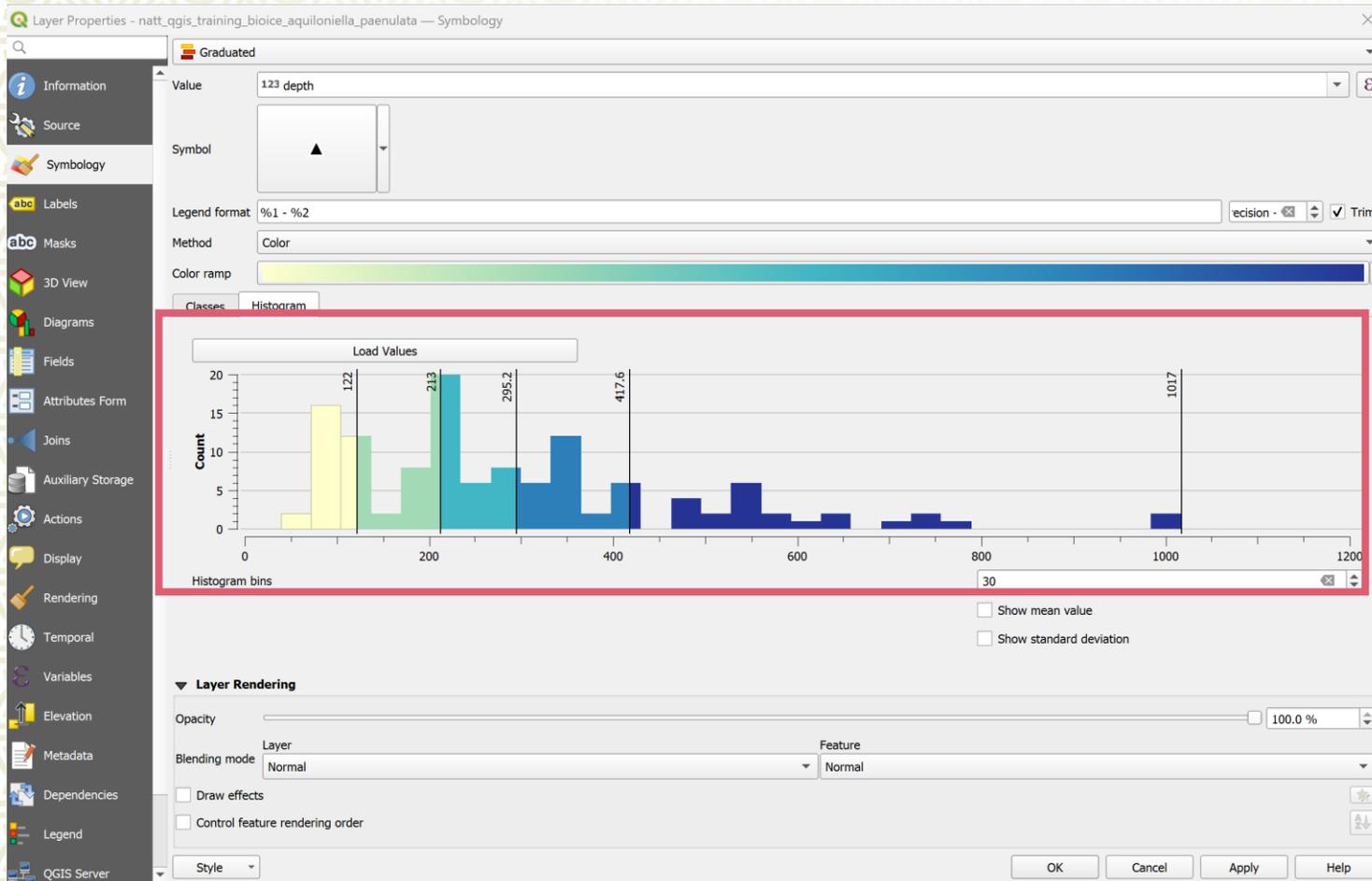


Style the vector layer by Attribute
Part two: Style by attribute

- In this example (depth), we changed precision to '-2' to round to nearest 10 meters
  - This created a nice set of 5 categories which will make the map clean and easy to read

- In this example, we use 'Equal Count', to make sure data was well distributed in each category

- Click 'Classify' to create categories or update categories. 'Delete All' if you want to start over.

- **Often you need to play around with this. Use what makes sense for your project.**

**WORKSHOP:**
**Basic Vector analysis and map creation**



Style the vector layer by Attribute
Part two: Style by attribute

- In the histogram tab, you can see how the data is binned

- Can be useful to see how data is distributed

- You can click and drag to change the bin value cutoffs

**WORKSHOP:**
**Basic Vector analysis and map creation**
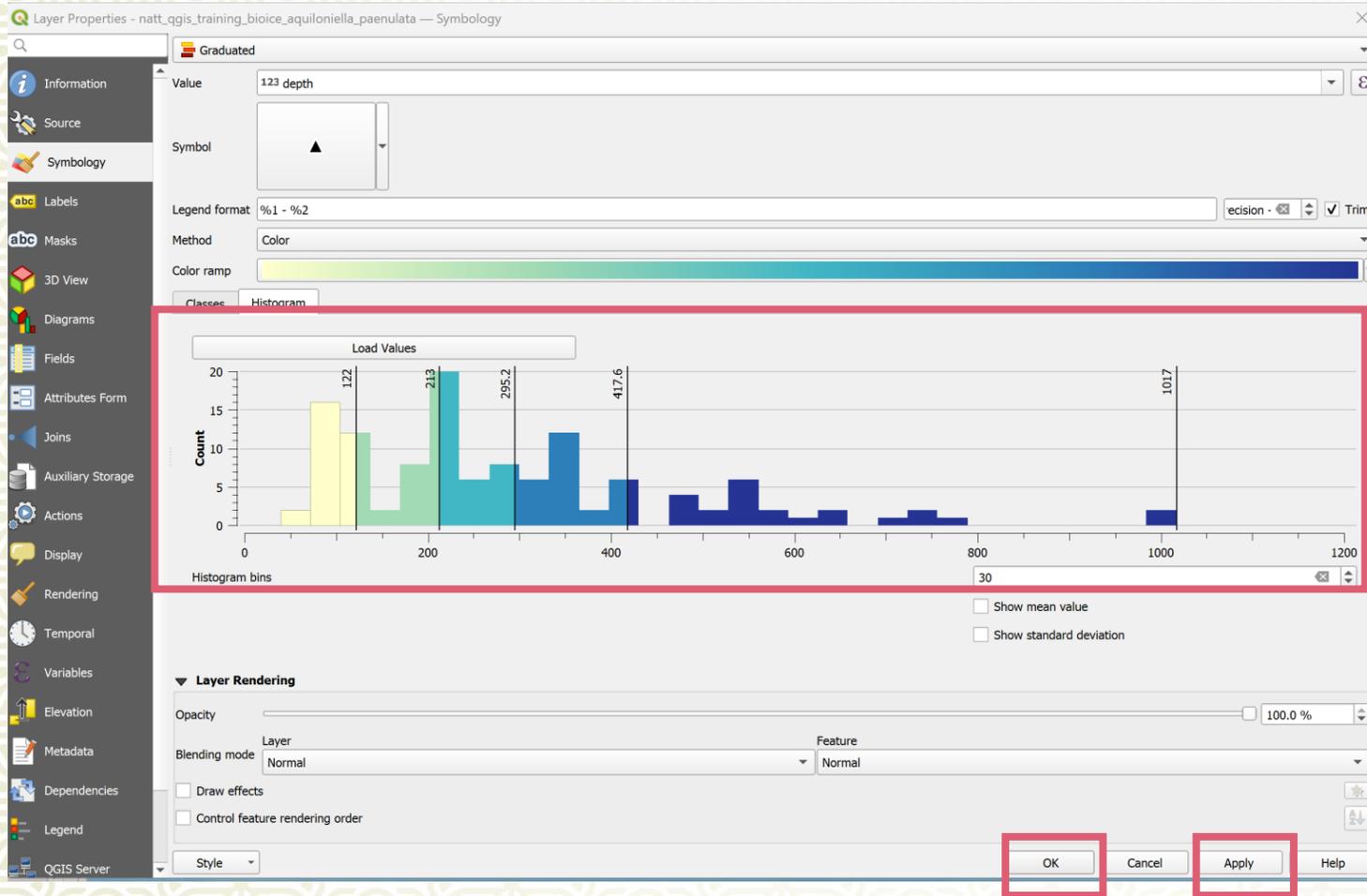
Style the vector layer by Attribute
Part two: Style by attribute

- In the histogram tab, you can see how the data is binned

- Can be useful to see how data is distributed

- You can click and drag to change the bin value cutoffs

- Click 'OK' to apply and close, or 'Apply' to apply changes

Náttúrufræðistofnun

**WORKSHOP:**
**Basic Vector analysis and map creation**

Style the vector layer by Attribute
Part three: Editing vectors
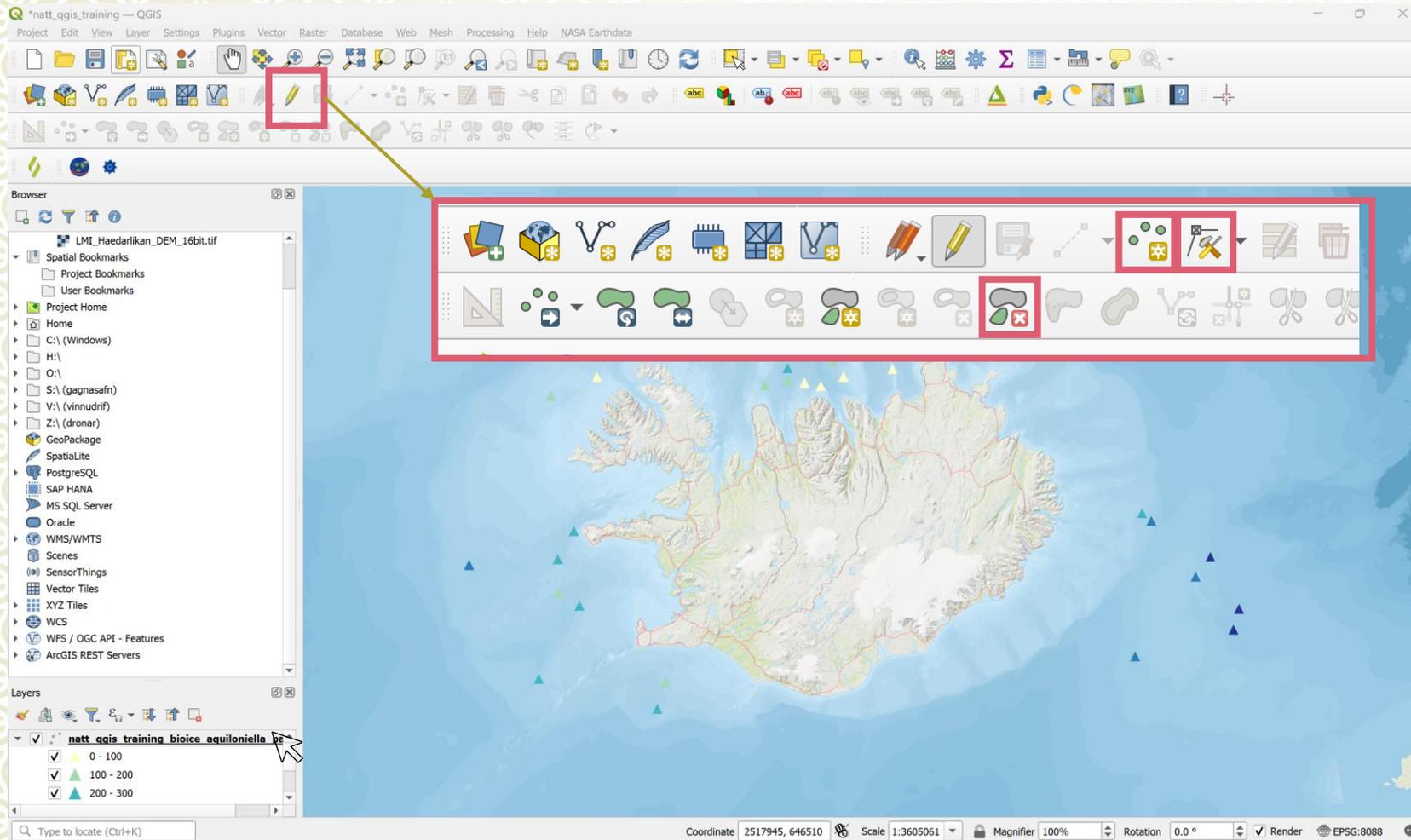
- Your map should look something like this now

- Let's say there is a missing point in the data or you need to remove a data point.

- Left click the layer in the 'Layers' window and click the pencil icon to edit it.
- On the toolbar, you will now be able to:
  - Add a feature
  - Remove a feature
  - Move a feature

# WORKSHOP:
# Basic Vector analysis and map creation
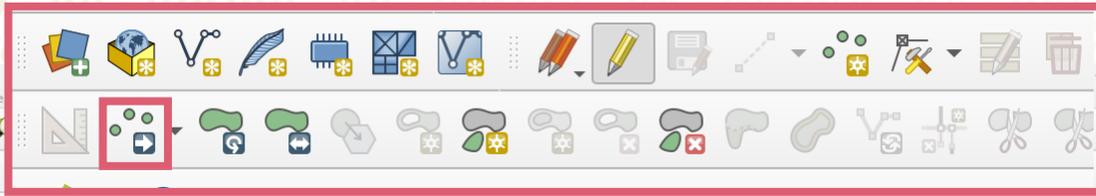


## Style the vector layer by Attribute
## Part three: Moving a feature

- Let's say we need to move a point because it´s in the wrong spot.

- Click the 'move feature' button, and click somewhere on the map to add a new point

**Náttúrufræðistofnun**

**WORKSHOP:**
**Basic Vector analysis and map creation**
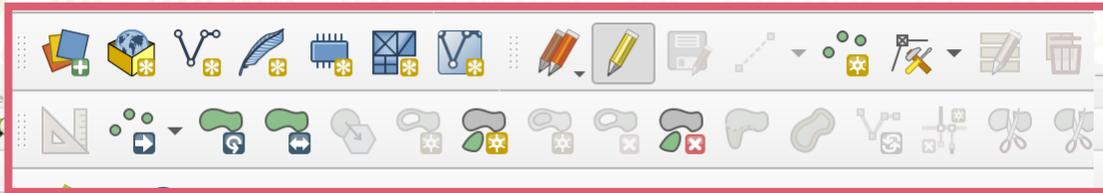
Style the vector layer by Attribute
Part three: Moving a feature

- The point now appears in the correct spot

**WORKSHOP:**
**Basic Vector analysis and map creation**

Náttúrufræðistofnun

Style the vector layer by Attribute
Part three: Deleting a feature
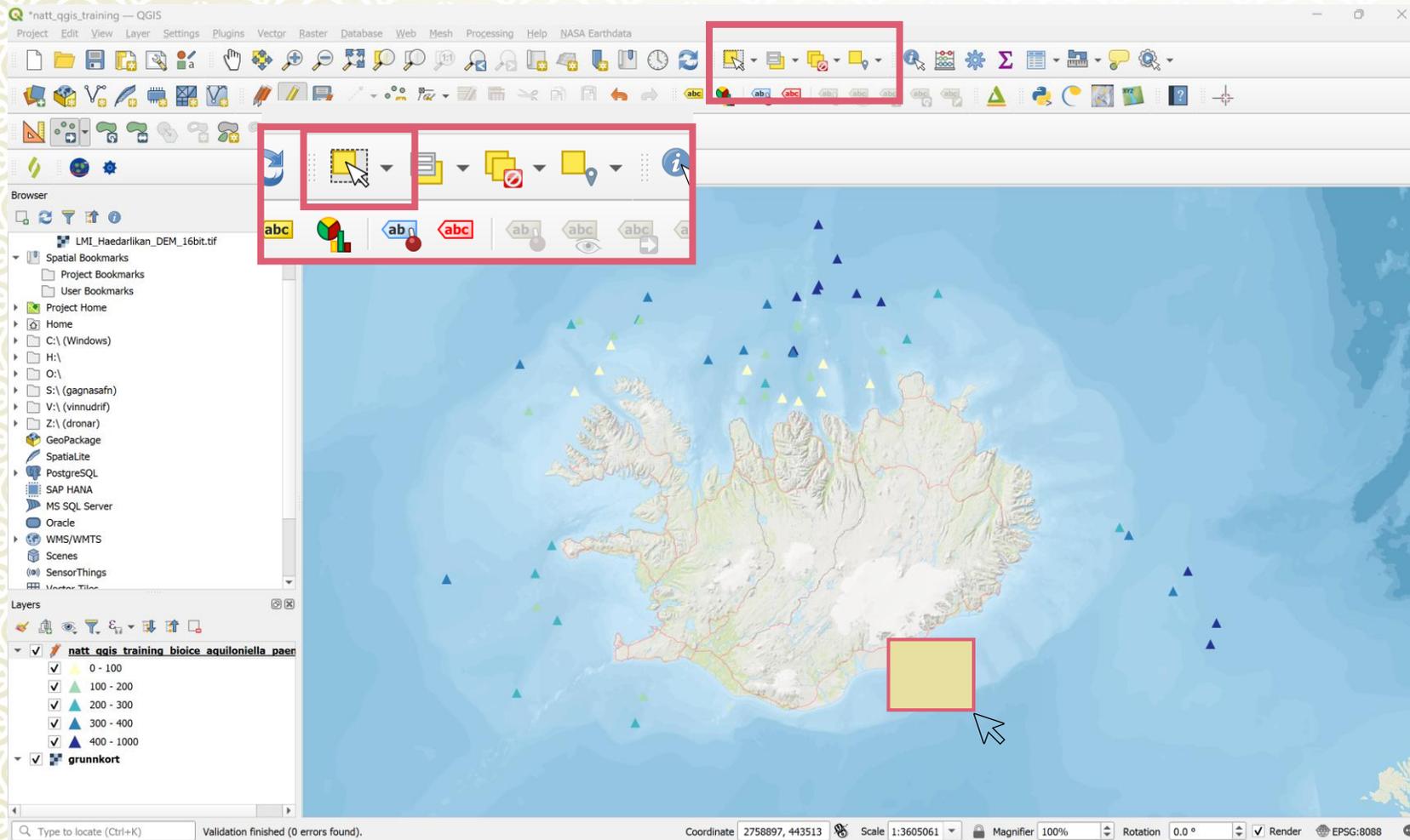
- Let's say this point is wrong and we need to delete it

