Wilderness Mapping

For Iceland's Central Highland

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Wilderness Defined in Icelandic Law

Objectives

- Create a systematic, transparent, and dynamic method to map wilderness based specifically on the impacts of **manmade structures** (predetermined 3D roads, reservoirs, powerlines, and building structures)
  - "Different types of structures yield different impacts on wilderness
- Enhance credibility regarding wilderness conceptualization and strengthen its viability for strategic planning and land use decision-making

Overall Process

- Consolidate databases of manmade structures in Central Highland into one comprehensive database
- **Determine criteria** characteristics of structures that impact wilderness
- **Develop overlay system** of establishing 6 manmade structure and 600 (600 different) wilderness areas
- **Determine buffers** (based on the said areas) for each point
- **Create refined wilderness map**

Database Consolidation Process

Creating a new, comprehensive database:

- Parsed the original database information
- Added on new information (surface area, etc...)
- Dew reference number
- Assigned structure category
- Built data needed for missing the entire IDB herself

As it stands...

- **Comprehensive database**
  - 623 total building structures
  - 12 (+ 17) structure categories
- **Impact Criteria** (2)
- **New Wilderness maps**

Ongoing Discussions

- **GIS / mapping outputs are only as good as their inputs**
  - Importance of accuracy, baseline data (e.g. heights for visibility)
- **Road impact assessments**
  - Other factors: season of usage, traffic, visibility)
- **Hard vs. soft (Servyn boundaries**
  - Wilderness concept as result of environment
  - What is the carrying capacity of the area?

Table!

Thank you!

Wilderness Defined in Icelandic Law

Óbyggt víðerni - Act 60/2013, Art. 5(19)

- Svæði í óbyggðum sem er að jafnaði a.m.k. 25 km ^{2} að stærð eða þannig að hægt sé að njóta þar einveru og náttúrunnar án truflunar af mannvirkjum eða umferð vélknúinna farartækja og í a.m.k. 5 km fjarlægð frá mannvirkjum og öðrum tæknilegum ummerkjum, svo sem raflínum, orkuverum, miðlunarlónum og uppbyggðum vegum.

- An area of uninhabited land that is usually at least 25 km^2 in size or so that one can enjoy solitude and nature without disturbance from man-made structures or the traffic of motorized vehicles and at least 5 km away from man-made structures and other evidence of technology, such as power lines, power stations, reservoirs and built-up roads.

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Objectives

- **Create a systematic, transparent, and dynamic method to map wilderness based specifically on the impacts of manmade structures** (predominantly roads, reservoirs, powerlines, and building structures)

    *Different types of structures yield different impacts on wilderness

- **Enhance credibility regarding wilderness conceptualization and strengthen its usability for strategic planning and land use decision-making**

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Overall Process

- **Consolidate databases** of manmade structures in Central Highland into one comprehensive database
- **Determine criteria**/characteristics of structures that impact wilderness
- **Develop scoring system** to evaluate each manmade structure and how they affect/reduce wilderness
- **Determine buffers** (based on the total scores) for each point
- **Create refined wilderness map**

1st round of mapping - Spring 2017

2nd round of mapping - Spring 2019

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Database Consolidation Process

Creating a new, comprehensive database

- Preserved original database information
- Added any new information (surface area, etc...)
- New reference number
- Assigned structure category
- Raw data needed for scoring the criteria (GIS-based)

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As it stands...

- **Comprehensive database**
  - 623 total building structures
  - 13 (+ 1?) structure categories

- **Impact Criteria** (6)

- **New Wilderness maps**

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13 Structure Categories

Manmade Structure Categories	Count	% of Total Structures
Samgöngumannvirki / Transportation Infrastructure	2	0.32
Söluskálar / Food Service	5	0.80
Óþekkt / Unknown	6	0.96
Þjónustumiðstöðvar / Service Center	7	1.12
Býli / Farm	11	1.77
Fjarskipta innviðir / Telecommunication	13	2.09
Starfsmannahús / Staff Office	14	2.25
Hótel og gestahús / Hotel or Guesthouse	16	2.57
Geymslur / Storage	21	3.37
Virkjanamannvirki / Energy Structure	31	4.98
Hesthús / Stable	50	8.03
Salerni og hreinlætisaðstaða / Bathroom Facilities	59	9.47
Fjallakofar / Mountain Hut	388	62.28

