WILDERNESS MAPPING IN ICELAND

Overview and comparative analysis of methods

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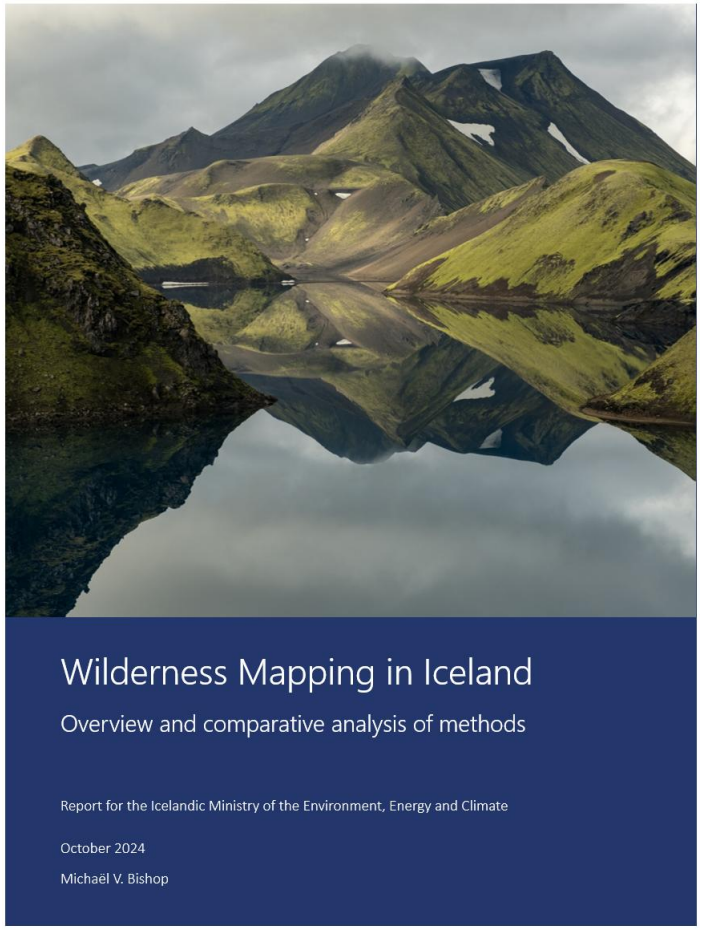
WILDERNESS MAPPING IN ICELAND

PROJECT OVERVIEW

- Wilderness first legally defined in 1999 in Iceland.
  - Multiple mapping attempts made over the past 25 years.
  - Use of different methods produced different maps.
  - Legal changes made older maps obsolete.
- Report with a dual aim:
  - To compare and analyze the different approaches.
    - Similarities, differences, assumptions, criteria, interpretations.
  - To make recommendations to reduce bias and increase consistency
- Methodology:
  - Review of regional to national wilderness maps
  - Expert interviews
  - Spatial overlay and comparative analysis
  - Case studies & perception studies also considered.



Source: Bishop, M. V. (2024). Wilderness Mapping in Iceland – Overview and comparative analysis of methods. https://www.stjornarradid.is/library/02-Rit--skyrslur-og-skrar/URN/2024_Wilderness_Mapping_in_Iceland.pdf

WILDERNESS MAPPING IN ICELAND

LEGAL BACKGROUND (NATURE CONSERVATION ACT 60/2013)

- Since 1999, the definition of wilderness has become more flexible and inclusive (e.g. *ósnortið -> óbyggð*).
  - Article 5.19 - *óbyggt víðerni*

  ~~Lands~~[S]væði [í óbyggðum] sem er [að jafnaði] a.m.k. 25 km² að stærð eða þannig að hægt sé að njóta þar einveru og náttúrunnar án truflunar af mannvirkjum eða umferð vélknúinna farartækja ~~á jörðu~~, [og að jafnaði]~~er~~ í a.m.k. 5 km fjarlægð frá mannvirkjum og öðrum tæknilegum ummerkjum, svo sem raflínum, orkuverum, miðlunarlónum og [uppbyggðum] ~~þjóð~~vegum~~, og þar sem ekki gætir beinna ummerkja mannsins og náttúran fær að þróast án álags af mannlegum umsvifum~~.

- Wilderness now also refers to a protected area category.
  - Article 46 - *óbyggð víðerni*

  Friðlýsingin skal miða að því að varðveita einkenni svæðisins, t.d. að viðhalda fjölbreyttu og óvenjulegu landslagi, víðsýni og/eða vernda heildstæð stór vistkerfi, og tryggja að núlifandi og komandi kynslóðir geti notið þar einveru og náttúrunnar án truflunar af mannvirkjum eða umferð vélknúinna farartækja