- With the editing toolbar still activated, click on the select tool

- Click and drag a box around the point to select it

# WORKSHOP:
# Basic Vector analysis and map creation



Style the vector layer by Attribute
Part three: Deleting a feature

- Now the point is selected (in yellow)

- Click the trash can icon to delete it

- Confirm when then popup window comes up
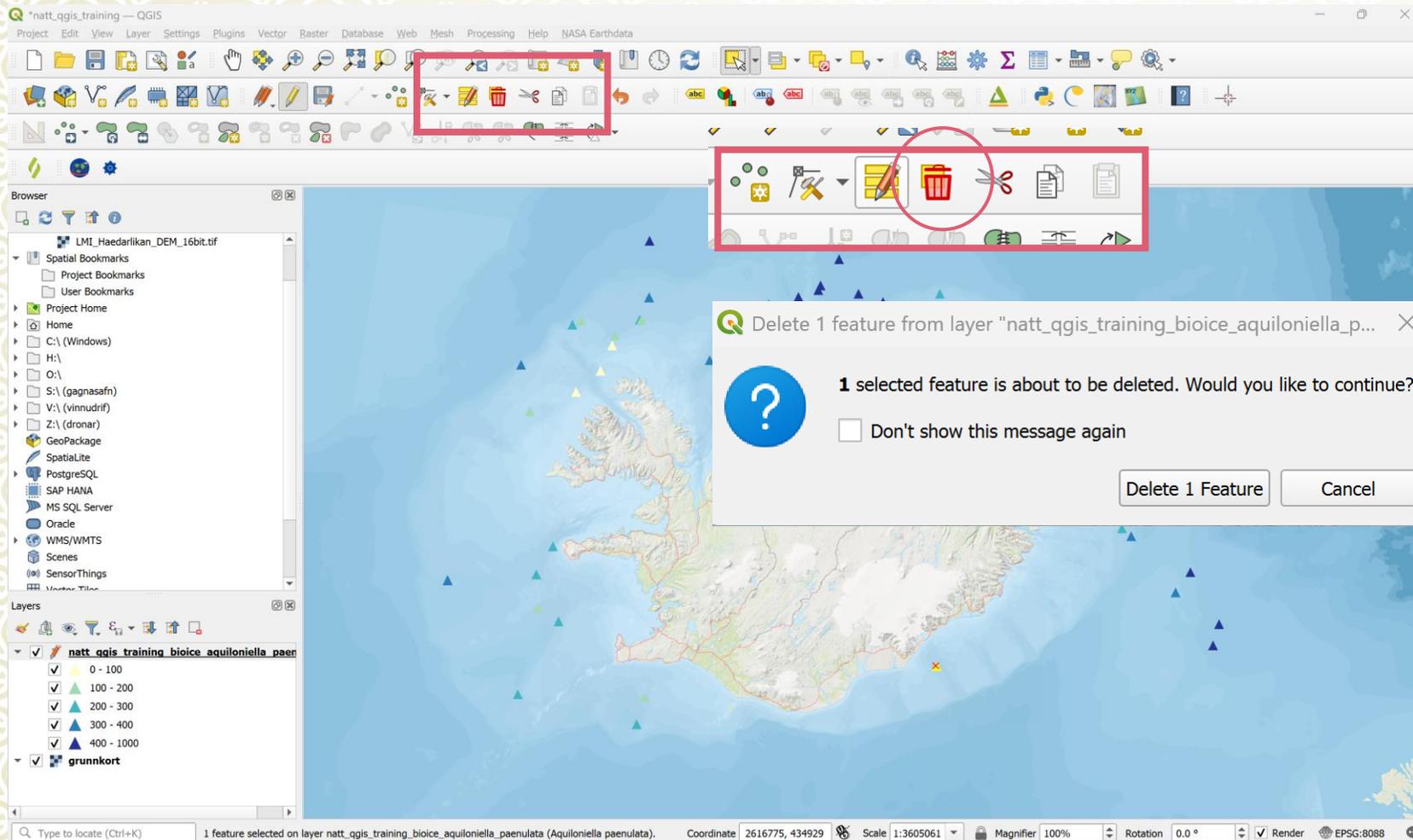
# WORKSHOP:
## Basic Vector analysis and map creation
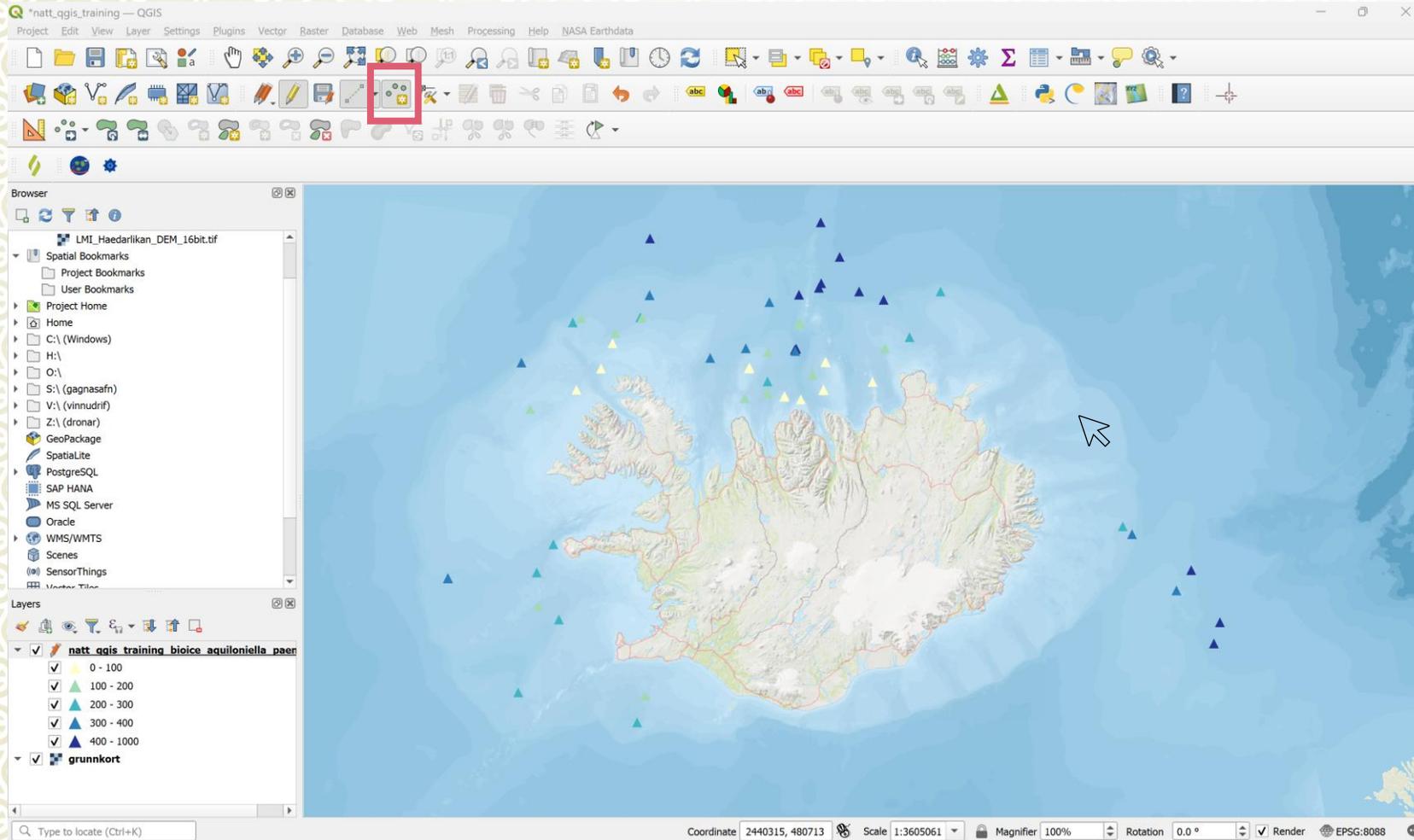
**Style the vector layer by Attribute**
**Part three: Adding a feature**

- Let´s say now there is a point missing from the map that we need to add

- Click on the 'Add Point Feature' button

- Click somewhere on the map to add a point

# WORKSHOP:
# Basic Vector analysis and map creation
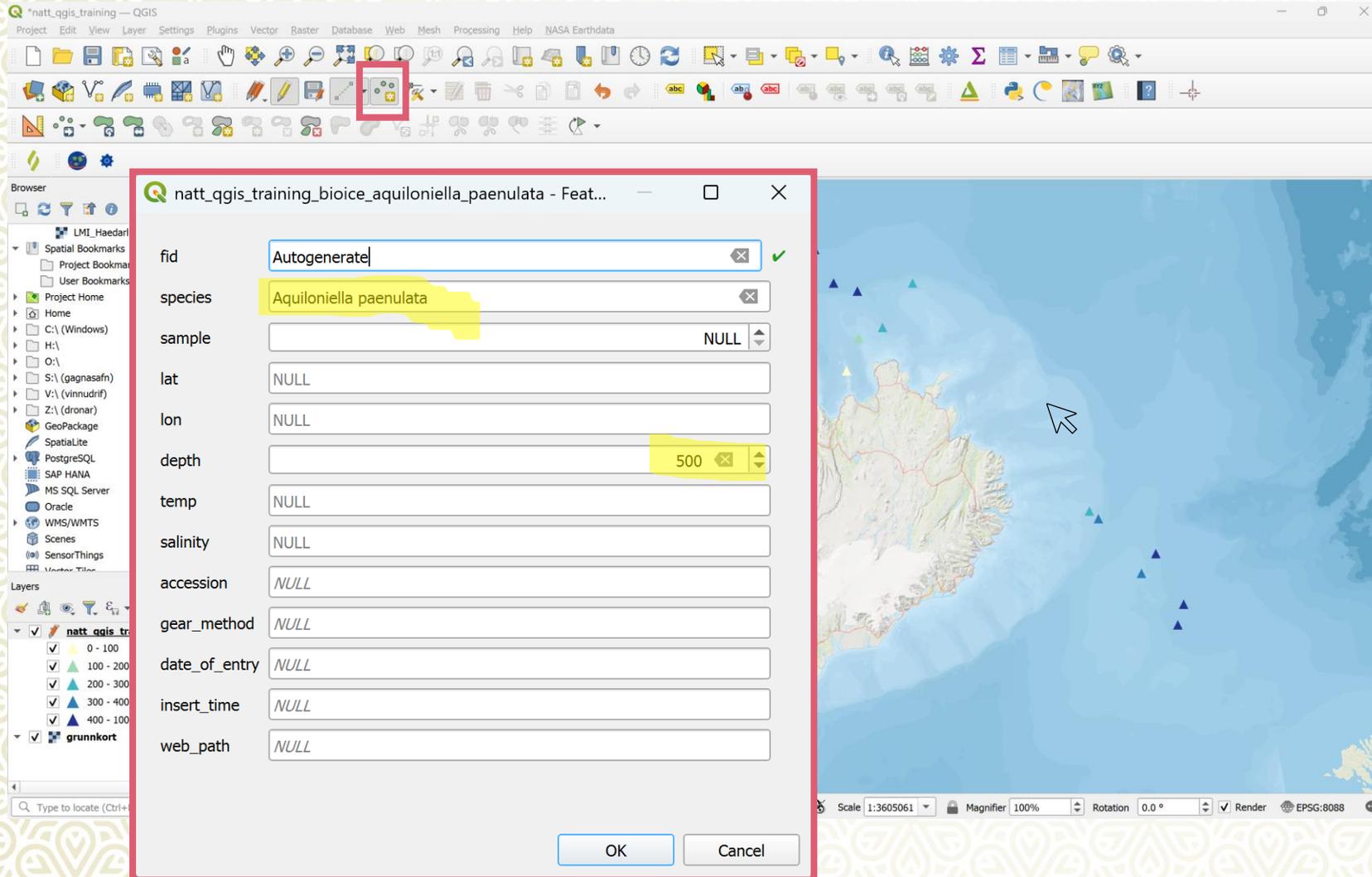
## Style the vector layer by Attribute
## Part three: Adding a feature

- A window will pop up to fill out attributes to the feature

- In order to have symbology on the map correct, these would need to be filled out with the correct data