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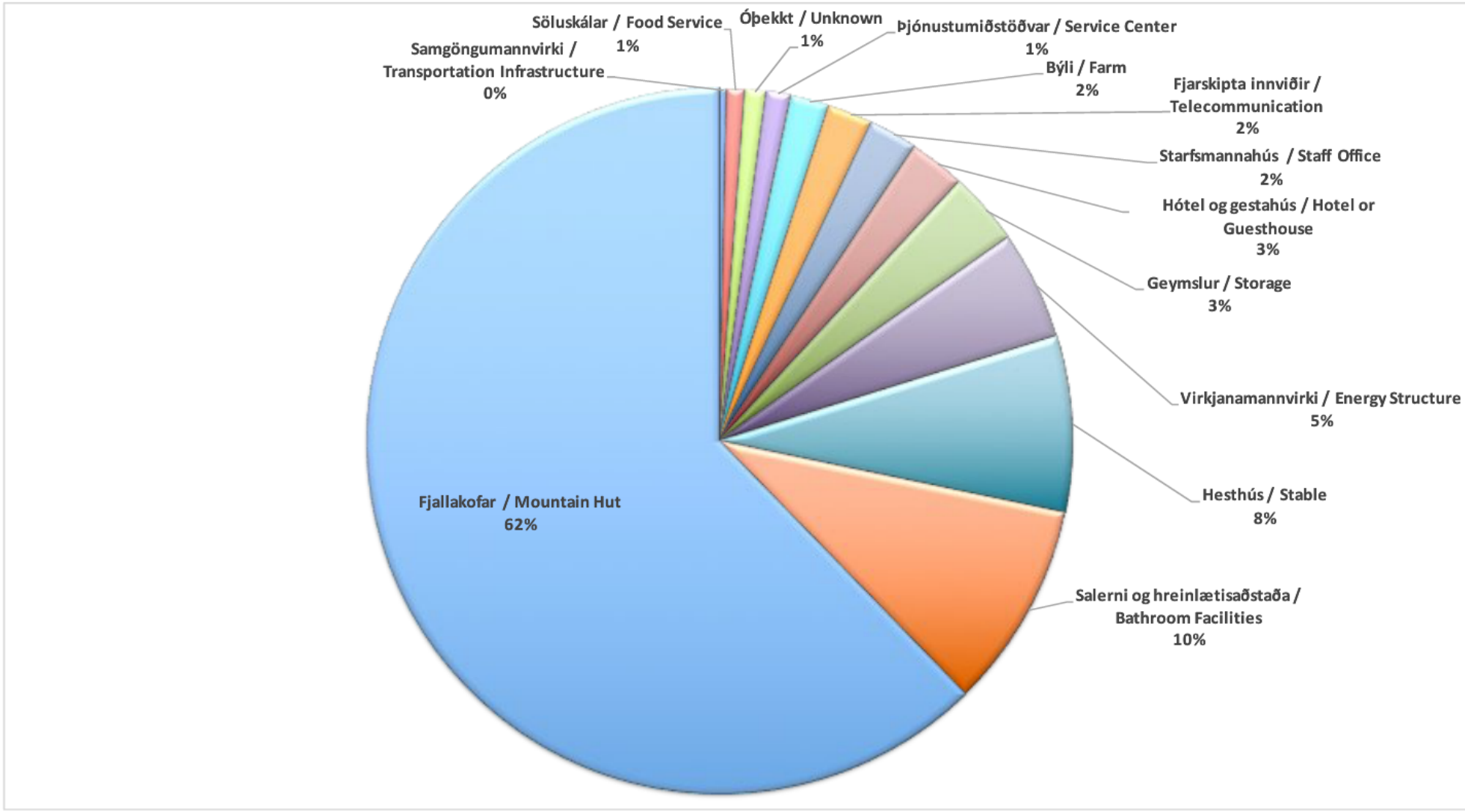
13 Structure Categories



As it stands...