- Mapping based on Article 5.19

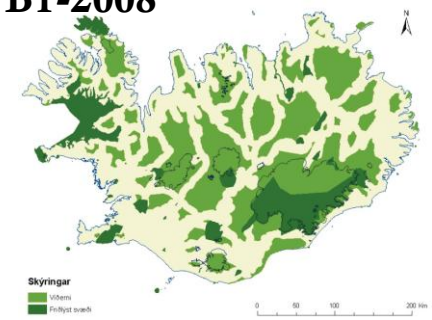
WILDERNESS MAPPING IN ICELAND

PUBLICATIONS

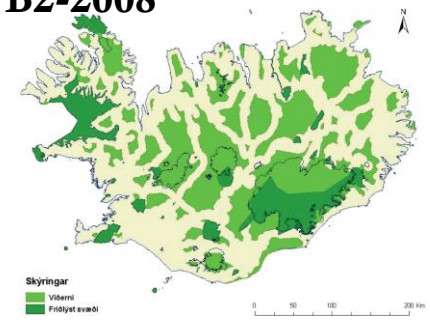
- 14 maps
- 7 teams

A1-1998

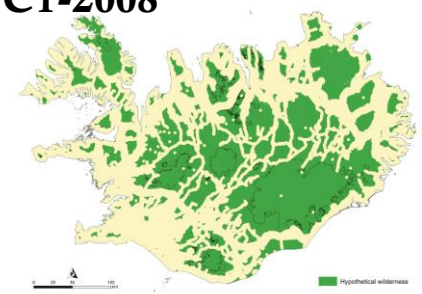
B1-2008



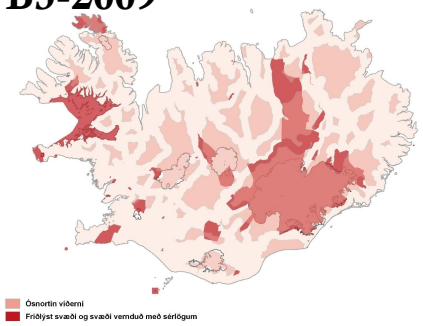
B2-2008



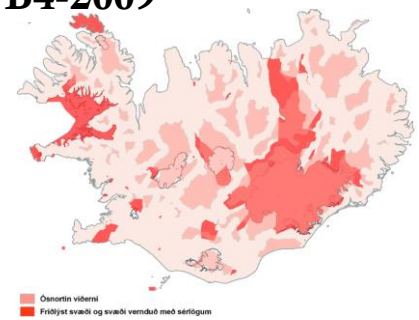
C1-2008



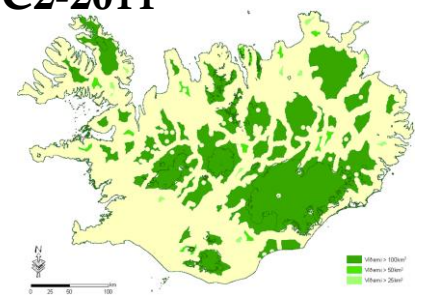
B3-2009



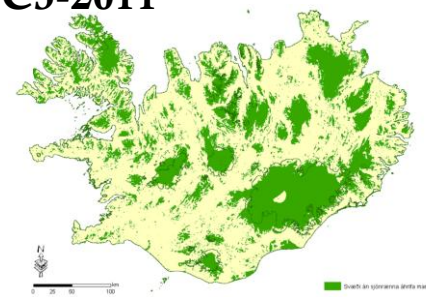
B4-2009



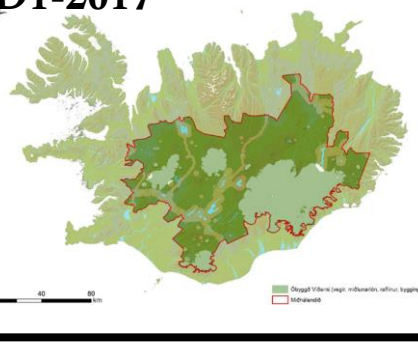
C2-2011



C3-2011

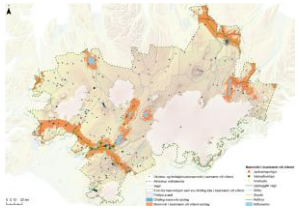


D1-2017

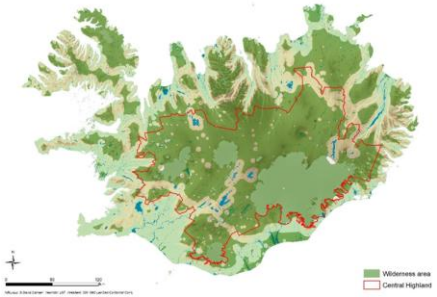


E1-2018

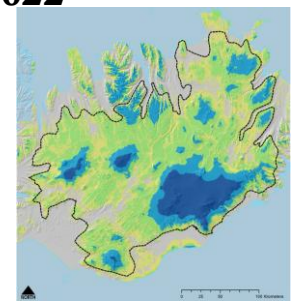
F1-2019



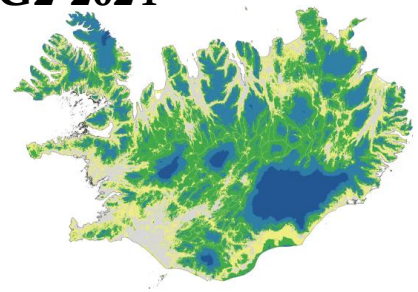
D3-2021



G1-2022



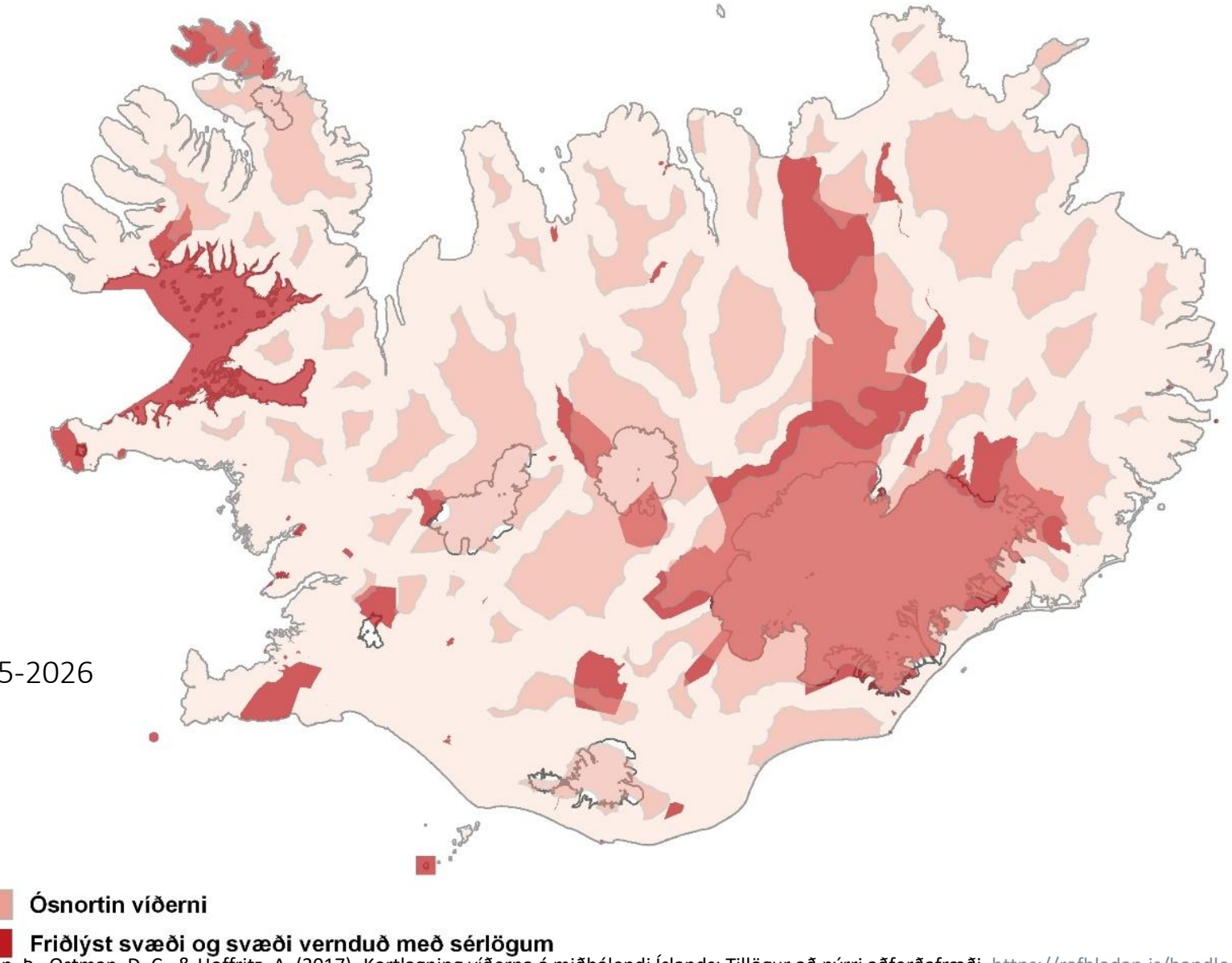
G2-2024



WILDERNESS MAPPING IN ICELAND

MAP B3-2009

- Made by Umhverfisstofnun
- Based on Act 44/1999:
  - 5km from:
    - Buildings, except
      - Isolated houses
      - Ruins
    - Main roads (Road Act)
    - Power line above ground
    - Artificial lakes
  - >25 km²
- Used in the Landsskipulagsstefna 2015-2026