- For this exercise, we can add a depth in order for it to appear on the map in the correct color scheme
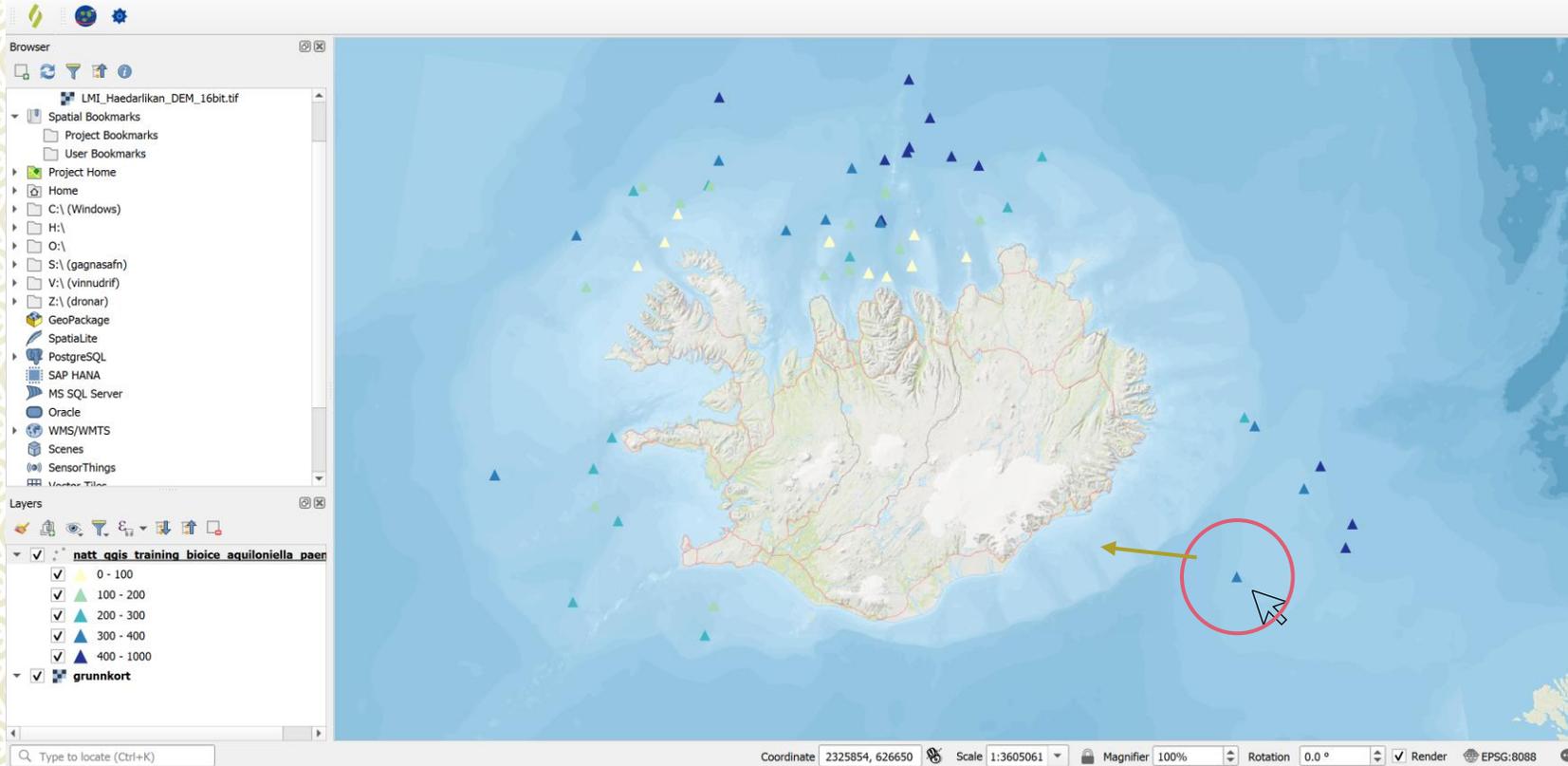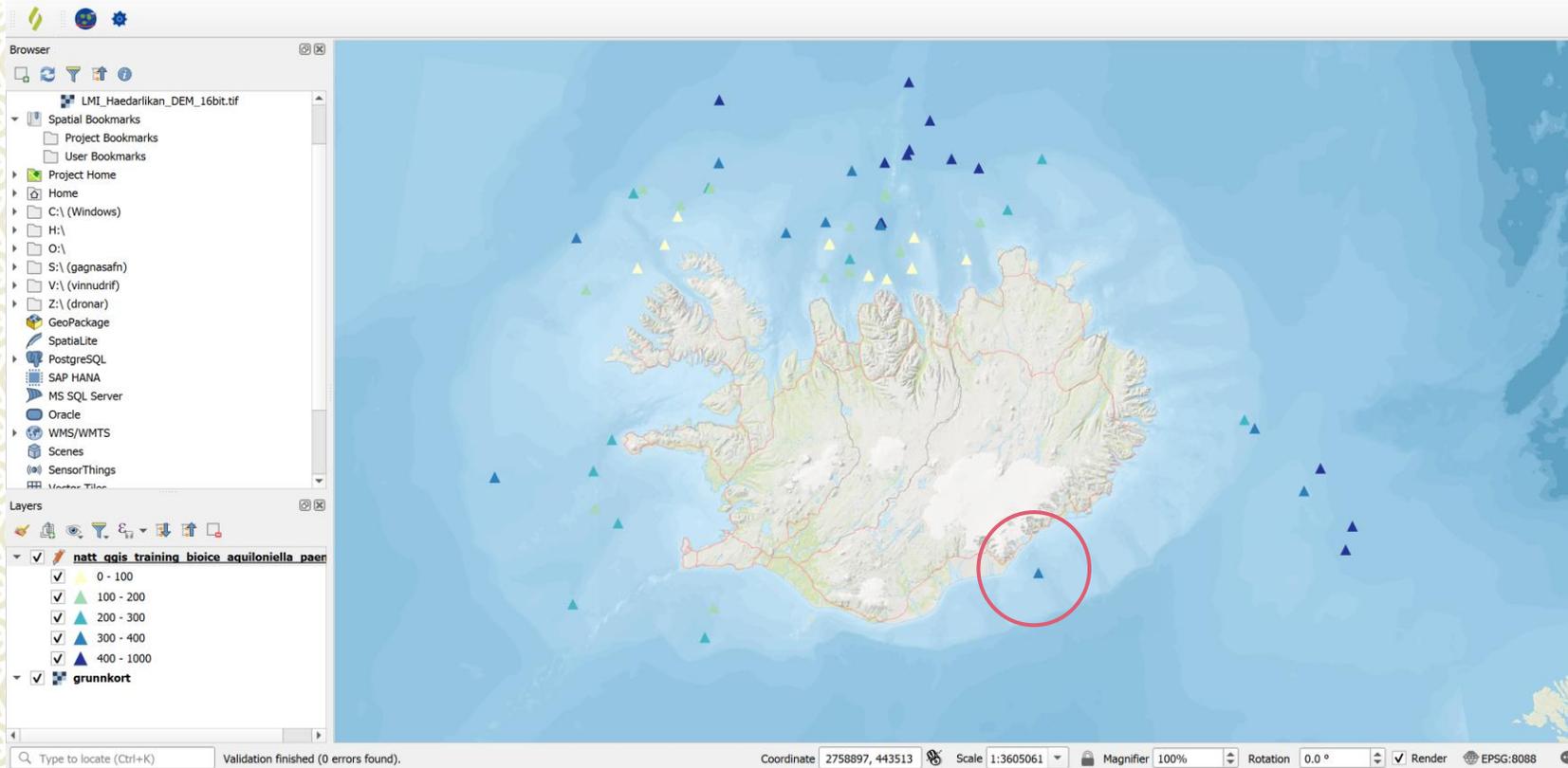
**Náttúrufræðistofnun**

**WORKSHOP:**
**Basic Vector analysis and map creation**
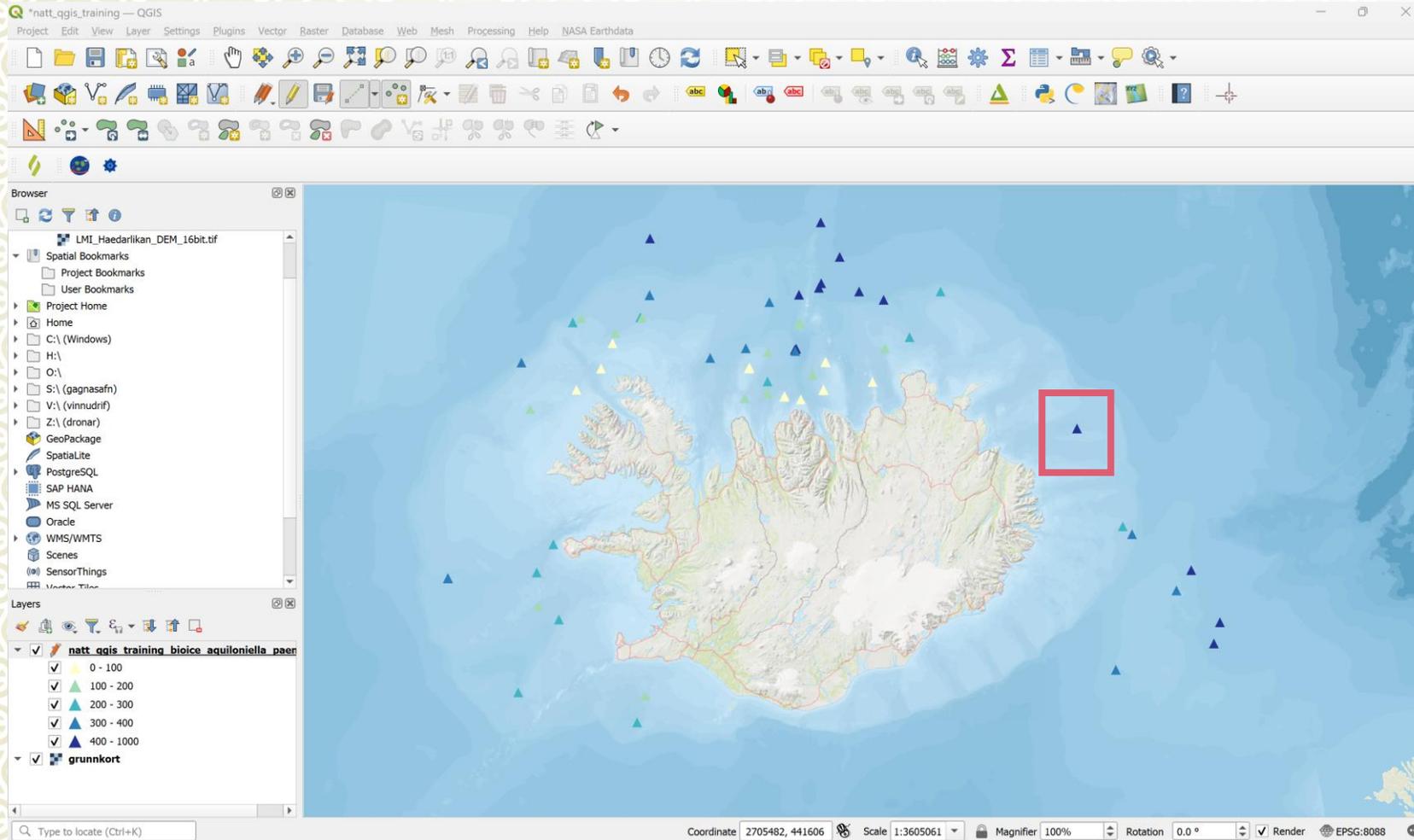
Style the vector layer by Attribute
Part three: Adding a feature

- The new point now appears on our map in the correct color scale for depth

**WORKSHOP:**
**Basic Vector analysis and map creation**

Náttúrufræðistofnun
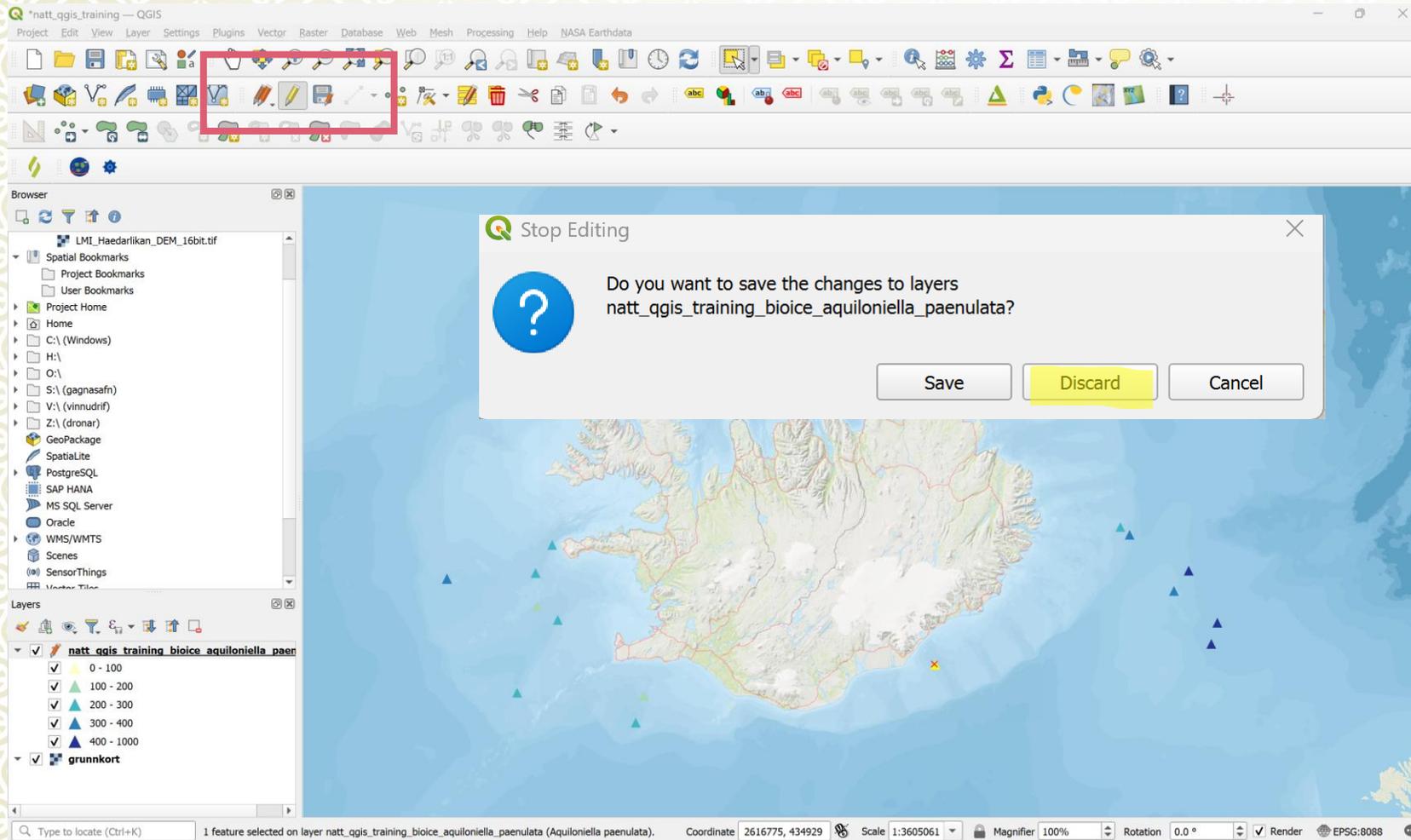
Style the vector layer by Attribute
Part three: Editing vectors

- To stop editing the layer, click on the pencil icon again

- You can save or discard your changes. In this case we will discard changes since this was just a practice.

WORKSHOP:
Basic Vector analysis and map creation
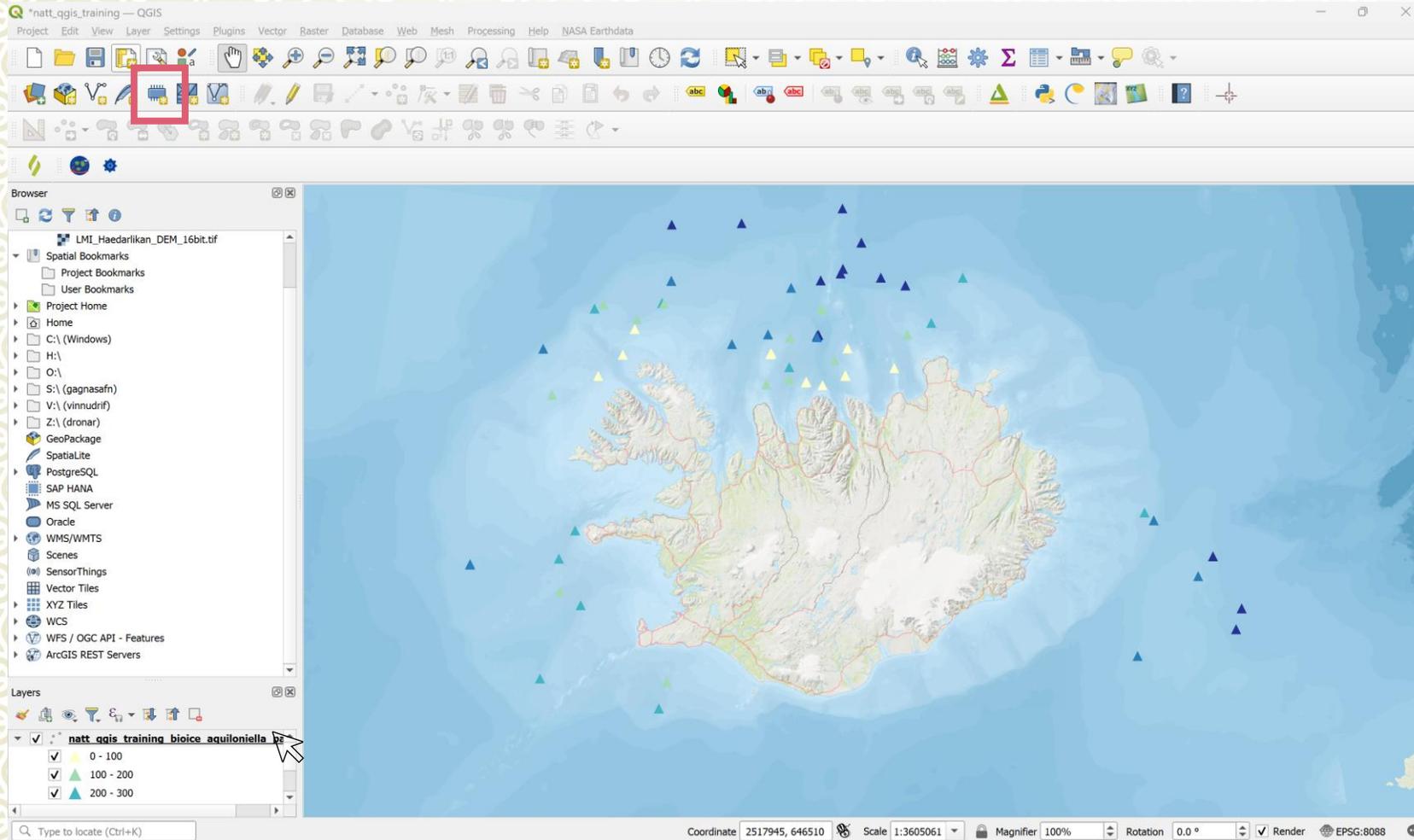
Style the vector layer by Attribute
Part three: Label by attribute

- Now let's say we want to add some features to make the map more readable

- Let's add a label for 'Vatnajökull' and 'Reykjavík' to help readers understand the map

- Click on the 'New Temporary Scratch Layer' icon in the toolbar.