- **Comprehensive database**
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- **Impact Criteria** (6)

- **New Wilderness maps**

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Criteria for Structures

- ***Structure Category / Usage***
- ***Clustering*** (point statistics tool)
  - **# of points within a 1km radius**
- ***Surface Area***
- ***Connectivity*** (near tool)
  - **Road type**
  - **Distance from road**
- ***Visibility*** (viewshed tool, cell count)

- Age
- Removability (Temporary vs. Permanent)
- Cultural Significance

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Scoring for Building Structures

[0 1 4 8 13 20]

Impact Criteria (Point Structures)	Metric	Impact Range	Impact Score (0,1,4,8,13,20)
Structure Usage	Category	Transportation Infrastructure	4
		Bathroom Facilities	1
		Hotel or guesthouse	8
		Energy Structure	20
		Staff Office	1
		Service Center	13
		Food Services	8
		Farm	4
		Storage	1
		Stable	1
		Mountain Hut	1
		Telecommunication	8
		Unknown	1
Surface Area	m2	0 - 49	0
		50 - 99	1
		100 - 149	4
		150 - 199	8
		200 - 249	13
		250 +	20
Clustering	# of points within 1km radius	0 - 1	0
		2 - 3	1
		4 - 5	4
		6 - 7	8
		8 - 9	13
		10 +	20
Connectivity	Road Type	F3	0
		F2	1
		F1	4
		D	8
		C	13
		A-B	20
	Distance to closest road (km)	10 +	0
		8 - 9	1
		6 - 7	4
		4 - 5	8
		2 - 3	13
		0 - 1	20
Visibility	Cell Count	0 - 299.999	0
		300.000 - 599.999	1
		600.000 - 899.999	4
		900.000 - 1.199.999	8
		1.200.000 - 1.499.999	13
		1.500.000 +	20

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Total Impact Score	Buffer Equivalent (0-7 km)
0 - 15	0
16 - 30	1
31 - 45	2
46 - 60	3
61 - 75	4
76 - 90	5
91 - 105	6
106 - 120	7

Scoring for Other Structures

Structure Type	Metric	Impact Range	Buffer (0-7 km)
Roads	Quality Type	F3	0
		F2	0
		F1	0
		D	0
		C (Excluding paved roads)	0
		C (Only paved roads) (#10)	5

Structure Type	Metric	Impact Range	Buffer (0-7 km)
Reservoirs	Category	Reservoir	5

Structure Type	Metric	Impact Range	Buffer (0-7 km)
Power Lines	Voltage (kV)	132	3
		220	5

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Scoring Process Overview

For each point structure....

Impact Score for **Surface Area**

+

Impact Score for **Cluster/Isolated**

+

Impact Score for **Connectivity**

+

Impact Score for **Category Type**

+

Impact Score for **Visibility**

=

Total Impact Score (0 - 120)

=

Buffer Equivalent (0 - 7 km)

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of structures in each buffer group

Impact Buffer (0 - 7 km)	Structure Category	Number	Total
0	Mountain Hut	10	13
	Stable	1	
	Unknown	2	
1	Bathroom Facilities	30	262
	Mountain Hut	186	
	Stable	32	
	Staff Office	2	
	Storage	8	
	Unknown	4	
2	Bathroom Facilities	25	219
	Energy Structure	1	
	Food Service	1	
	Mountain Hut	151	
	Stable	14	
	Staff Office	11	
	Storage	10	
	Telecommunication	5	
	Transportation Infrastructure	1	
3	Bathroom Facilities	4	85
	Energy Structure	4	
	Food Service	4	
	Hotel or Guesthouse	9	
	Mountain Hut	38	
	Service Center	5	
	Stable	3	
	Staff Office	1	
	Storage	3	
	Telecommunication	6	
	Transportation Infrastructure	1	
	Farm	7	
4	Energy Structure	24	39
	Farm	4	
	Hotel or Guesthouse	4	
	Mountain Hut	3	
	Service Center	2	
	Telecommunication	2	
5	Energy Structure	2	5
	Hotel or Guesthouse	3	
6			
7			