Source: Árnason, Þ., Ostman, D. C., & Hoffritz, A. (2017). Kortlagning víðerna á miðhálendi Íslands: Tillögur að nýrri aðferðafræði. https://rafhladan.is/handle/10802/29604

WILDERNESS MAPPING IN ICELAND

MAP E1-2018

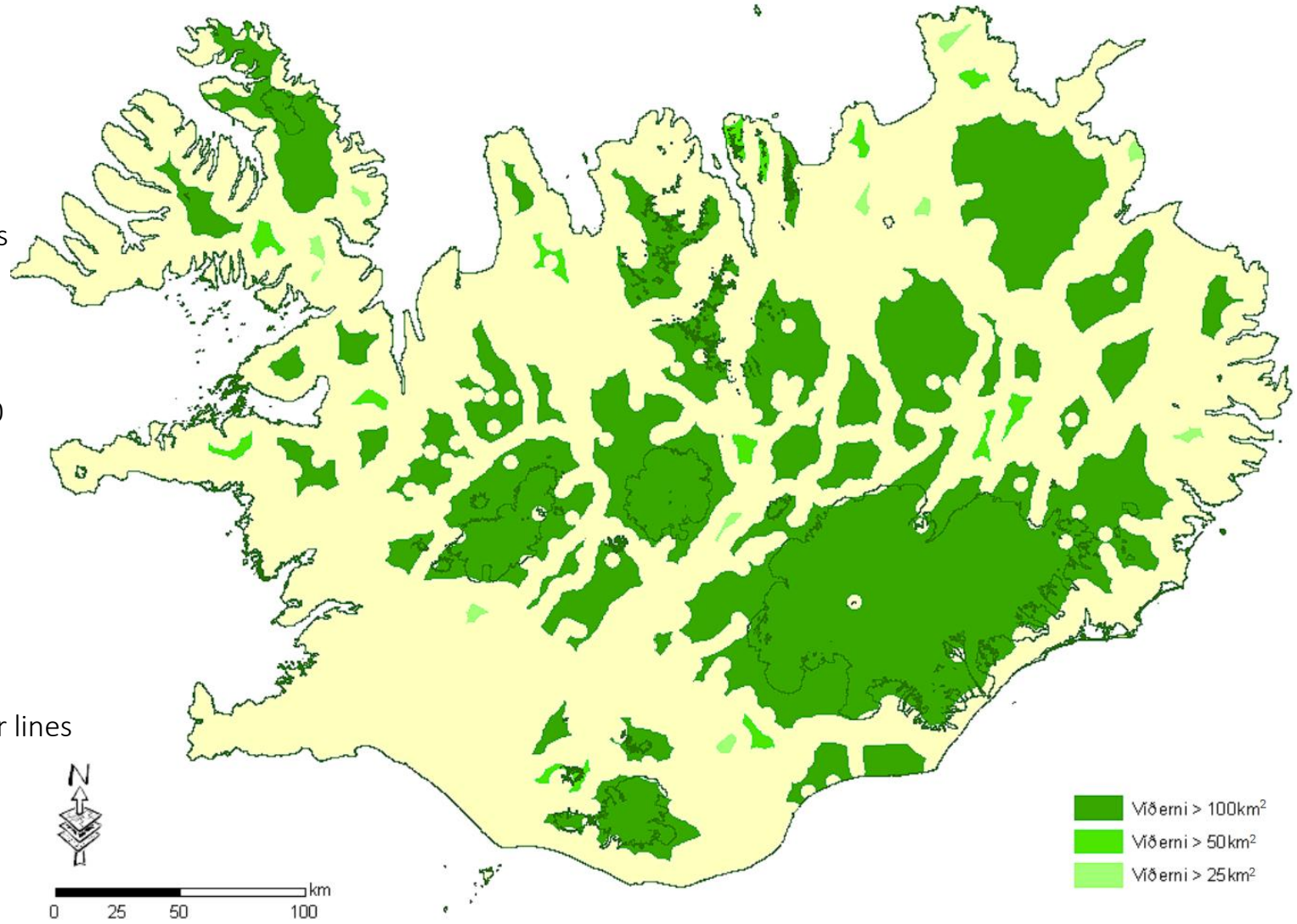
- Made by Náttúrufræðistofnun Íslands
- Update of UST 2009 map:
  - 5 km from:
    - Structures except cat. 1340, e.g. emergency shelters, herding cabins, mountain huts, etc.)
    - Paved roads and other roads except public/private gravel roads
    - Urban areas, power lines, airports
    - Reservoirs
    - Cultivated lands, planted forests, lupine fields
  - > 25 km²
- Unofficial map, used on online viewer.

Source: Náttúrufræðistofnun Íslands. (2018). Tilgátukort – Óbyggð víðerni. Retrieved 11/05/2024 from: https://iinh.maps.arcgis.com/apps/webappviewer/index.html?id=f843cb215b1244778 856859d4911373e

WILDERNESS MAPPING IN ICELAND

MAP C2-2011

- Made by Ólafsdóttir & Runnström
- Mechanized access
  - 5 km from major roads/country roads
  - 3 km from highland roads
- Permanent settlements
  - 25 km from urban nuclei of >100.000 inhabitants
  - 5 km from other urban nuclei, industrial/services facilities
  - 5 km from farms and single houses
- Apparent naturalness
  - 5 km from largest high-voltage power lines
  - 5 km from energy, telecom., utility structures
  - 3 km from mountain huts