**WORKSHOP:**
**Basic Vector analysis and map creation**



Style the vector layer by Attribute
Part three: Label by attribute

- We will create a multipoint layer for the places we want to label

- Coordinate system same as map system (ISN2016)

- We want to create an attribute for name so that we can label them
  - This is type 'Text (string)'
  - Put length '0' to have unlimited length
  - Add to fields list, click ok to create
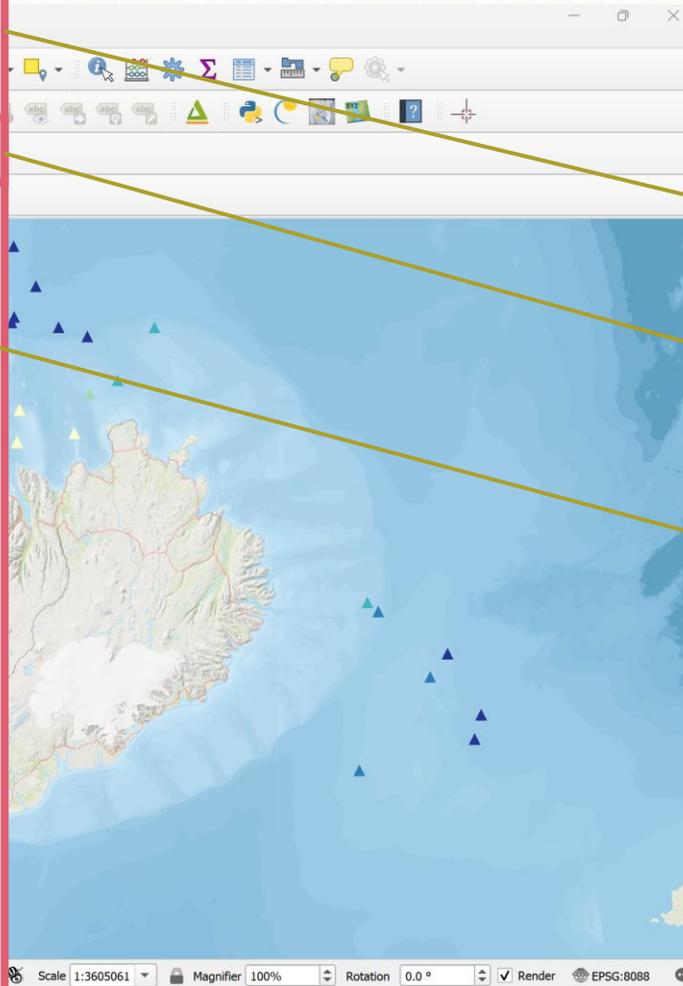
**Náttúrufræðistofnun**

**WORKSHOP:**
**Basic Vector analysis and map creation**

Style the vector layer by Attribute
Part three: Label by attribute

- Editing will automatically be enabled for this new layer

- Now, click on 'Add New Point Feature' again and click on the center of Vatnajökull

- In the pop up window, write the name exactly as you want it to appear in the label

- Click OK to create the point

- Repeat for Reykjavík or any other place of interest

- Save the layer and stop editing

**Náttúrufræðistofnun**

## WORKSHOP:
## Basic Vector analysis and map creation
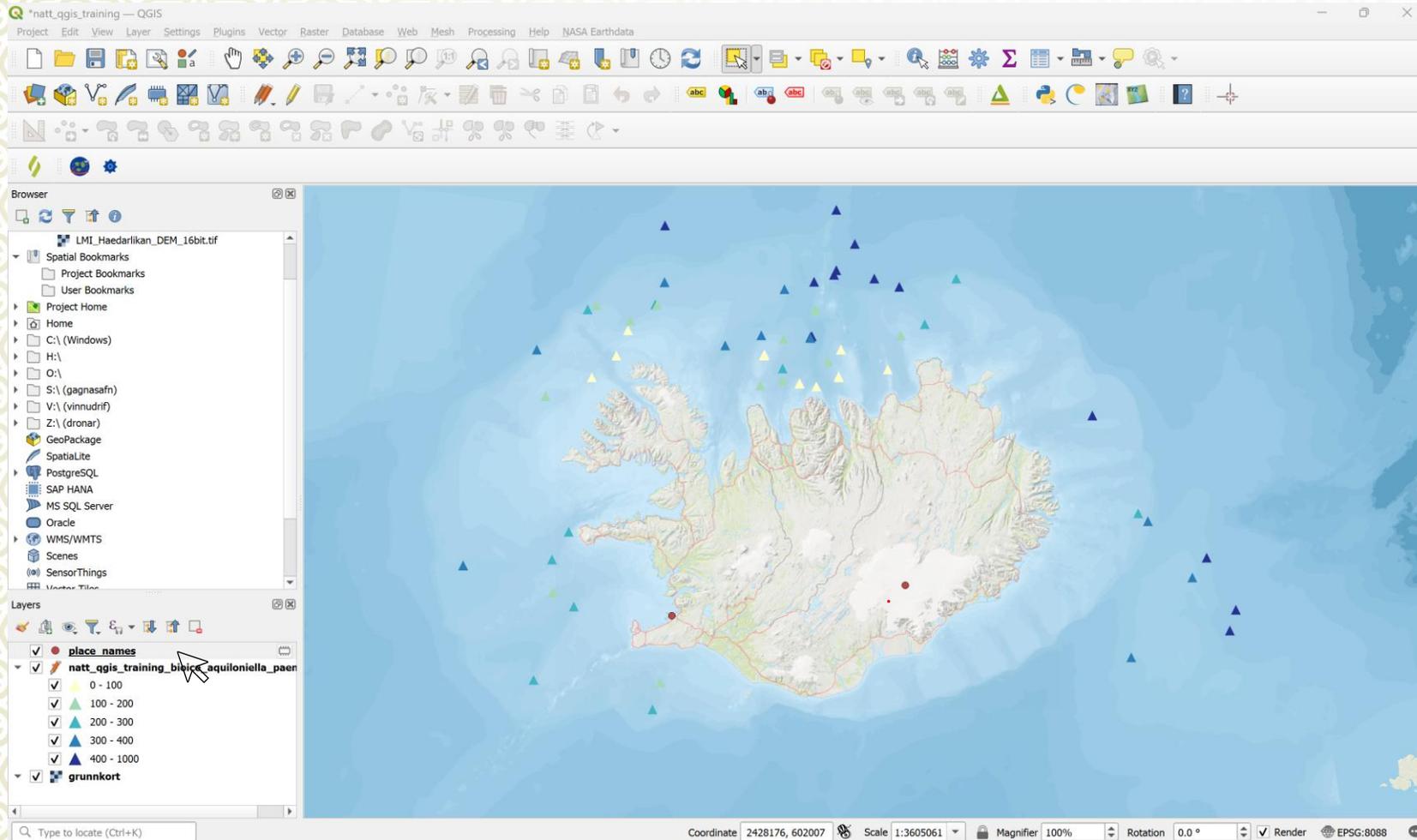
**Style the vector layer by Attribute**
**Part three: Label by attribute**

- Your map now looks like this, with points added at the locations you created

- Now we want to display ONLY the labels, not the points:

- Right click on the place_names layer in the layers window and go to properties

**Náttúrufræðistofnun**

**WORKSHOP:**
**Basic Vector analysis and map creation**
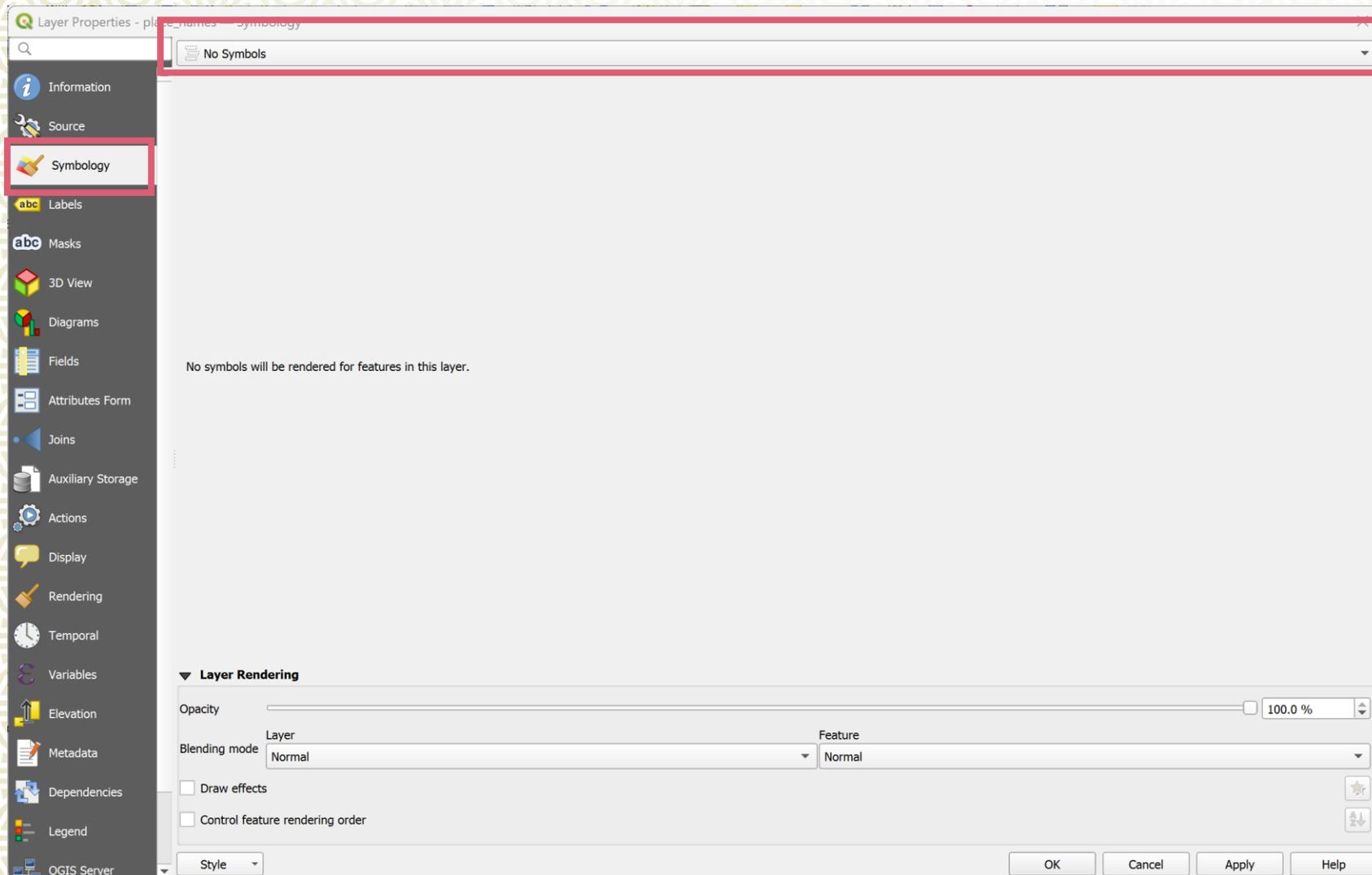
Style the vector layer by Attribute
Part three: Label by attribute

- First of all, we don't want a dot to appear where the label is.

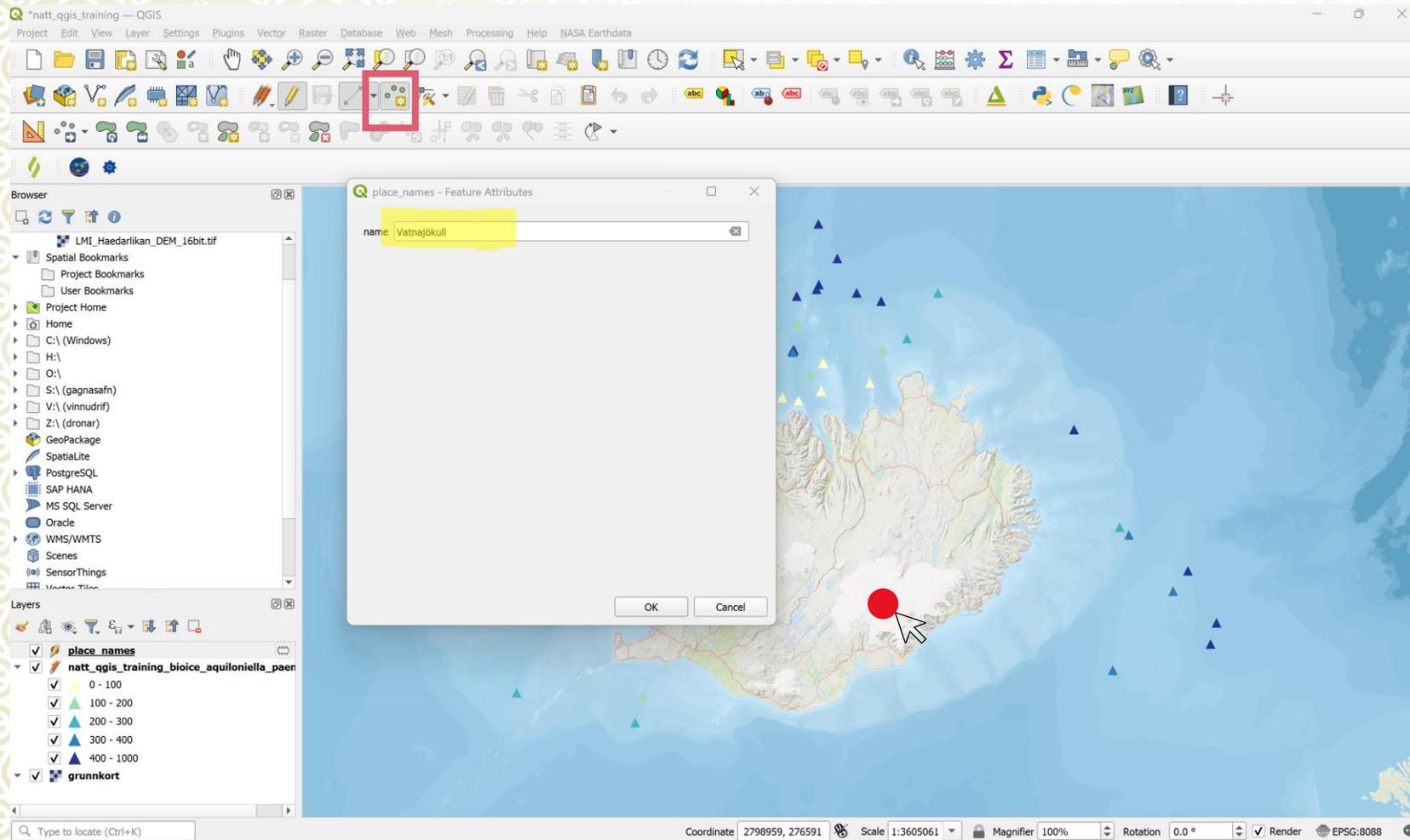- To do this, open the symbology tab and select 'No Symbols' from the dropdown

**WORKSHOP:**
**Basic Vector analysis and map creation**
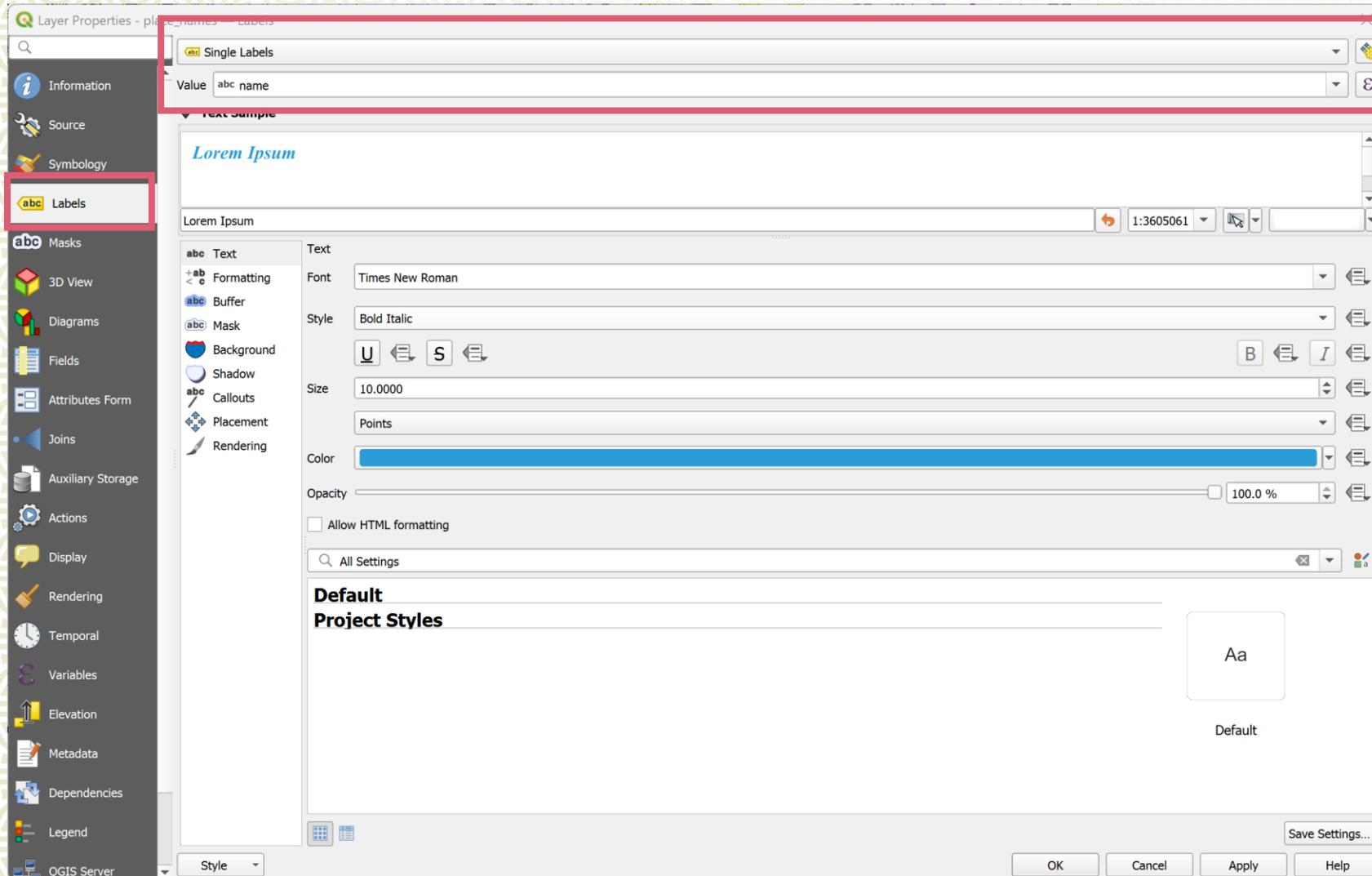


Style the vector layer by Attribute
Part three: Label by attribute

- Next, open the 'Labels' tab

- Open the dropdown menu and choose 'Single Labels' and 'Name' as the value.