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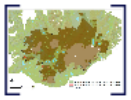
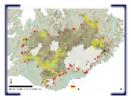
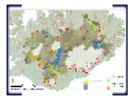
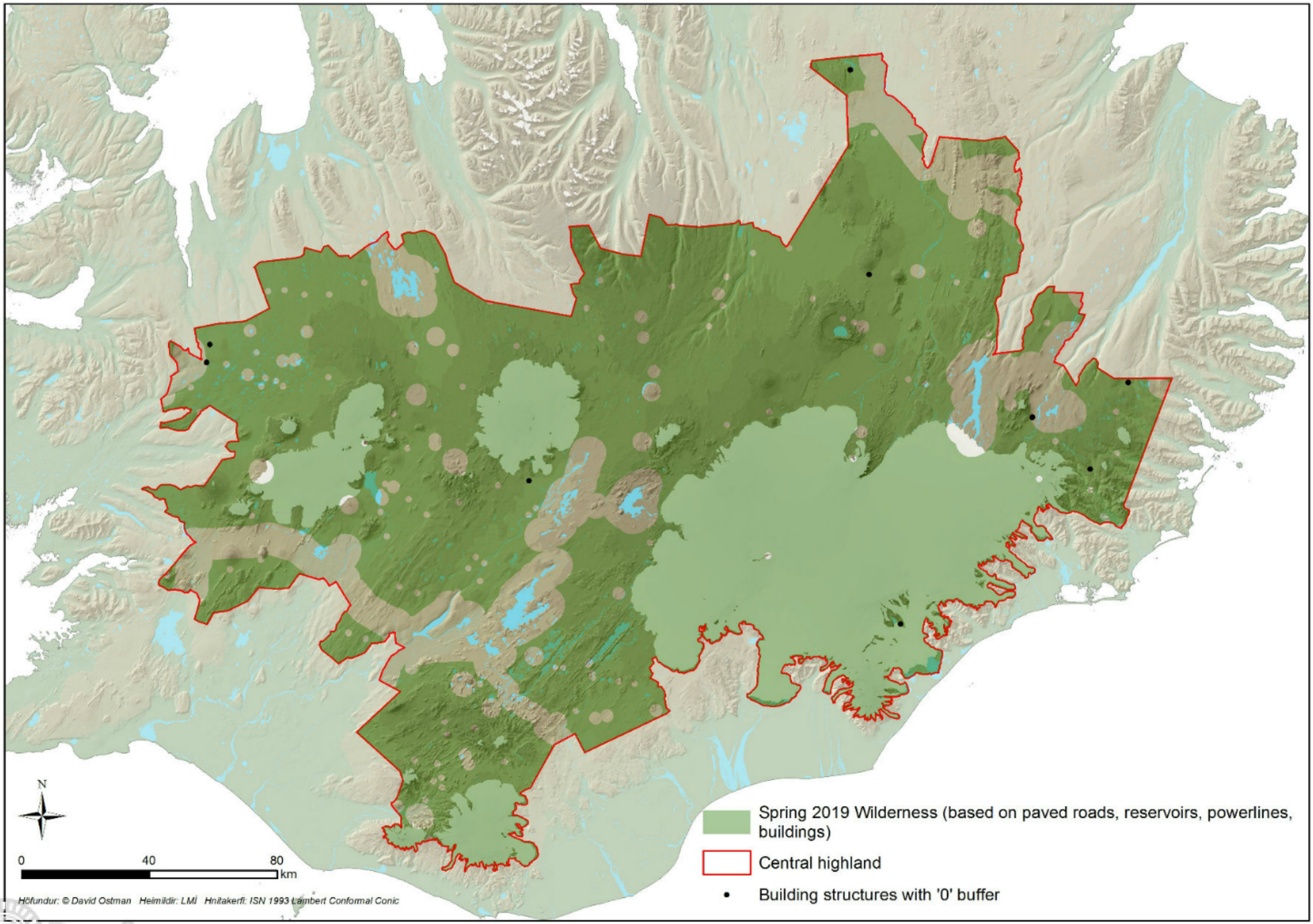
Resulting Wilderness Map