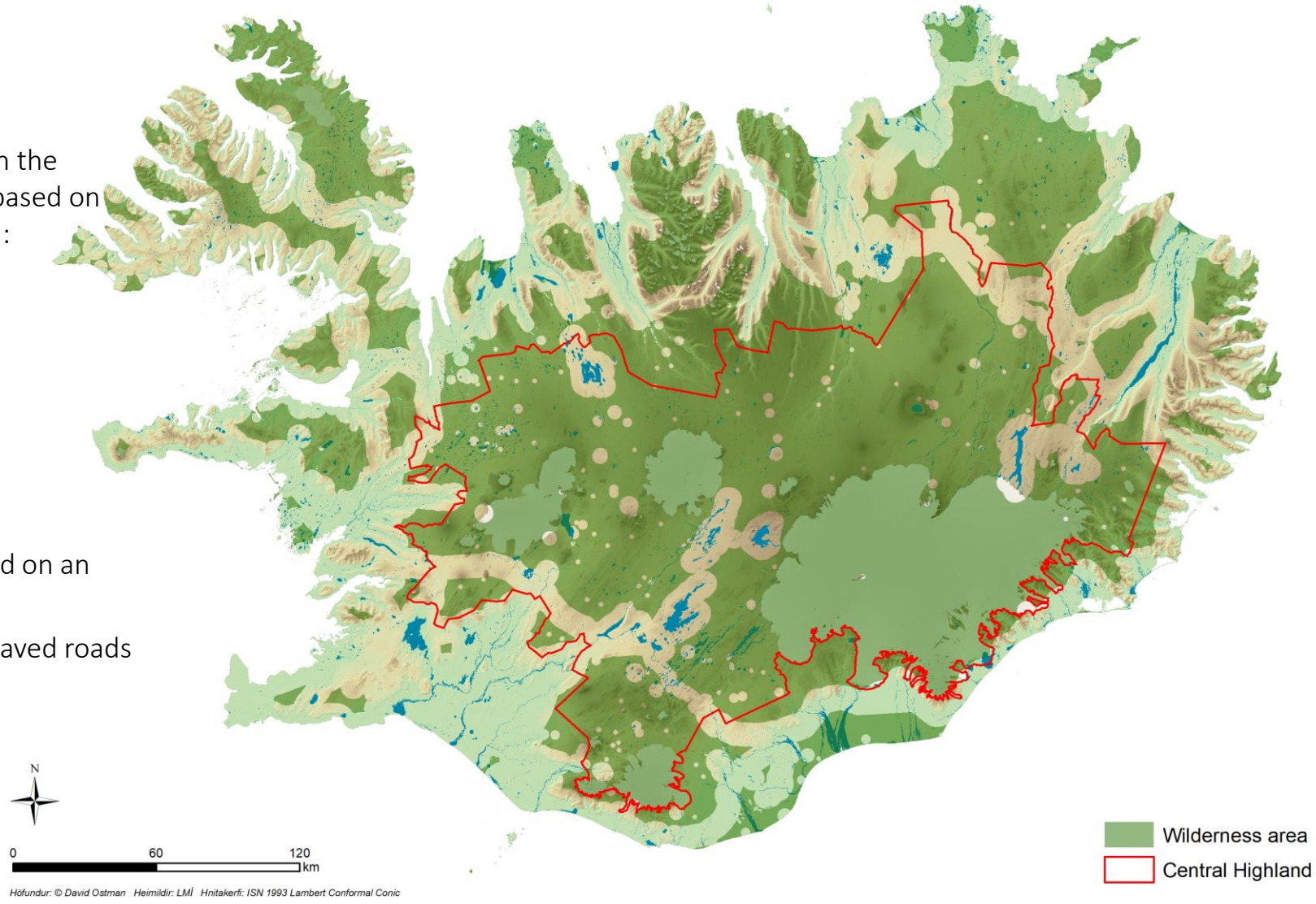


Source: Ólafsdóttir, R., & Runnström, M. C. (2011a). Endalaus víðátta? Mat og kortlagning íslenskra víðerna. Náttúrufræðingurinn, 81(2), 61–68. https://www.researchgate.net/publication/256766562_Endalaus_vidatta_Mat_og_kortlagning_islenskra_viderna

WILDERNESS MAPPING IN ICELAND

MAP D3-2021

- Made by Ostman et al.
  - Focus on buildings, initially only in the Central Highland. 0-7 km buffer, based on score from 0-120 [0-1-4-8-13-20]:
    - Type of use
    - Built surface
    - Cluster size
    - Distance to nearest road
    - Type of nearest road
    - Visibility
  - Extension to whole country, based on an exclusion area:
    - 5 km from power lines & paved roads
    - 2 km from urban areas
    - 0 km from cultivated lands
  - Unpaved roads not assessed.

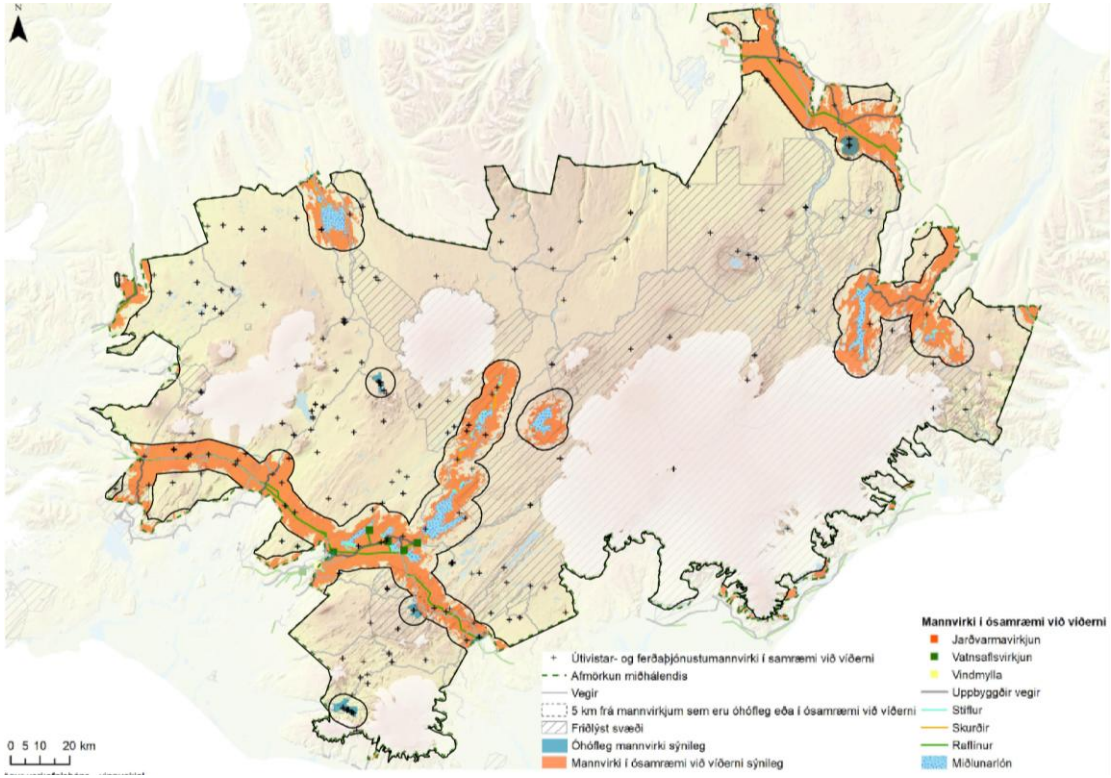


Source: Ostman, D. C., Neumann, O., & Árnason, Þ. (2021). Óbyggð víðerni á Íslandi – greining og kortlagning á landsvísu. https://www.ramma.is/media/rannsoknir/OstmanEtal2021_WildernessIceland.pdf

WILDERNESS MAPPING IN ICELAND

MAP F1-2019

- Made by Skipulagsstofnun & Umhverfisstofnun
  - 5km from **inappropriate** structure
    - Large structures, e.g. power lines, power plants, reservoirs, wind turbines, upbuilt roads, industry, significant mines, quarries & utility structures.
  - 5 km from **excessive** structures
    - Built surfaces
    - Weighted by use type 1-1,5
    - Road impact (tolerance of gravel roads and jeep tracks, use of **traffic intensity**)
    - **Visibility of buildings and traffic**, 2m offset
  - Unpaved roads **not** assessed.

