NatureScot Research Report RR1356 spatial data outputs - Application of surface motion remote sensing to quantify the condition and trajectory of change of c.680,000 ha of peatland

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Primary satellite data was provided for free by the European Space Agency (ESA). These data were then further processed by Terra Motion Limited and then the University of Nottingham.

Information on the condition classes

It is essential to note that the classification system is not mapping ecological condition but provides measures of condition based on ground motion that results from the combined effects of ecology, hydrology and mechanics. It does not replace detailed assessment of peatland ecology or hydrology condition should specific measures of these parameters be required.

Areas classed as good may reflect areas in good ecological condition that do not require restoration work, but the good class also encompasses areas that may contain patches of bare peat with the soft, wet nature of the peat still resulting in a dynamic surface motion. The stiff class can also represent the near natural condition on areas with steeper slopes that are naturally well drained or on peatland margins. In flatter areas that collect water, the stiff class may result from artificial drainage.

For detailed information on the classes used, please see the “Conceptual model and classification” section and Table 1 in the associated NatureScot Commissioned Research Report RR1356:

https://www.nature.scot/doc/naturescot-research-report-1356-application-surface-motion-remote-sensing-quantify-condition-and

The three classes used, and their characteristics are summarised here:

Degrading:

- sustained subsidence in the trend, possibly at variable rates, with or without evidence of seasonal oscillations
- active subsidence due to loss of water and/or oxidation of the peat and/or active erosion
- vegetation will change as water table depths deepen, with shrub (e.g. *Calluna vulgaris*) or scrub (e.g. *Betula spp., Pinus contorta, Picea sitchensis*) becoming increasingly dominant. The characteristic surface motion signals are based on those that correspond to areas of actively draining, clear-felled, and eroding sites.

Good:

- dynamic surface swelling in winter in response to water storage in soft spongy peat
- the multi-annual trend in the surface level is stable or rising
- indicative of resilient behaviour as the surface can adapt to the position of the water table
- near natural or rewetted peatland with a shallow water table and soft to spongy surface, e.g. near natural sphagnum peat
- if not in good ecological condition (e.g. wet gully bases) these areas are likely to be more responsive to restoration on account of their natural tendency to hold water.

Stiff:

- the multi-annual trend in the surface level is stable
- non-dynamic surface indicative of stiff consolidated peat
- typical of well drained environments and the later stage of degradation (when peat has consolidated) including areas of upland peat that have experienced long-term erosion
- likely to have a vegetation layer dominated by shrub or grasses.

File formats

- Raw CSV files
- GeoPackage
- ESRI File Geodatabase

Additional style files

If you choose to download the raw CSV files, they include CSVT header information, which allows you to quickly convert them into point features for further GIS analysis using ogr2ogr. The GeoPackages contain point feature classes in WGS84. For the best accuracy in British National Grid applications, please use the OSGB_1936_To_WGS_1984_Petroleum or the OSTN02 transformation in ArcGIS products.

Please use the zipped style files (QML, SLD or ArcGIS layer files) to symbolise the point data so that the maps resemble the output intended by the data producers. Each feature class contains multiple attribute values, which can be used for symbolisation to generate the various mapping outputs. The following sections describe which attributes to use to display which map.

Condition maps

Description: Condition classes of peat and the probability of each class for 2015-2019 and 2019-2023

Name:	InSAR_ConditionProbs_peat_clip_<tile>_<f/l>4
where:	<tile> = tile reference e.g. N001
	f = first (2015-2019)
	l = last (2019-2023)

Data columns:

ID.vec1	Identification number of point unique to <tile> - integer
Lat.vec	Latitude in decimal degrees. Datum WGS-84 - float
Long.vec	Longitude in decimal degrees. Datum WGS-84 - float
Class	Class with greatest probability
where:	1 = Degrading (black)
	2 = Good (blue),
	3 = Stiff (green) - integer
ProbDeg	Probability of degrading, values 0-1 - float
ProbGood	Probability of good, values 0-1 - float
ProbStiff	Probability of stiff, values 0-1 - float

Change maps

Description: Direction and magnitude of change between 2015-2019 and 2019-2023 and change between pairs of consecutive years, 2015/16 and 2016/17, 2016/17 and 2017/18, 2017/18 and 2018/19, 2018/19 and 2019/20, 2020/21 and 2021/22, 2021/22 and 2022/23.

Name: InSAR_<tile>_Peat_ChangeDetection_2019-2023

where <tile> = tile reference e.g. N001

Data columns:

X GIS file identifier - integer

ID.vec1 Identification number of point unique to <tile> - integer

Lat.vec Latitude in decimal degrees. Datum WGS-84 - float

Long.vec Longitude in decimal degrees. Datum WGS-84 - float

velchange4y Change detection between two periods of time series (e.g. 2015-2019 and 2019-2023) - float

velchange2v1 Change detection between two whole consecutive years (e.g. 2015/16 and 2016/17) - float

velchange3v2 Change detection between two whole consecutive years (e.g. 2016/17 and 2017/18) - float

velchange4v3 Change detection between two whole consecutive years (e.g. 2017/18 and 2018/19) - float