N
0
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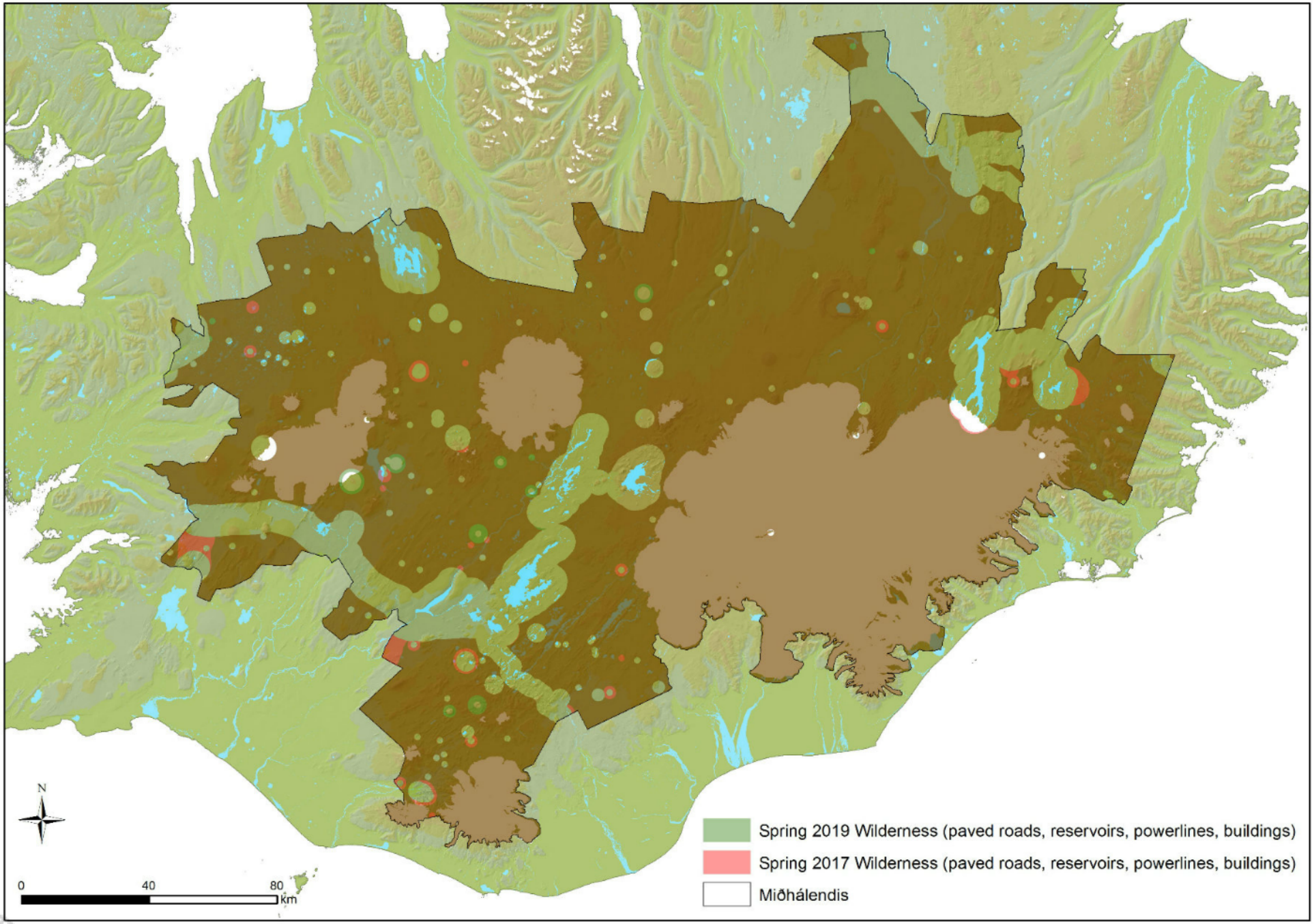
km
Höfundur: © David Ostman Heimildir: LMÍ Hnitakerfi: ISN 1993 Lambert Conformal Conic
Spring 2019 Wilderness (based on paved roads, reservoirs, powerlines, buildings)
Central highland
Building structures with '0' buffer