- Style the labels as you want. In this example, a bold italic style was chosen with blue color text

- Click 'Apply' to see how it looks on the map

**WORKSHOP:**
**Basic Vector analysis and map creation**



Style the vector layer by Attribute
Part three: Label by attribute

- Labels can be styled in many ways

- In this example, we open the 'Placement' tab and create labels 'Offset from Point' then Quadrant center

- This creates a label directly over the point we drew

- These are a personal style choice

# Náttúrufræðistofnun

## WORKSHOP:
## Basic Vector analysis and map creation

Style the vector layer by Attribute
Part three: Label by attribute

- You should now have a map with labels and stylized vectors

- If you like your label file, it is a good idea to save it in your working folder. Since it is a scratch layer, it will not be saved if you close the project.

- Right click on the layer, and select 'Make Permanent'.

- Save as a geopackage layer. Give it a name and save it in your working folder.
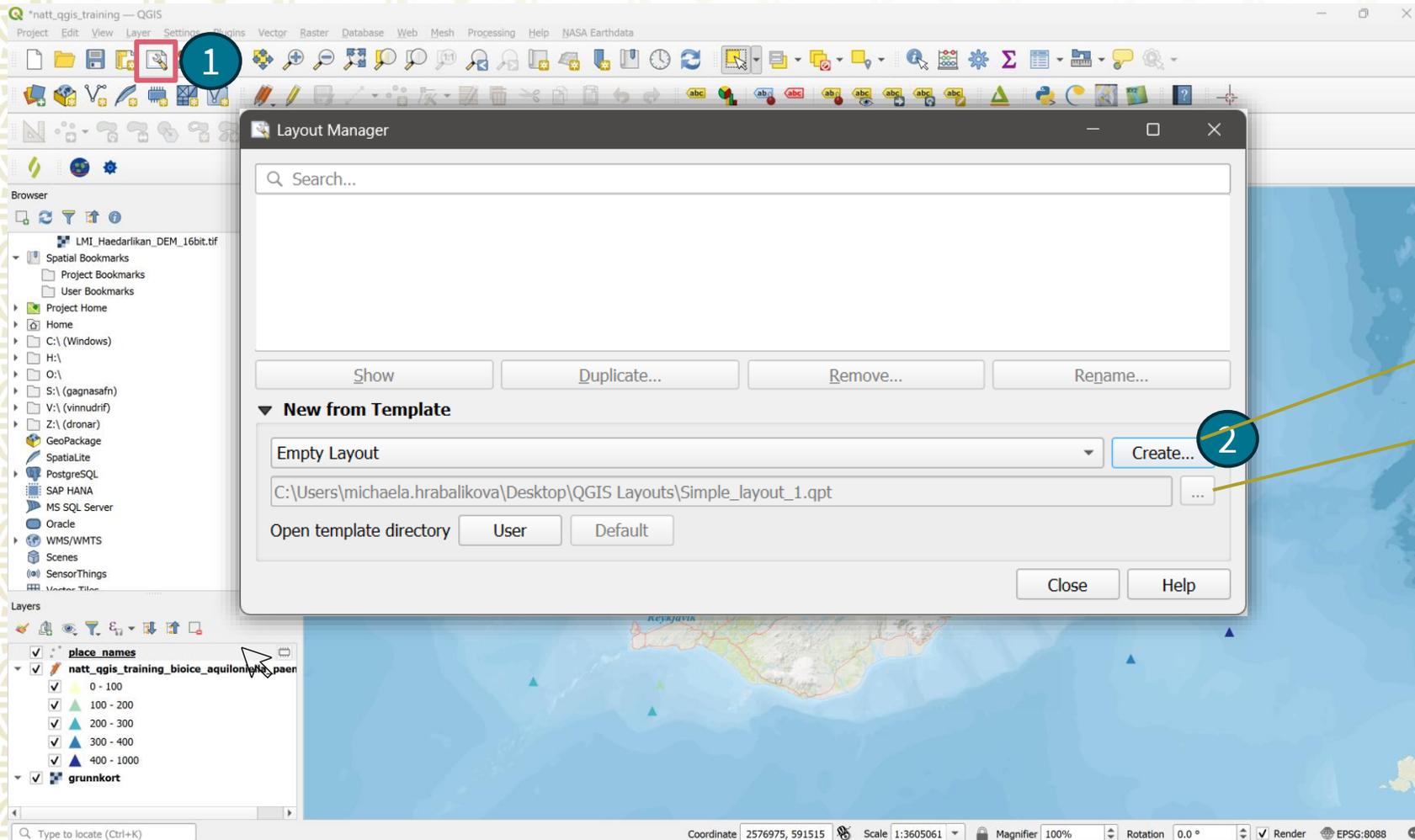
**Layout Manager**



Create a map
Part one: open the Layout Manager

- Open the layout manager

- For this exercise, we will create a new layout by clicking here

- You can import a template here (future exercise)

- Give your print layout a name:

# Náttúrufræðistofnun

## WORKSHOP:
## Basic Vector analysis and map creation

### Create a map
### Part two: change map layout

- Right click on the empty map
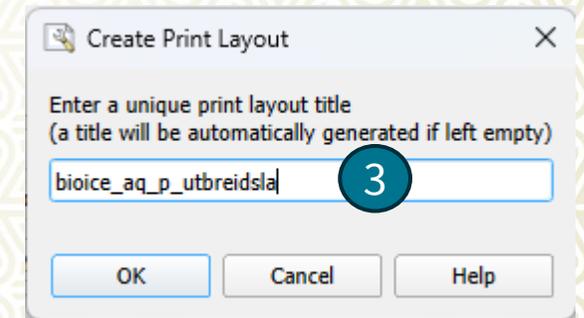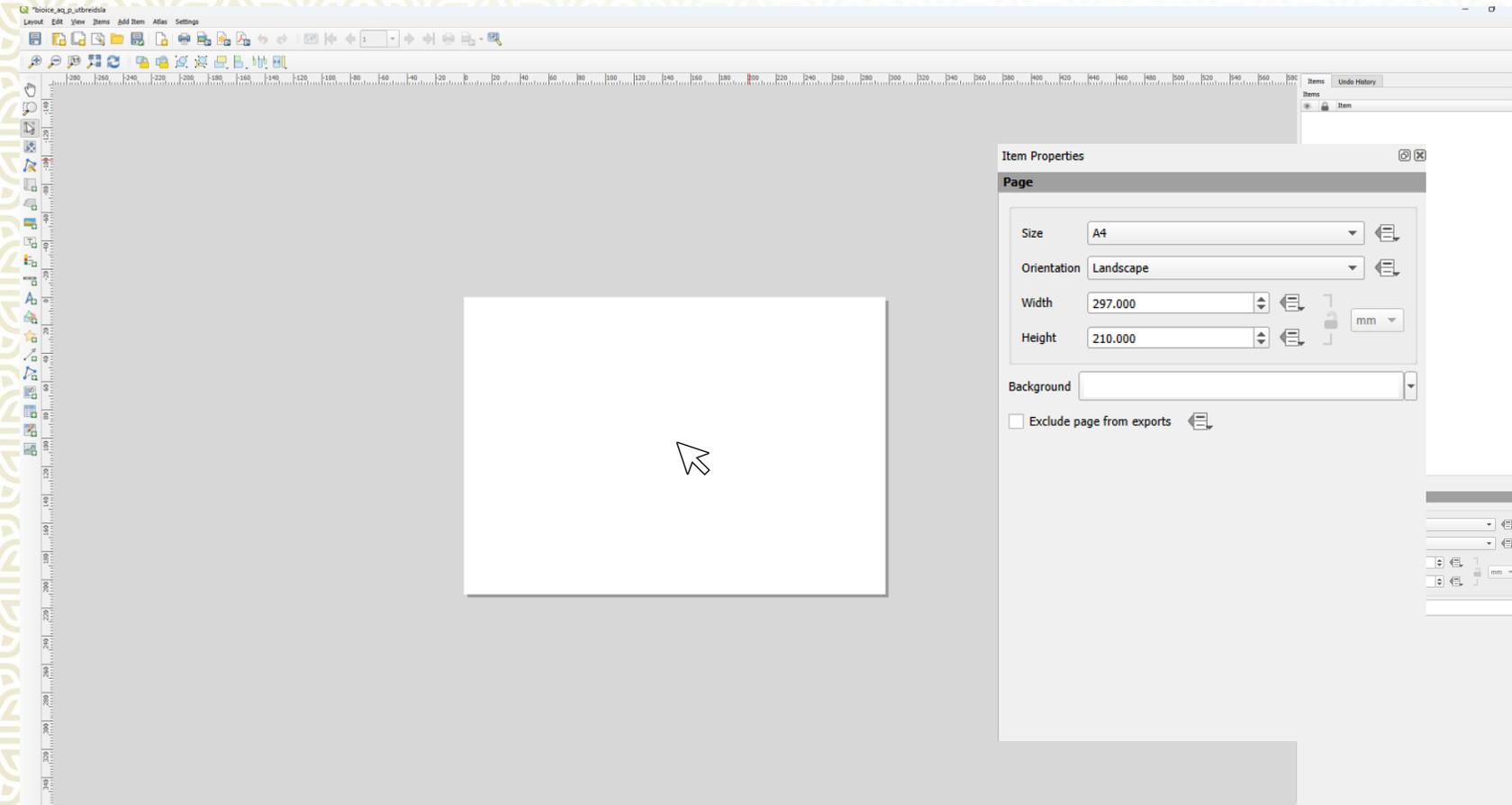
- Choose the size and orientation.

- A5 is good for small figures in articles or reports – makes sure fonts are correct size

- A4 is a pretty typical size for full page figures

- A0 is good for posters or large format prints

- Portrait or Landscape, background color, etc

**Náttúrufræðistofnun**
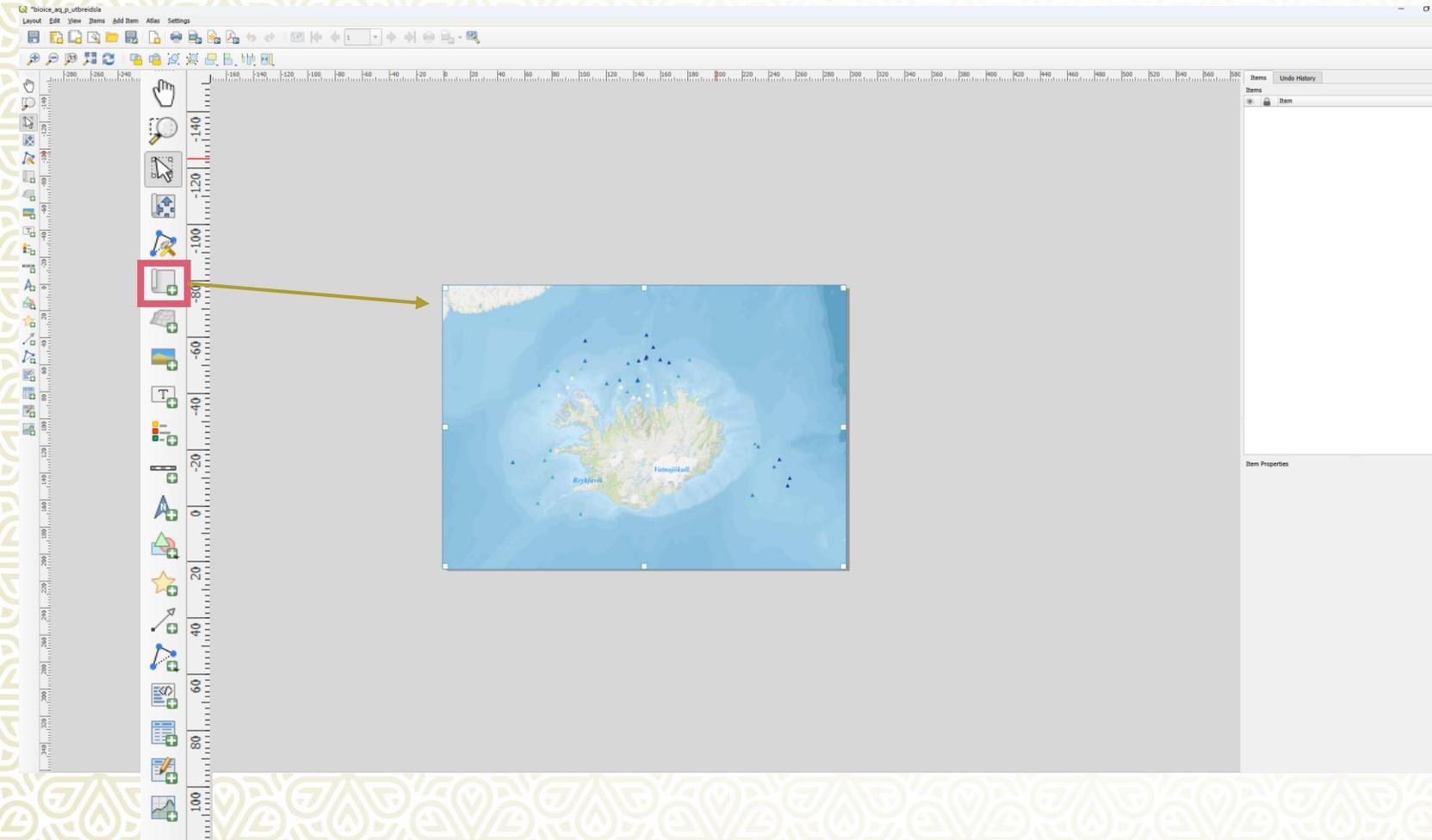
**WORKSHOP:**
**Basic Vector analysis and map creation**

Create a map
Part two: create a map layout

- Click on the add map symbol here

- Click and drag over the map layout to add the current view as the map
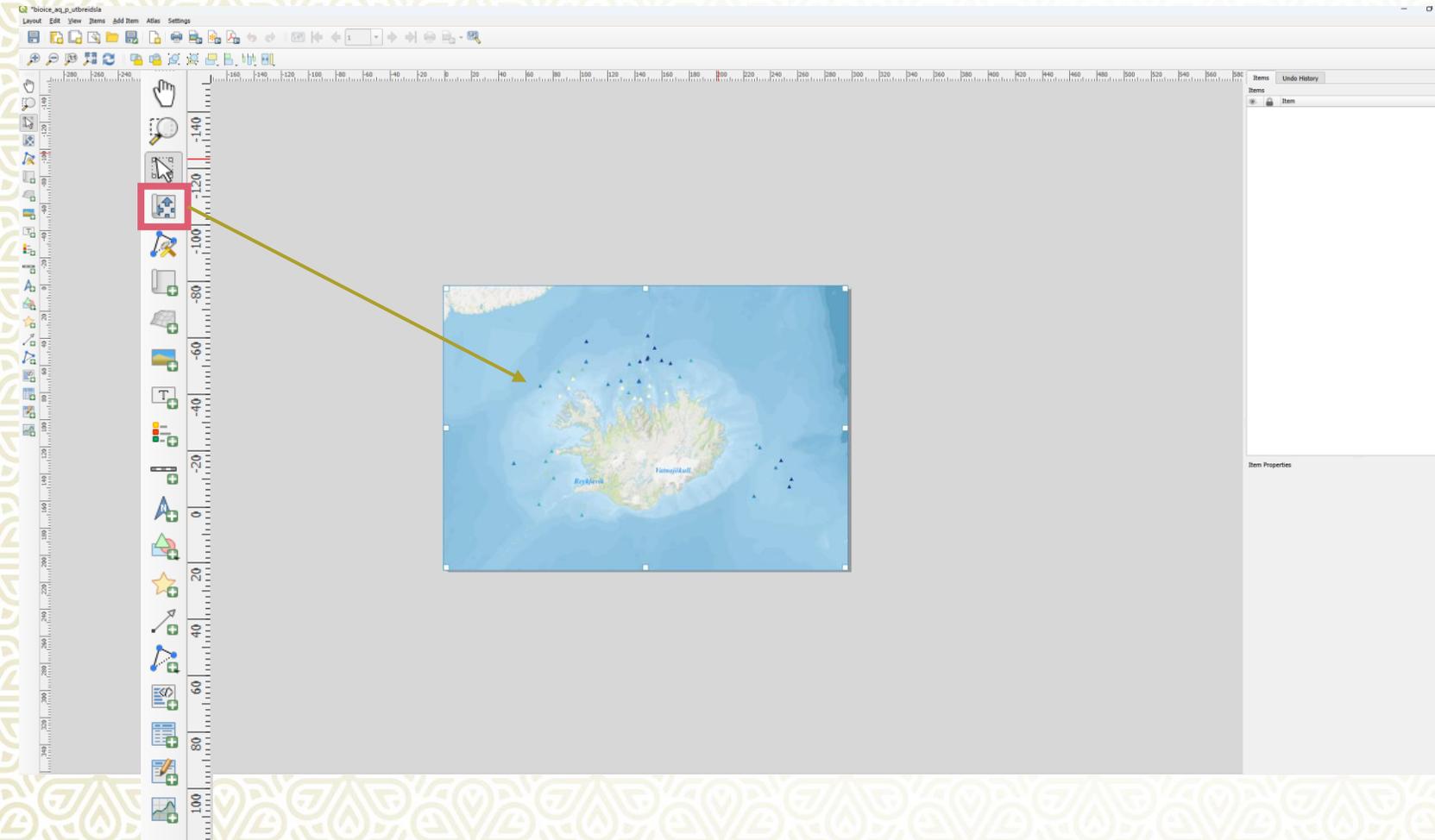
**Náttúrufræðistofnun**