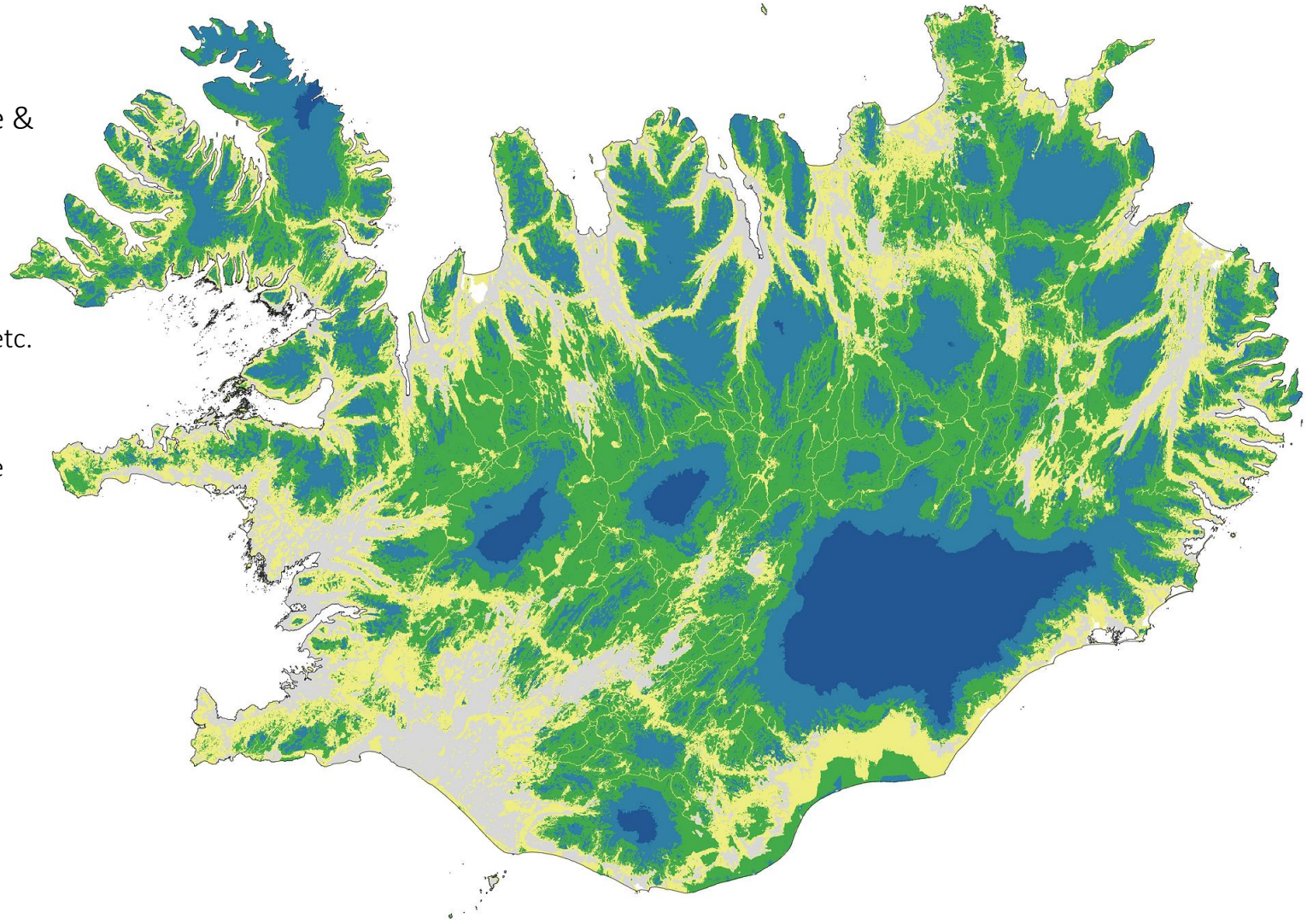


Source: Skipulagsstofnun og Umhverfisstofnun. (2019). Kortlagning víðerna á miðhálendinu. Tillögur að útfærslu viðmiða. https://www.landsskipulag.is/media/pdf-skjol/Kortlagning_viderna_Skyrsla_verkefnishops_14102019_sam.pdf

WILDERNESS MAPPING IN ICELAND

MAP G2-2024

- Made by the Wildland Research Institute & ÓFEIG Náttúruvernd
  - Remoteness from mechanized access
    - Walking time to the nearest road/track open to the public
    - Use of terrain, barrier features, etc.
  - Absence of modern human artefacts:
    - Cumulative viewsheds based on full/partial visibility, artefact type and distance
    - Significance of visible cell
  - Perceived naturalness of land-cover
    - 5 classes based on UN Land Use Change database
    - Mean value within 250m radius
- Combined values -> Wilderness Quality Index (WQI)
- Values in 5 classes (Jenks breaks)
- Follow-up work to define wilderness areas



Source: Wildland Research Institute & ÓFEIG. (2024). Víðernakortið 1.1. https://www.vidernakort.is/saekja-kort

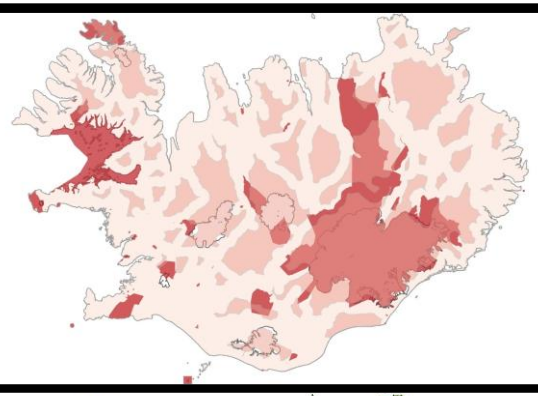
WILDERNESS MAPPING IN ICELAND

COMPARISON

<u>Mapping method:</u>

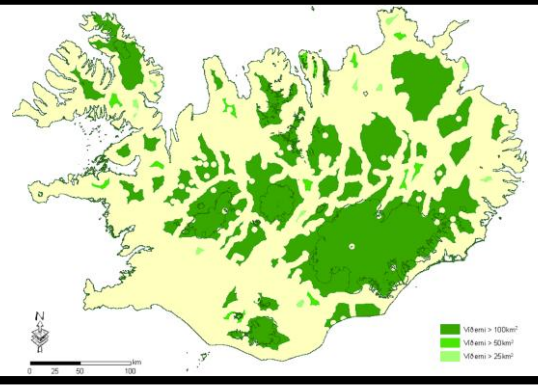
- Buffers-based?
  - Fixed size? B3/E1/F1
  - Variable size? C2/D3
  - Based on classification? B3/E1/C2
  - Based on score? D3/F1
- Topography-based?
  - Using visibility? D3/F1/G2
  - Using terrain? G2
  - Output type:
    - Binary? (F1)
    - Continuous? G2
    - Used in scores for buffers? D3/F1