N
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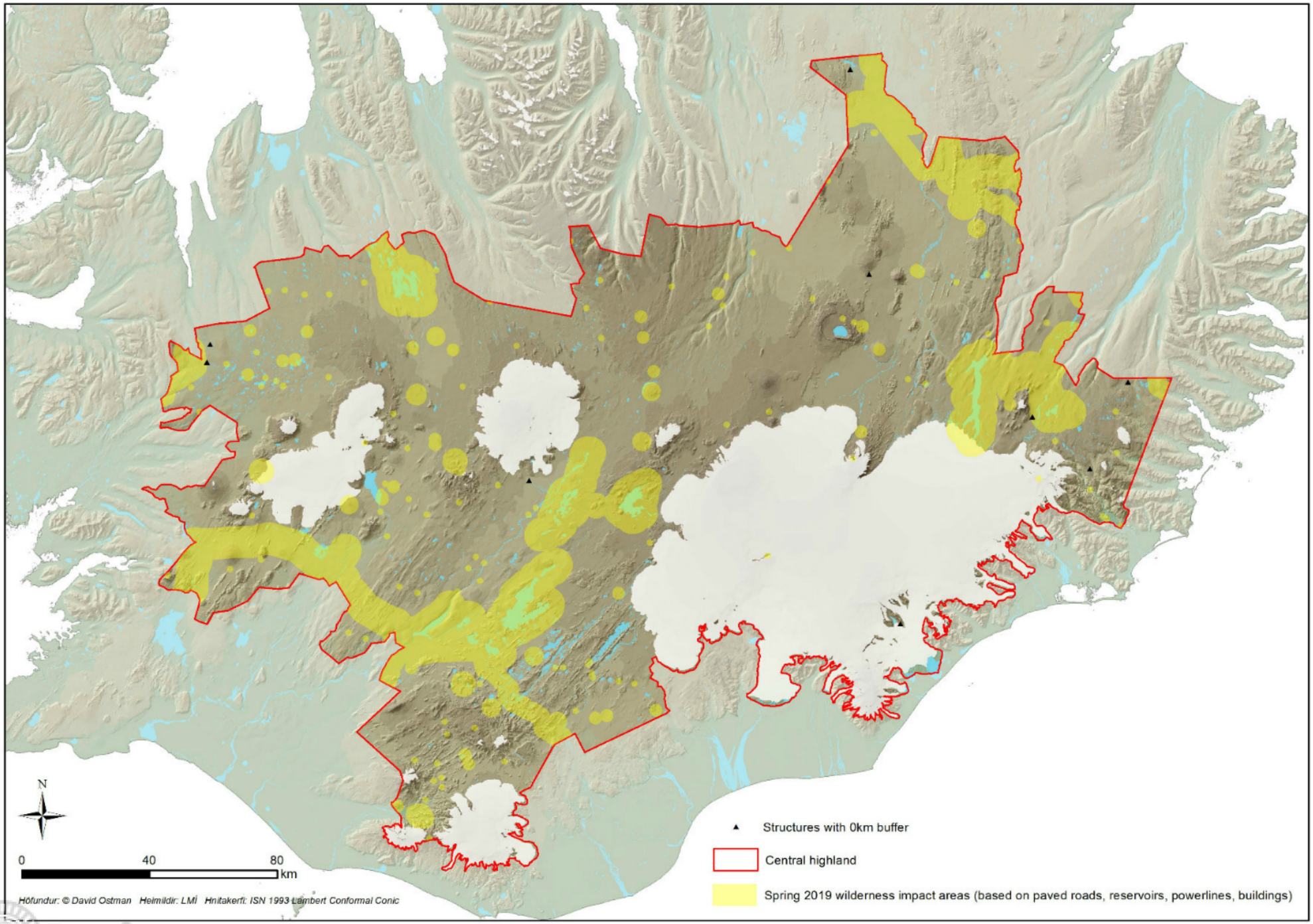
km
Spring 2019 Wilderness (paved roads, reservoirs, powerlines, buildings)
Spring 2017 Wilderness (paved roads, reservoirs, powerlines, buildings)
Miðhálendis