**WORKSHOP:**
**Basic Vector analysis and map creation**

Create a map
Part two: create a map layout

- Move the map up, down, left right
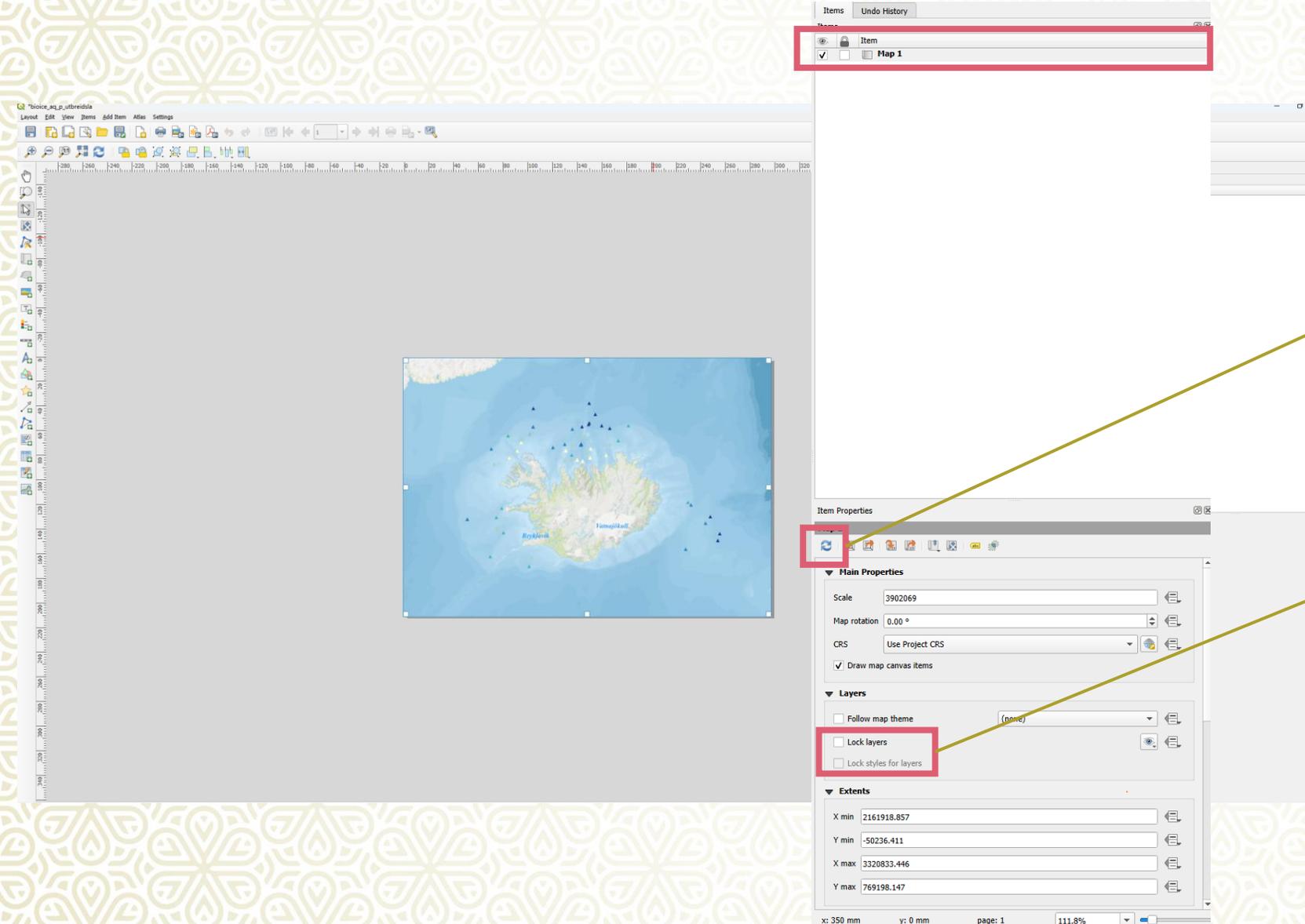
- Zoom in or out

**WORKSHOP:**
**Basic Vector analysis and map creation**



Create a map
Part two: create a map layout

- After selecting your map, in item properties (right panel), click this button to refresh the map – use this if you make changes in the canvas that you want to update

- If you don't want the map to change even while you work in the canvas, lock the layer(s) here
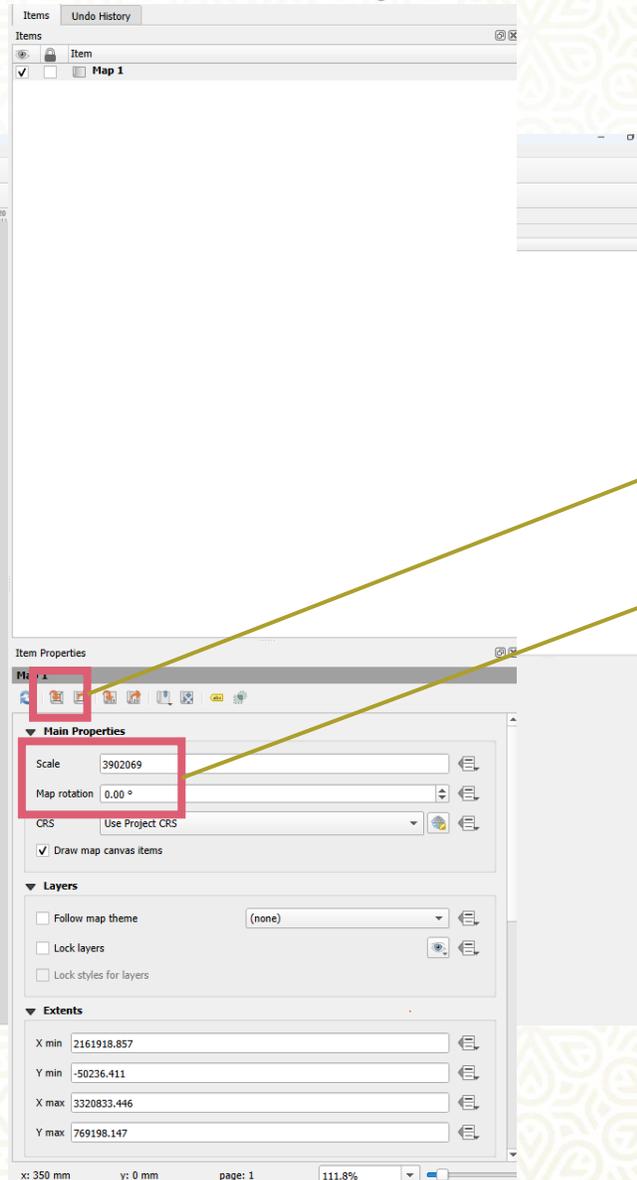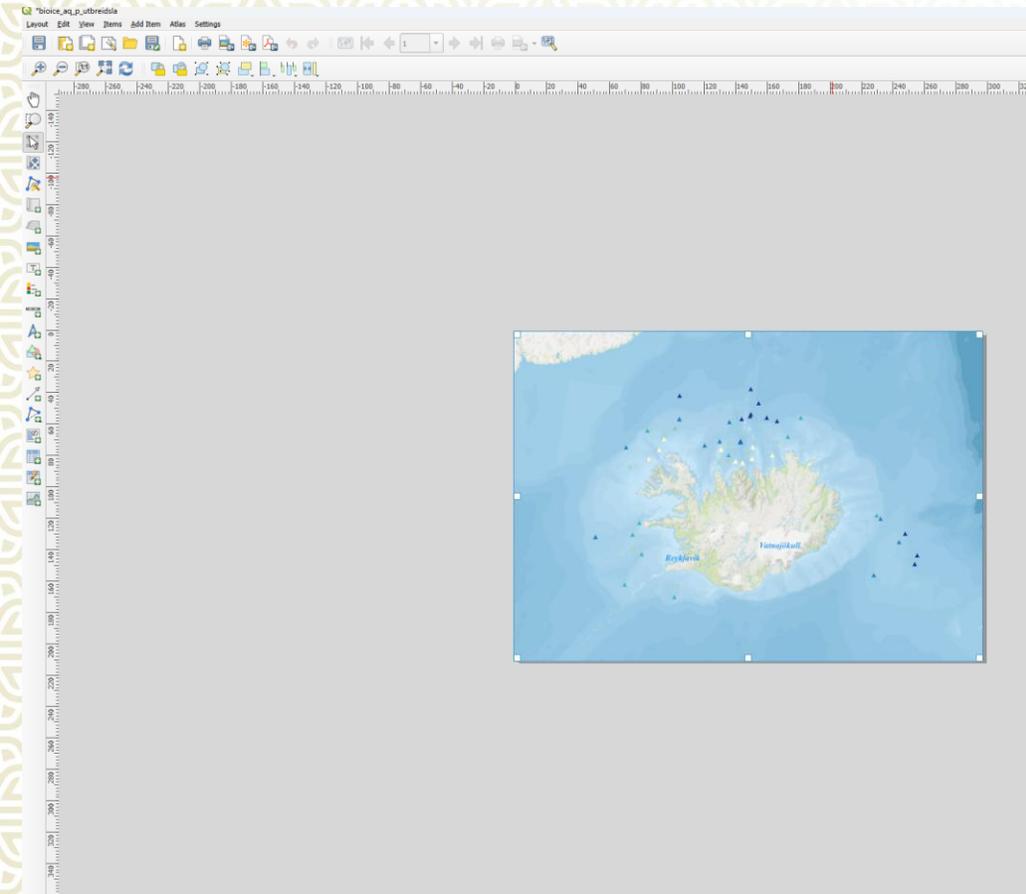
**Náttúrufræðistofnun**

**WORKSHOP:
Basic Vector analysis and map creation**

Create a map
Part two: create a map layout

- Use this button to grab the current canvas for the map

- Set scale or rotation (optional)

**WORKSHOP:**
**Basic Vector analysis and map creation**
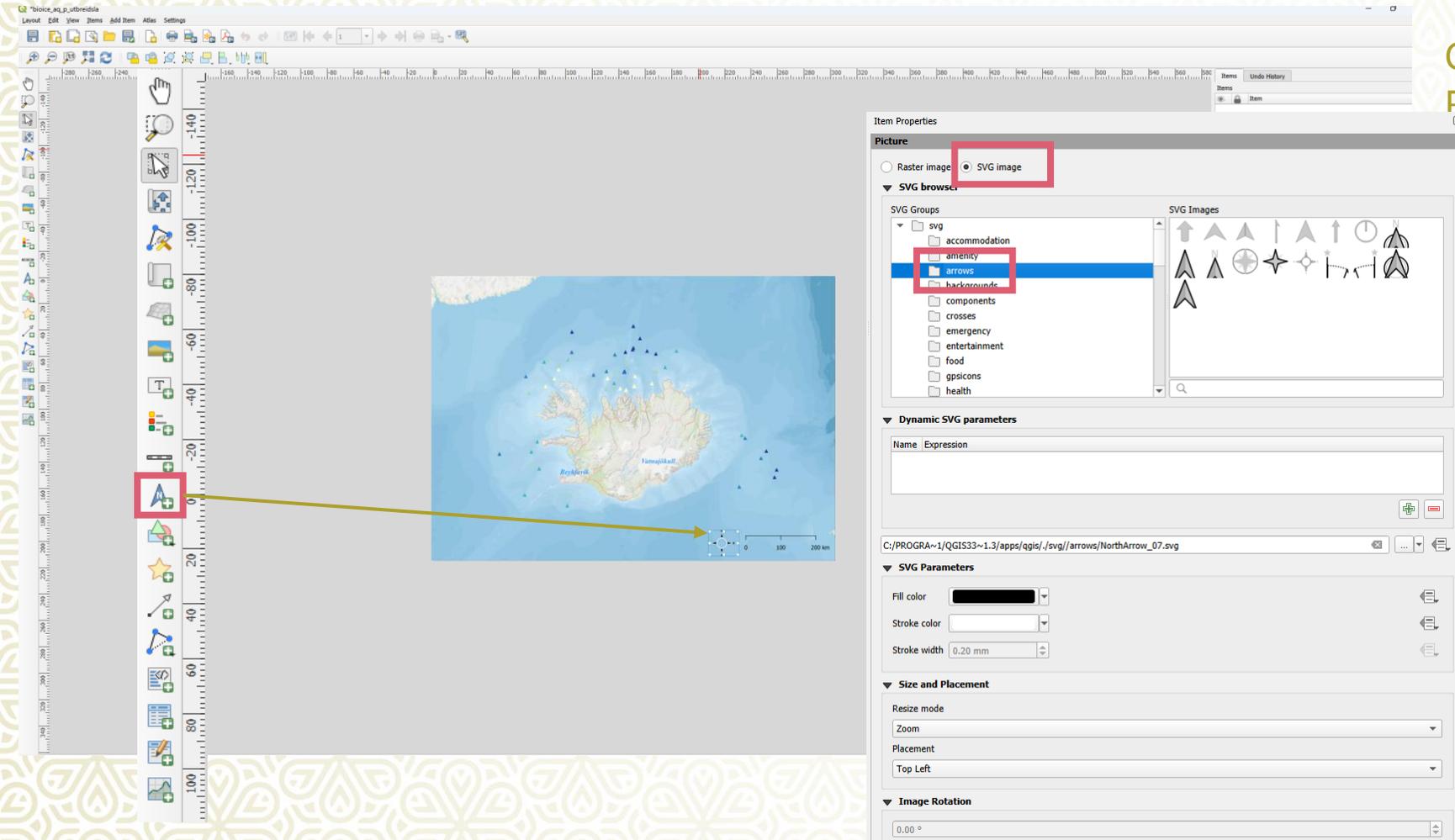


Create a map
Part three: add scale bar

- When you click on your newly created scale bar, it will pull up item properties. Make sure your scale bar is linked to your map (Map1)

- In item properties bar on the right, you can choose:
  - Style
  - Units
  - Label /number format
  - Appearance/ color, etc

- Play around with these until you find a map you like.

# WORKSHOP:
# Basic Vector analysis and map creation

Create a map
Part four: add north arrow

- Click on the add north arrow button and click on the map where you want to create it

- If you click on 'Picture' – 'svg img', QGIS has several useful north arrows that you can choose from, choose one you like.