B3-2009
5 km

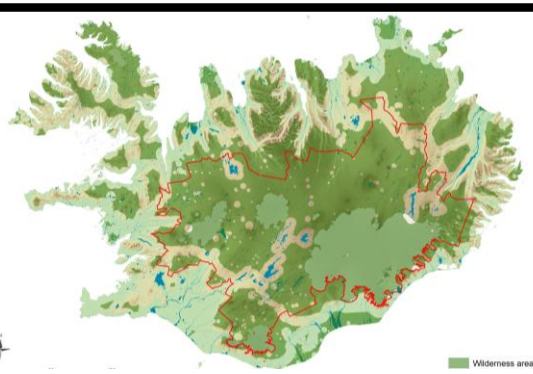


E1-2018
5 km

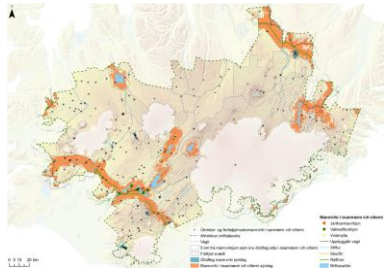
C2-2011
3-5 km



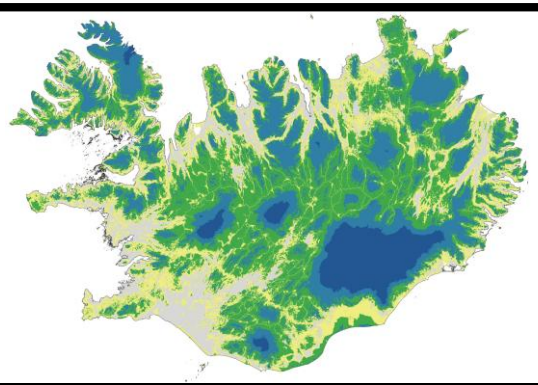
D3-2021
0-7 km



F1-2019
5 km



G2-2024



WILDERNESS MAPPING IN ICELAND

COMPARISON

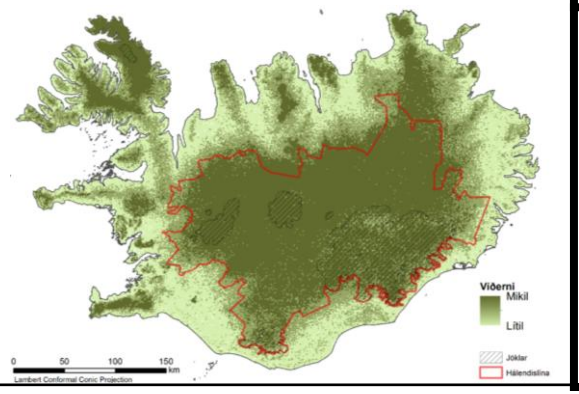
Extent:

- **29-65% of Iceland** (38-86% in C.H.)

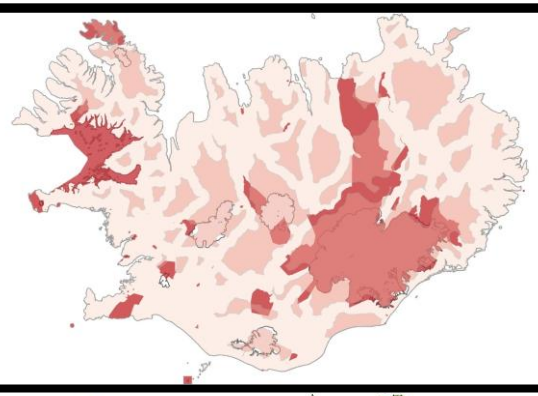
ATH: D3 and F1 did **not** consider unpaved roads due to lack of legal definition of *uppbyggðir vegir*

ATH: G2 extent only based on the top 2-3 WQI classes

- Rather consistent with public perception (Ólafsdóttir et al, 2016)[1]

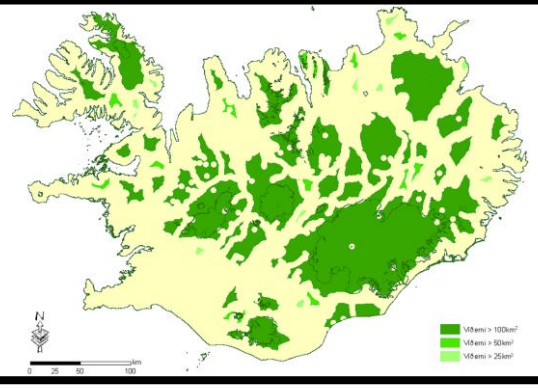


B3-2009
Í:37%
CH:61%

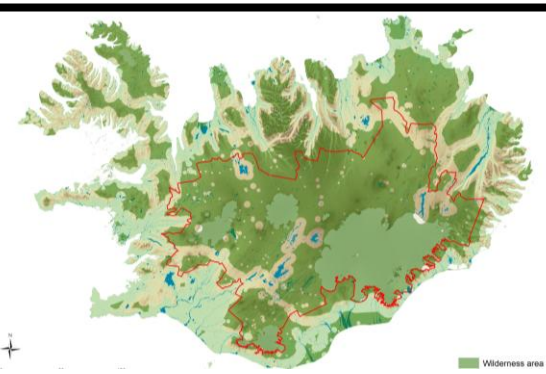


E1-2018
Í:34%
CH:58%

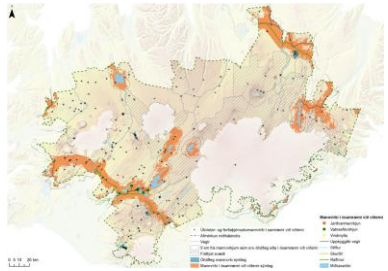
C2-2011
Í:33%
CH:56%



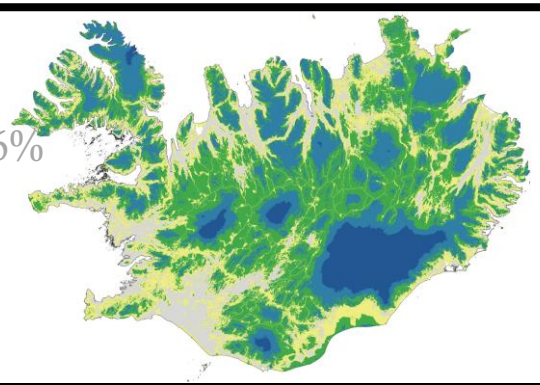
D3-2021
Í:55%
CH:82%



F1-2019
Í: N/A
CH:84%



G2-2024
Í:29-65%
CH:38-86%



[1]Source: Ólafsdóttir, R., Sæþórsdóttir, A. D., Guðmundsson, H., Huck, J., & Runnström, M. C. (2016). Viðhorf og upplifun Íslendinga á víðernum, óbyggðum og miðhálendi Íslands.