N
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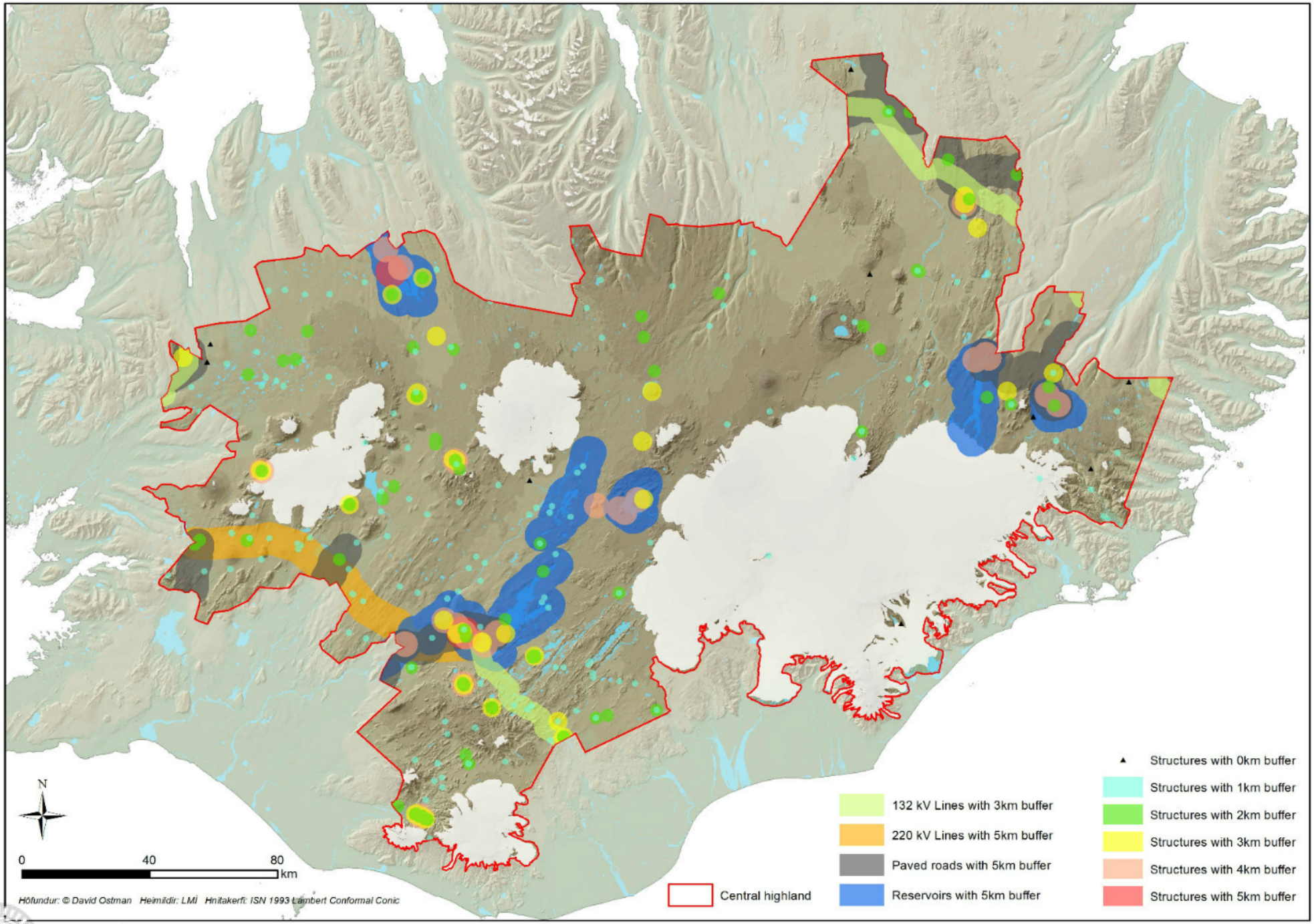
km
Höfundur: © David Ostman Heimildir: LMÍ Hnitakerfi: ISN 1993 Lambert Conformal Conic
Structures with 0km buffer
Central highland
Spring 2019 wilderness impact areas (based on paved roads, reservoirs, powerlines, buildings)


N
0
40
80
km
Höfundur: © David Ostman Heimildir: LMÍ Hnitakerfi: ISN 1993 Lambert Conformal Conic
Central highland
132 kV Lines with 3km buffer
220 kV Lines with 5km buffer
Paved roads with 5km buffer
Reservoirs with 5km buffer
Structures with 0km buffer
Structures with 1km buffer
Structures with 2km buffer
Structures with 3km buffer
Structures with 4km buffer
Structures with 5km buffer

Ongoing Discussions

- **GIS / mapping outputs are only as good as their inputs**
  - Importance of accurate, baseline data (e.g. heights for visibility)
- **Road impact assessment**
  - Other factors (seasonal usage, traffic, visibility)
- **Hard vs. soft (fuzzy) boundaries**
  - Wilderness concept as multi-dimensional
  - What is the purpose/usage of the map?

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Takk!

Thank you!

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