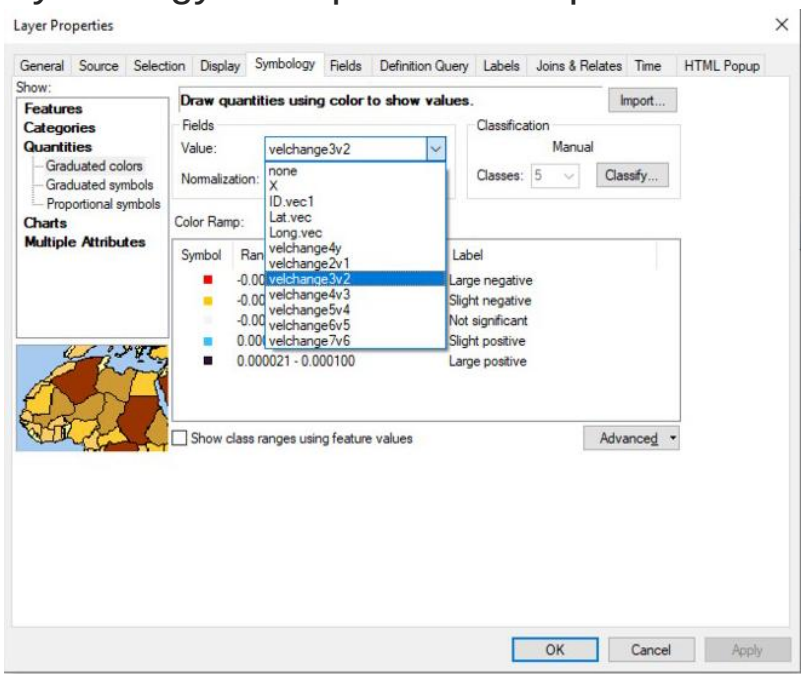
velchange5v4 Change detection between two whole consecutive years (e.g. 2018/19 and 2019/20) - float

velchange6v5 Change detection between two whole consecutive years (e.g. 2020/21 and 2021/22) - float

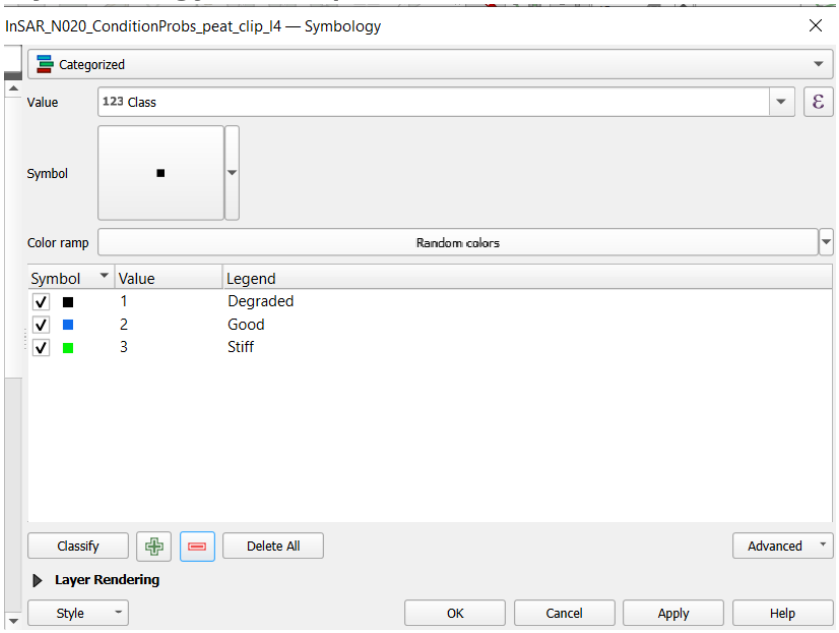
velchange7v6 Change detection between two whole consecutive years (e.g. 2021/22 and 2022/23) – float

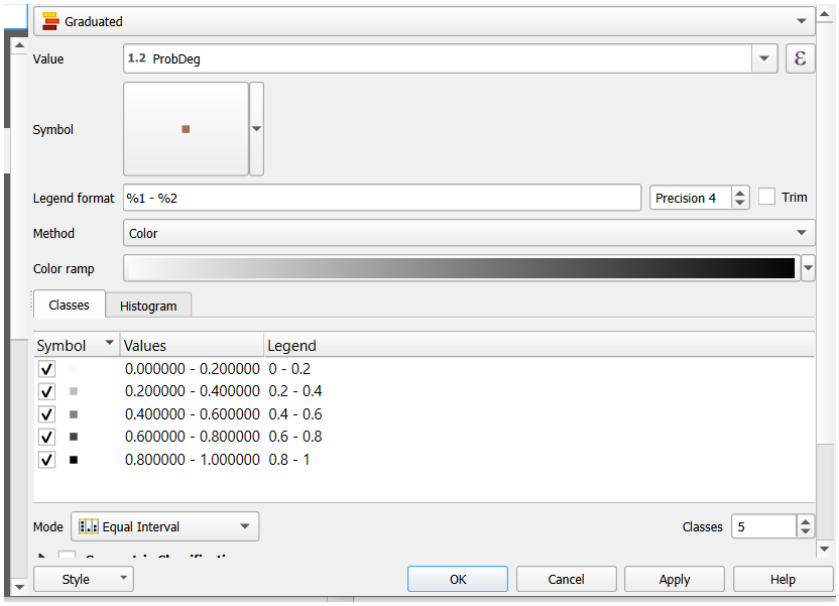
The classes represent the 10, 20, 80 and 90th percentiles and the values used have been calculated from all InSAR tile outputs.

Symbology example in ArcMap



Symbology examples in QGIS




Graduated
Value
1.2 ProbDeg
Symbol
Legend format
%1 - %2
Precision 4
Trim
Method
Color
Color ramp
Classes
Histogram
Symbol
Values
Legend
0.000000 - 0.200000 0 - 0.2
0.200000 - 0.400000 0.2 - 0.4
0.400000 - 0.600000 0.4 - 0.6
0.600000 - 0.800000 0.6 - 0.8
0.800000 - 1.000000 0.8 - 1
Mode
Equal Interval
Classes
5
Style
OK
Cancel
Apply
Help