https://www.ramma.is/media/rannsoknir-f2-ra3/Vidhorf-og-upplifun-Islendinga-a-vidernum,-obyggdum-og-midhalendi-Islands.pdf

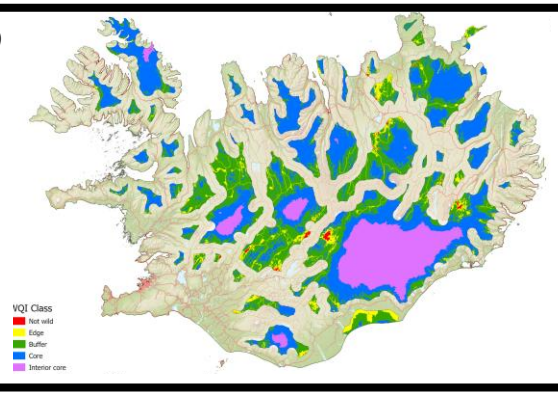
WILDERNESS MAPPING IN ICELAND

COMPARISON

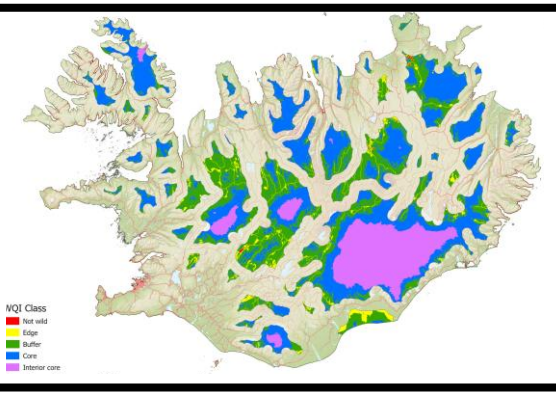
<u>WQI values in Wilderness areas:</u>

- 45-65% consistency (coverage of top 2 WQI classes).
- Low values due to:
  - Reservoirs
  - Naturalness of land cover

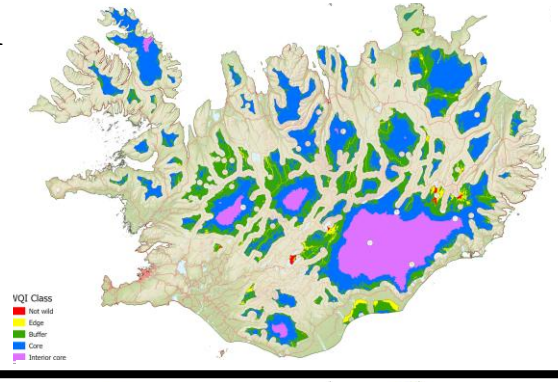
B3-2009
H:59%
M:36%
L:5%



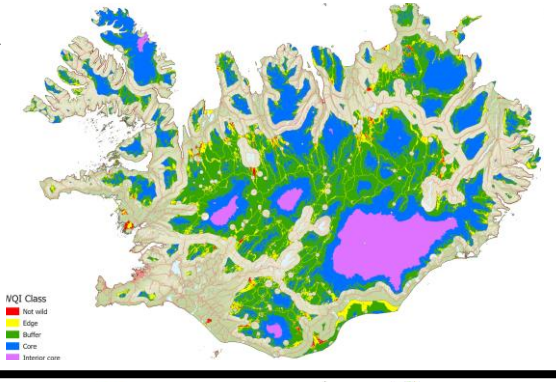
E1-2018
H:62%
M:34%
L:4%



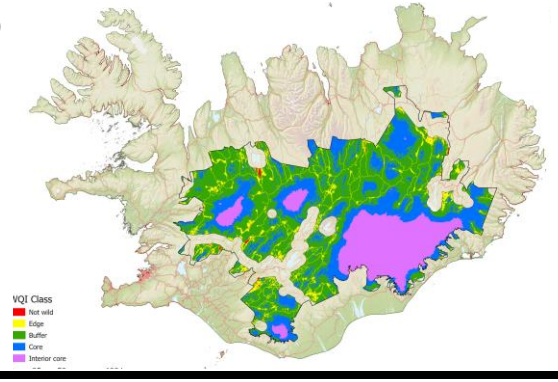
C2-2011
H:65%
M:32%
L:3%



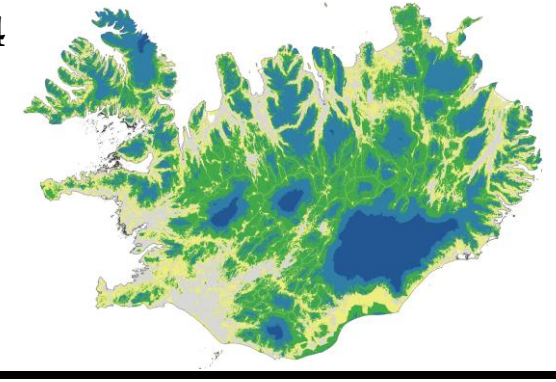
D3-2021
H:47%
M:45%
L:8%



F1-2019
H:45%
M:49%
L:6%



G2-2024
N/A



WILDERNESS MAPPING IN ICELAND

COMPARISON

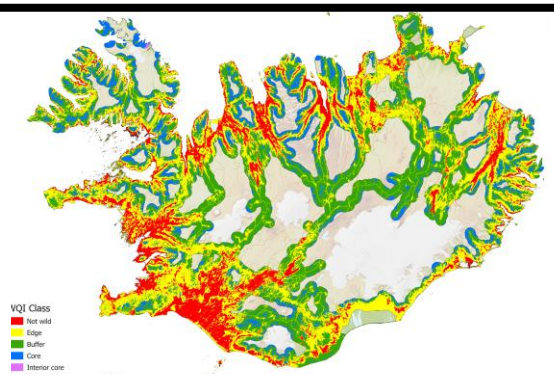
WQI values in Wilderness areas:

- 45-65% consistency (coverage of top 2 WQI classes).
- Low values due to:
  - Reservoirs
  - Naturalness of land cover

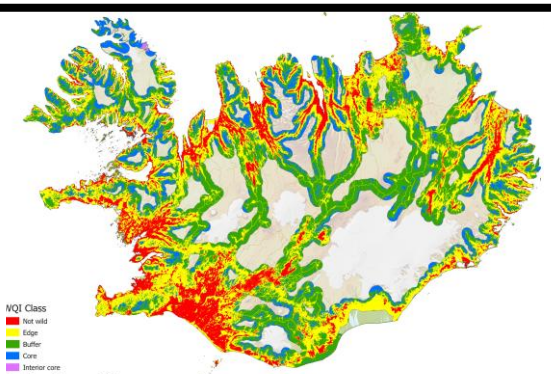
WQI values in non-Wilderness areas:

- 51-67% consistency (coverage of bottom 2 WQI classes).
- High values due to:
  - Topography (visibility/remoteness)