- Select your newly created arrow, and you can choose the style in the right-hand item properties panel

**Náttúrufræðistofnun**

# WORKSHOP:
# Basic Vector analysis and map creation

Create a map
Part five: add legend

- Click on the add legend button and click on the map where you want to create it

- In properties, you can give it a name (optional)

- Uncheck 'Auto Update' from Legend items, and use the Plus and minus buttons to add or remove items from the list

- Play around with the style until you like it

# WORKSHOP:
# Basic Vector analysis and map creation



Create a map
Part five: add legend

- To change the ugly name 'natt_qgis_training_bioice_...', double click on it and it will open a new box where you can change it

- In this example, Depth was used as the category for styling the layer, so here you would label it 'Depth (m)'
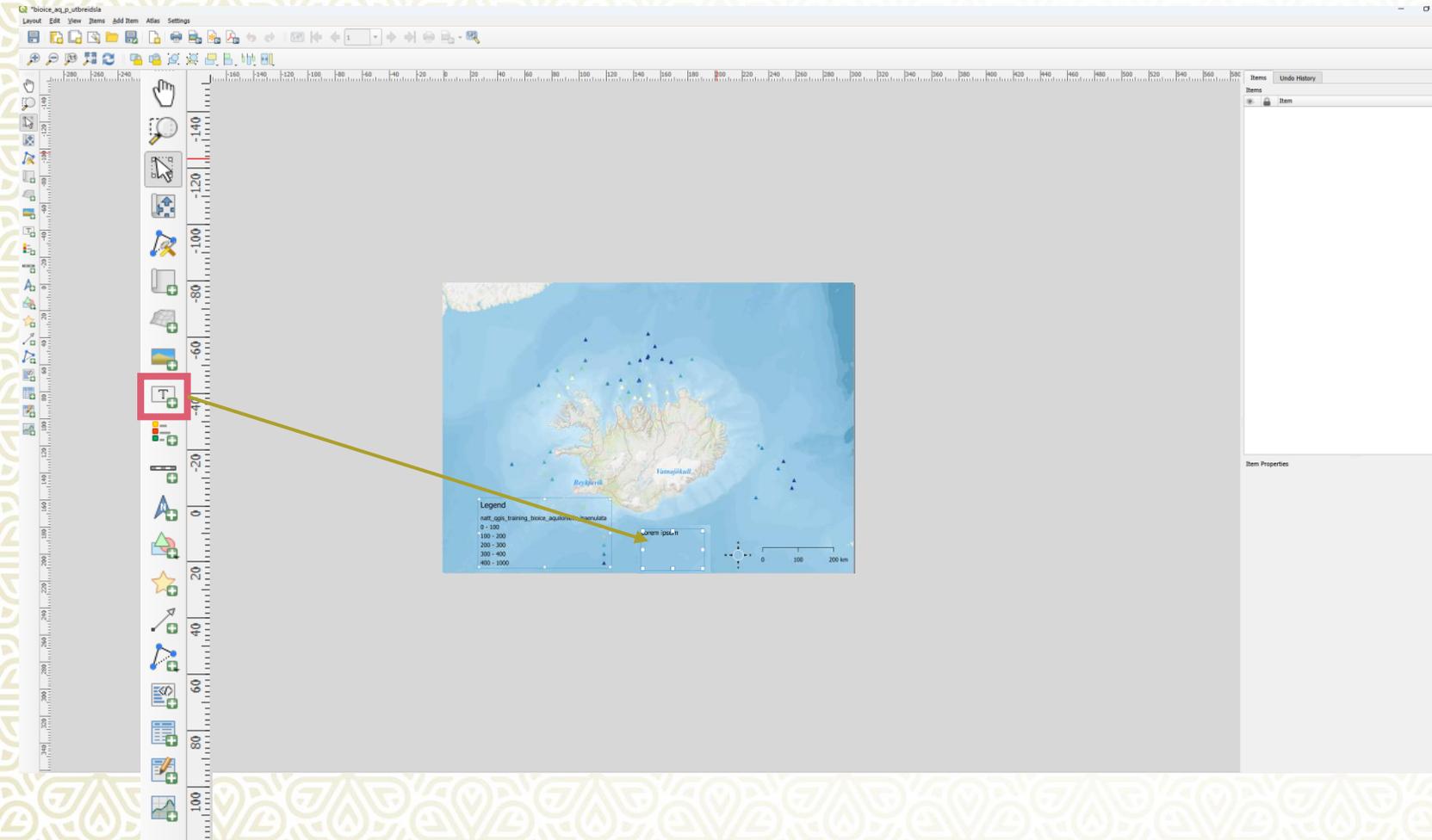
**Náttúrufræðistofnun**

# WORKSHOP:
# Basic Vector analysis and map creation

Create a map
Part six: add map information

- Click 'add label' button and click somewhere to add the relevant information to your map. What info you put, if any at all, will depend on the purpose of the map

- In this example, we will use CRS, name, and date.

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Create a map
Part six: add map information

- When your new text box is created, you can change it in item properties

- You can either manually type in the information OR you can add Dynamic Text dropdown (automatically updates/adds info)

- In this example, we added: **'Dynamic text– Map properties – Map1 –- CRS Identifier (EPSG:8088) and 'Dynamic text – Project Author' and 'Dynamic text – Current date', but reformatted to dd MMMM yyyy**
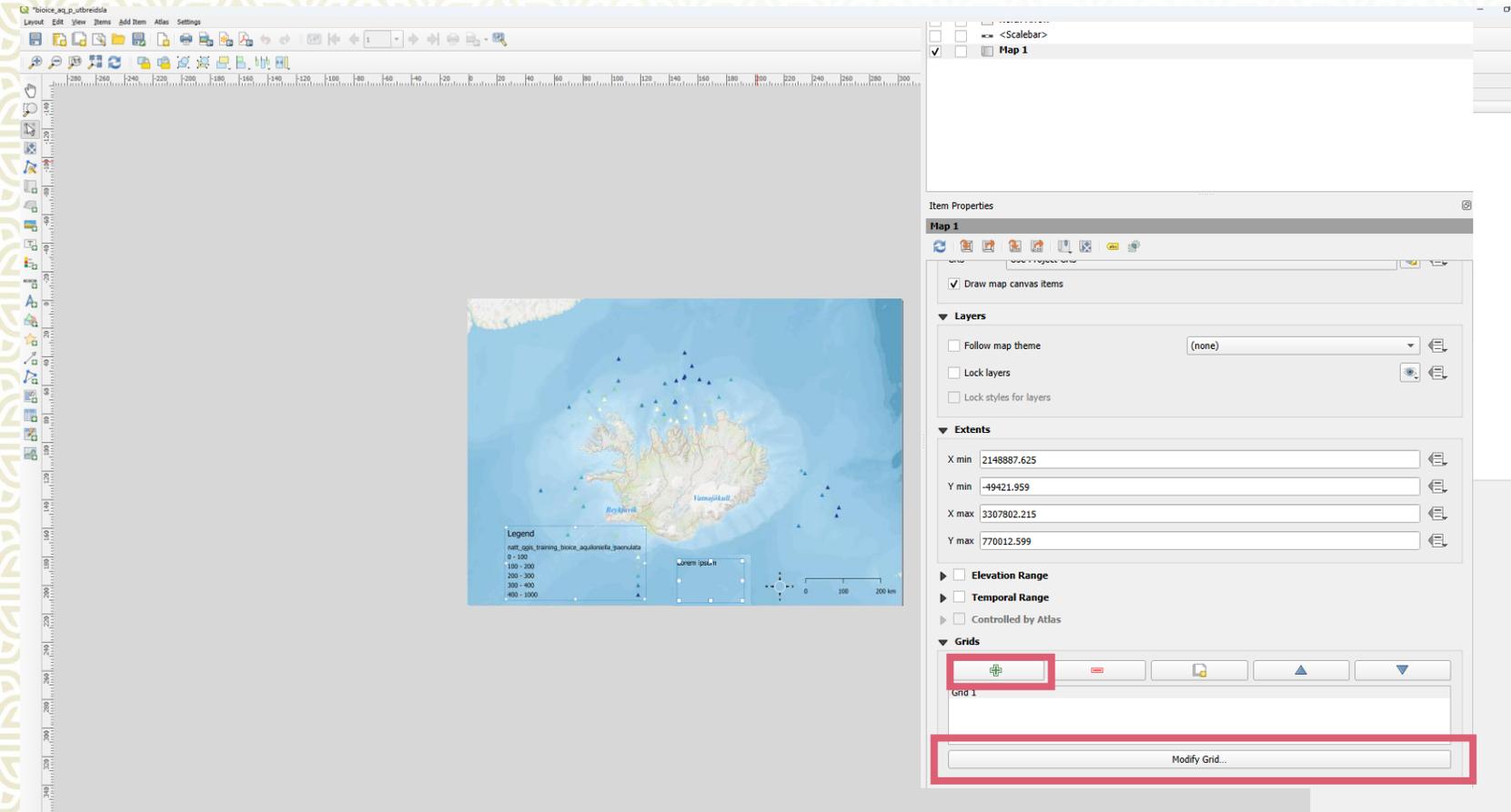
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Create a map
Part seven: add grid lines

- Last, you'll want to add gridlines to help the reader get context

- Select your map (Map1) then find 'Grids' dropdown menu.

- Click on the green plus to add a grid, then click 'Modify Grid..'

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Create a map
Part seven: add grid lines

- There are many ways to set up a grid, but generally you will want your grid labels to be in Lat/long (EPSG 4326)
  - This is standard for cartography

- Try setting your grid up the way it is set up here, but you can play around with the style if you want later

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## Create a map
## Part eight: make it beautiful

- Last, you can play around with the location of the items and map, fonts, sizes, etc.

- You can also add shapes with the add shape button on the left to create a box for your legend or information

- This is often up to personal choice. Choose a style that works for you

Some inspiration:
https://hub.qgis.org/map-gallery/?page=3&sort=upload_date&order=desc
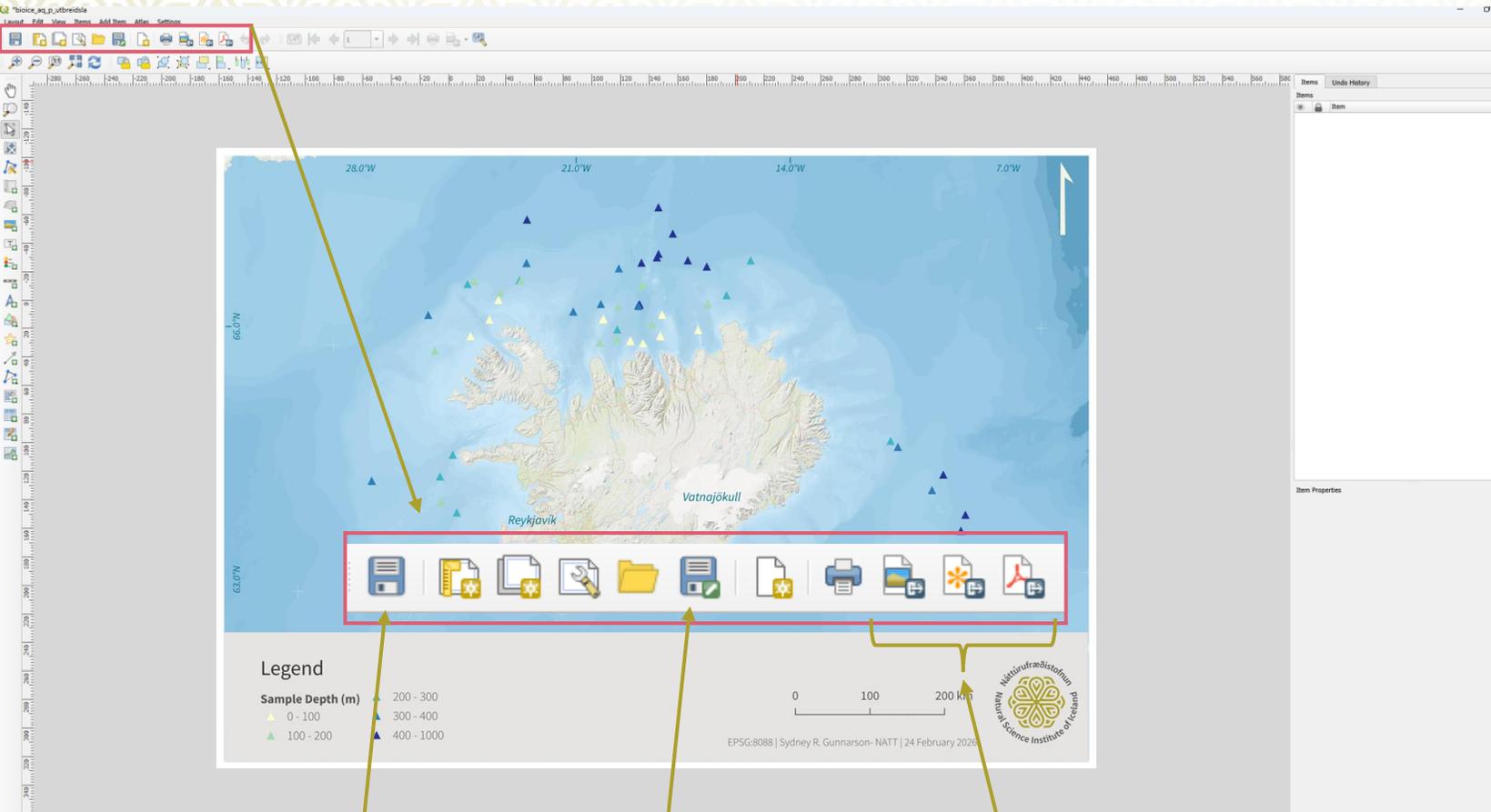
**Náttúrufræðistofnun**
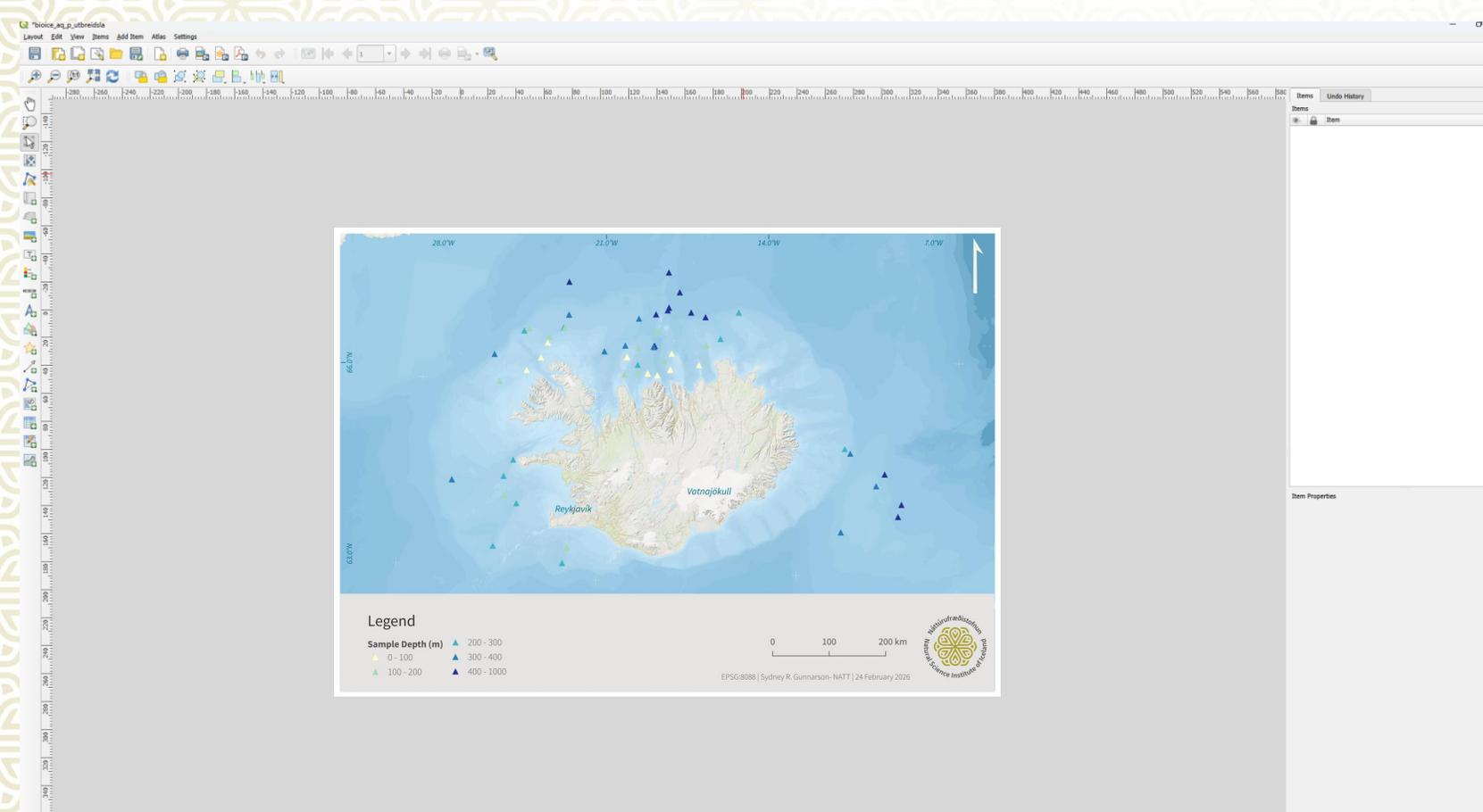
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Create a map
Part nine: Export the map

- Don't forget to save your map layout if you want to keep working on it (save button)

- You can also save this map layout as a template (save template button)