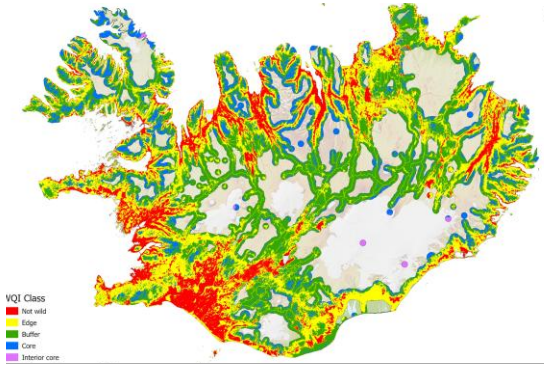
B3-2009
H:11%
M:37%
L:52%



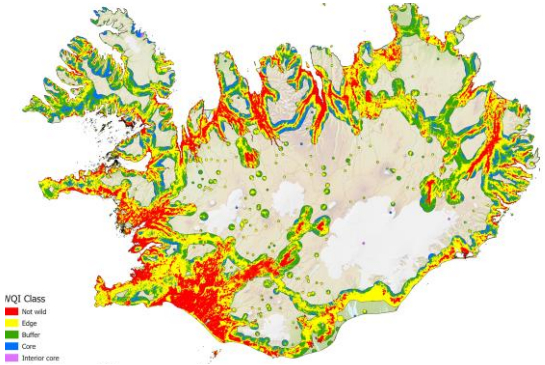
E1-2018
H:12%
M:37%
L:51%



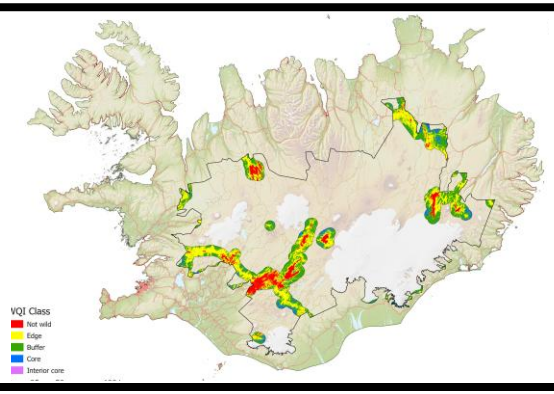
C2-2011
H:11%
M:38%
L:51%



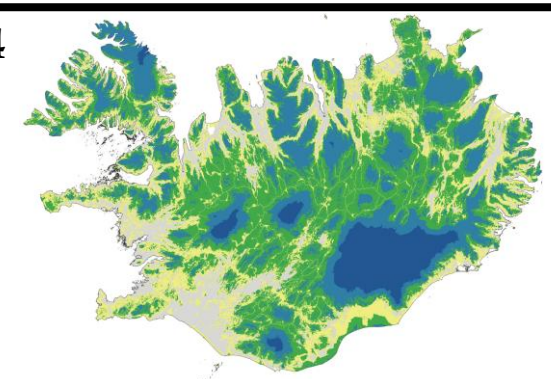
D3-2021
H:7%
M:26%
L:67%



F1-2019
H:5%
M:42%
L:53%



G2-2024
N/A



WILDERNESS MAPPING IN ICELAND

RECOMMENDATIONS

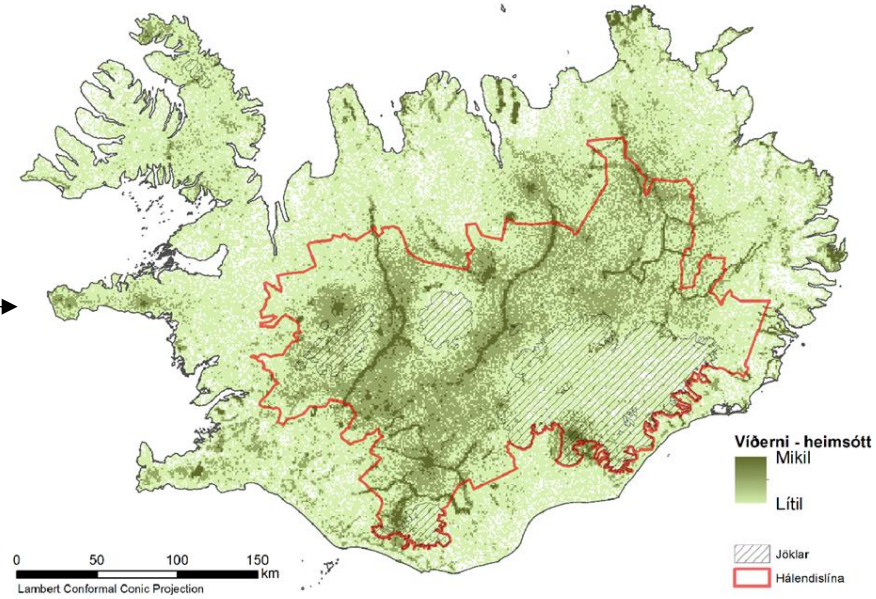
1. Clarifying the legal basis for wilderness mapping.
   - Better distinction between the Article 5.19 and Article 46 – *Víðernaverndarsvæði*?
2. Defining the term upbuilt roads (*uppbyggðir vegir*).
   - Based on physical characteristics and appearance
   - Related GIS data is needed for wilderness mapping
3. Considering recommendations from the 2019 report[1]:
   - Intrusiveness criteria
   - Allowing adjustments of the reduction distance (<5 km/>5km)
   - Considering visibility in the reduction distance
   - Exemptions for isolated small structures […] compatible with:
     - Wilderness experience
     - Natural qualities of uninhabited lands.
4. Considering naturalness & topography.
5. Need for high resolution tools for wilderness impact assessments.

[1]Source: Skipulagsstofnun og Umhverfisstofnun. (2019). Kortlagning víðerna á miðhálendinu. Tillögur að útfærslu viðmiða. https://www.landsskipulag.is/media/pdf-skjol/Kortlagning_viderna_Skyrsla_verkefnishops_14102019_sam.pdf

WILDERNESS MAPPING IN ICELAND

CONCLUDING REMARKS

- Wilderness can be experienced outside of areas identified as such (Ólafsdóttir et al., 2016).
  - (See map of areas in Iceland seen as wilderness visited by Icelanders) →
- Considering structure usage in wilderness impact assessments.
  - e.g. road development → increasing visitor numbers → increasing pressure on nature and attract service-oriented visitors → requiring more infrastructure and services → reducing natural appearance and spoiling visitor experience (Sæþórsdóttir, A. D., Waage, E. R. H., Jóhannesdóttir, G. R., & Jóhannsdóttir, S. S. (2024). Áhrif Skrokkölduvirkjunar á landslag, víðerni og friðlýst svæði. https://www.ramma.is/media/almenn-gogn/Fylgiskjal-6.-Greinargerd-faghopa-1-og-2-um-Skrokkolduvirkjun-lagfaert-13.1.2024-.pdf).



TAKK FYRIR

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Source: Ólafsdóttir, R., Sæþórsdóttir, A. D., Guðmundsson, H., Huck, J., & Runnström, M. C. (2016). *Viðhorf og upplifun Íslendinga á víðernum, óbyggðum og miðhálendi Íslands*.

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