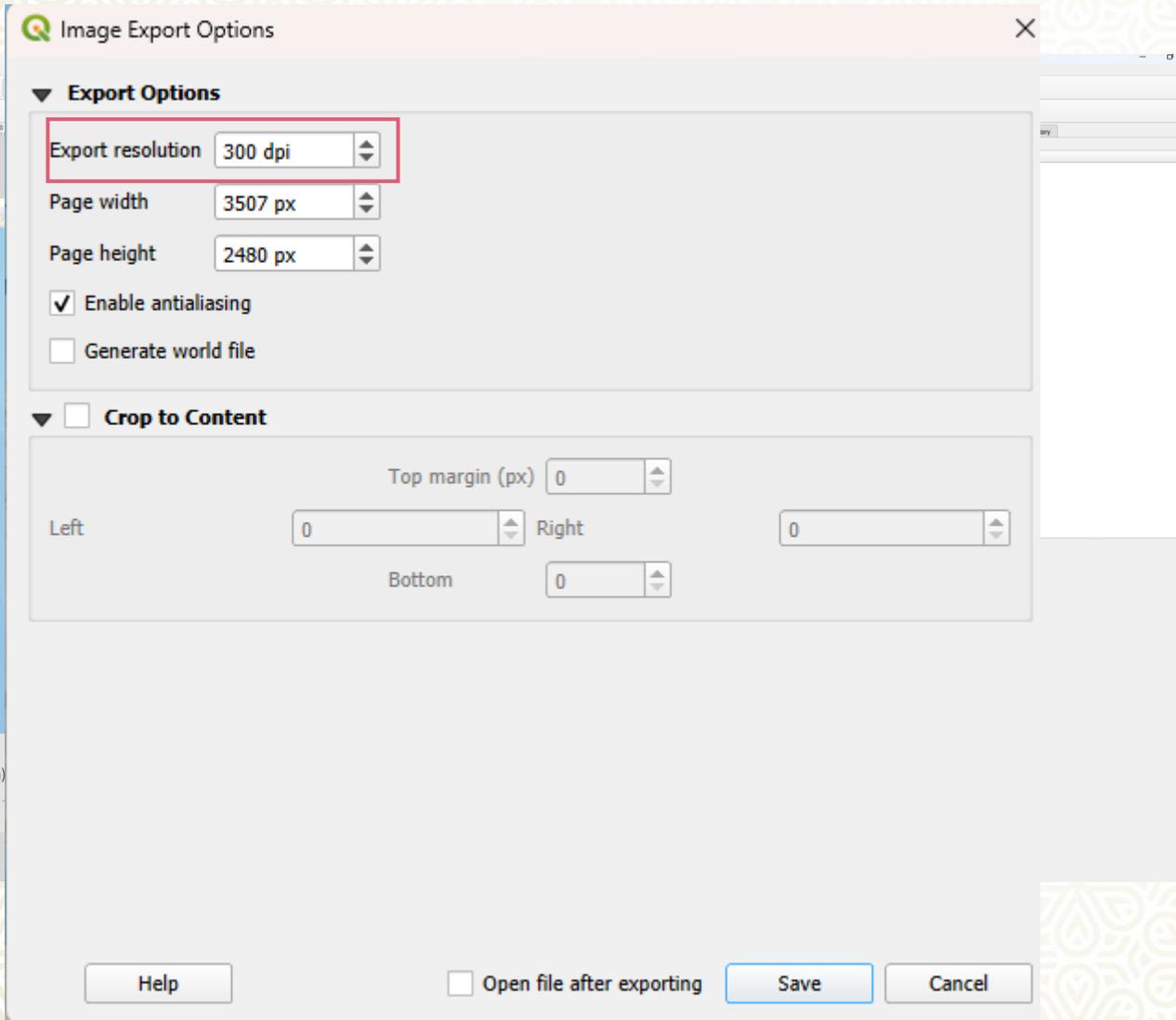- You can export your map with one of these three buttons (PNG, SVG, PDF)

Save print layout

Save as template

Export map

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**Basic Vector analysis and map creation**



Create a map
Part nine: Export the map

- **Click export as PNG. Give the file a name. For this exercise export at 300 dpi.**

- For a figure in a report: Png, 300+ DPI, A5 format

- Scientific article: Varies, check journal requirements

- Powerpoint: PNG, A5 and 150 dpi

- Website/online: A4 or A5 and 90 dpi

- Full-page map
  - PNG or PDF, 600+ DPI, A4

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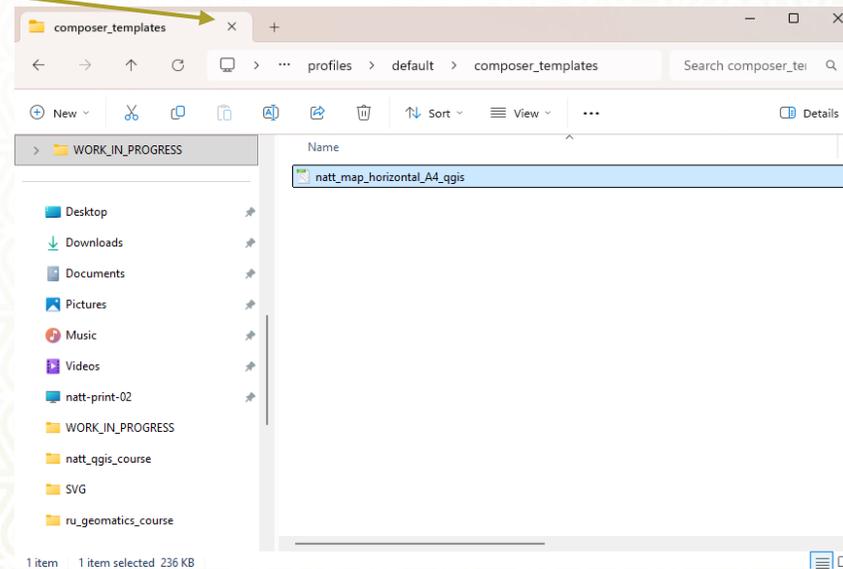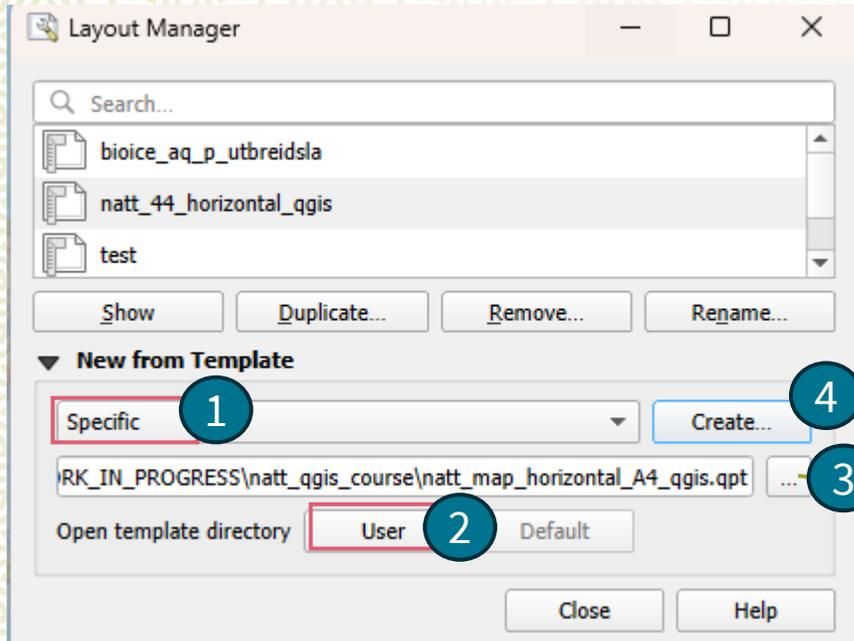


Create a map
Part ten: Now try with a template

- Open print layout Manager again in the map canvas

- Under 'New from template' change type to 'specific'.

- Click 'User' to find your template directory. Copy and paste the style 'natt_map_horizontal_A4.qpt' into this directory

- Now you should be able to open the style by clicking ... and selecting the template

- In the future, you can keep templates you make here

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## Basic Vector analysis and map creation
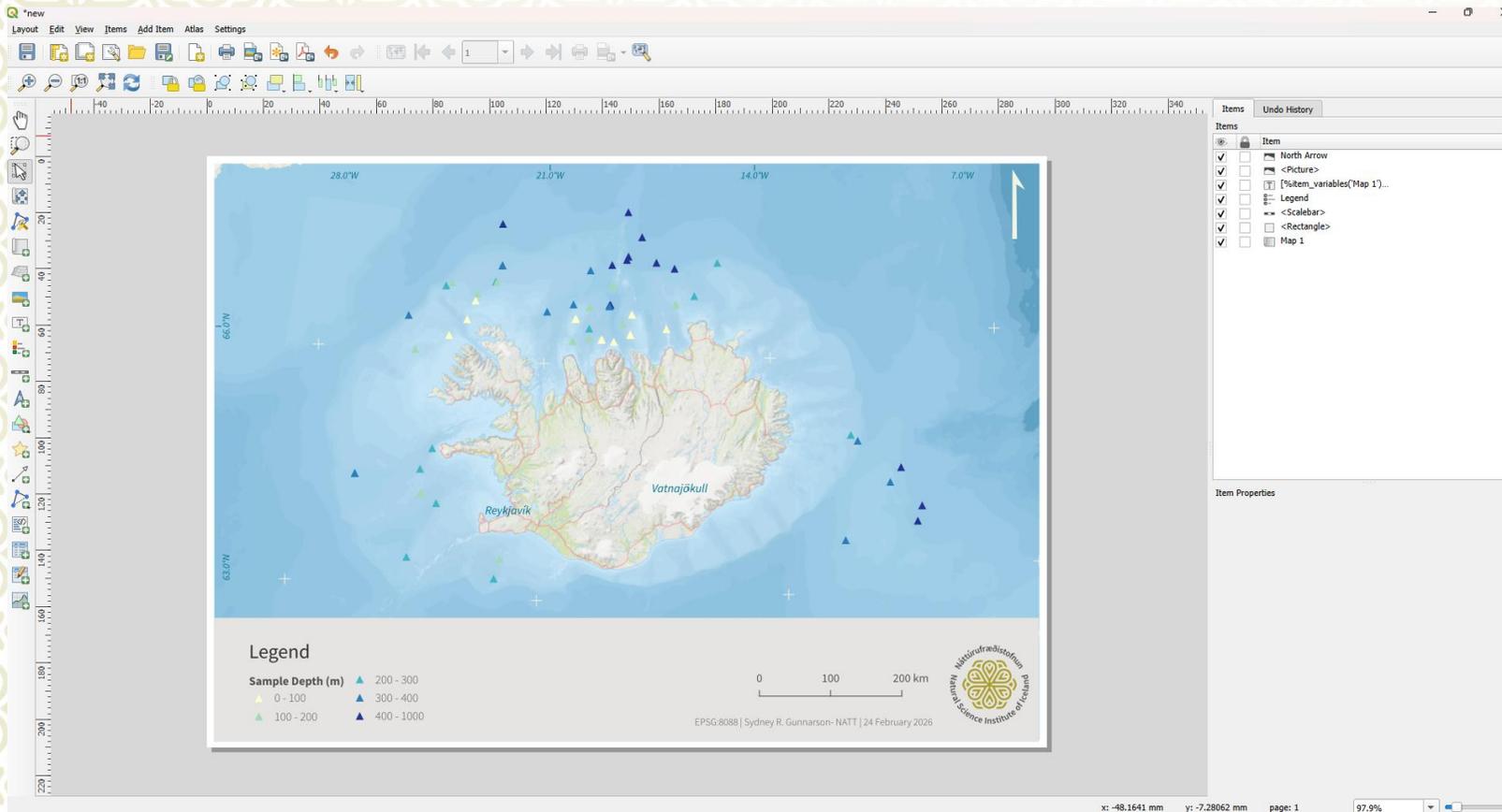
Create a map
Part ten: Now try with a template

- The Dynamic text updates automatically with the CRS, name, and date. The logo, grid, and scale bar are automatically included at the correct scale.

- Now re-style the map and legend using your new map template.

- Export your map as you did in step nine

- Compare the two maps together

- If you make the same type of maps often, templates can save a lot of time!

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# Basic Vector analysis and map creation
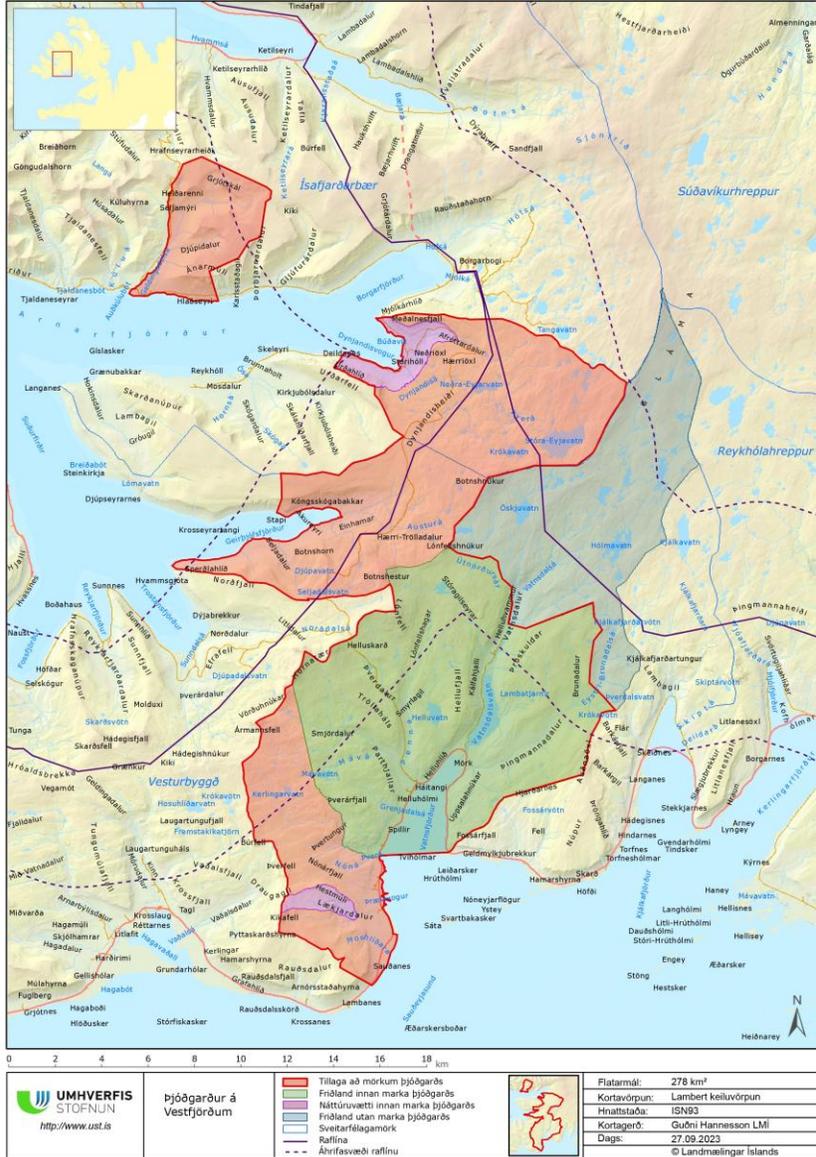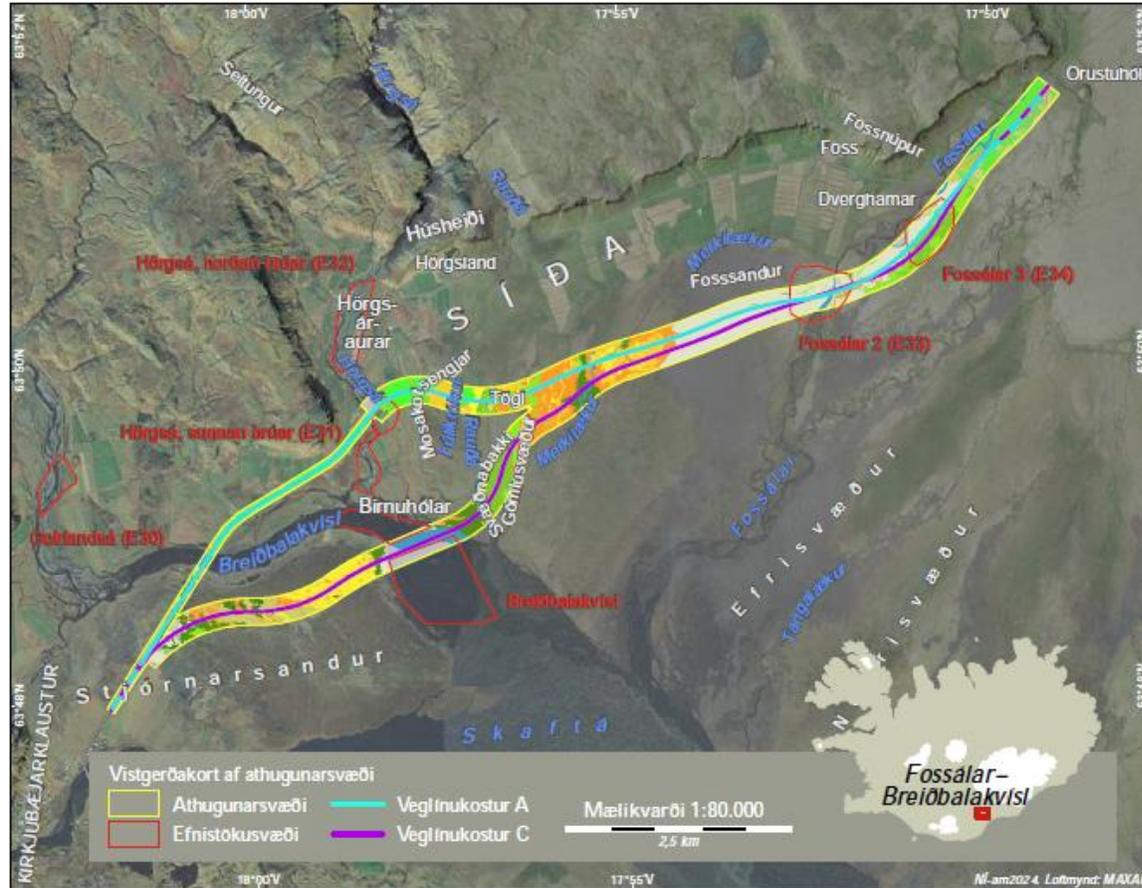


### Example map created for a client

G. Hannesson, Nátt

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**Example map created for an article**

A. T. Meier, Nátt.