



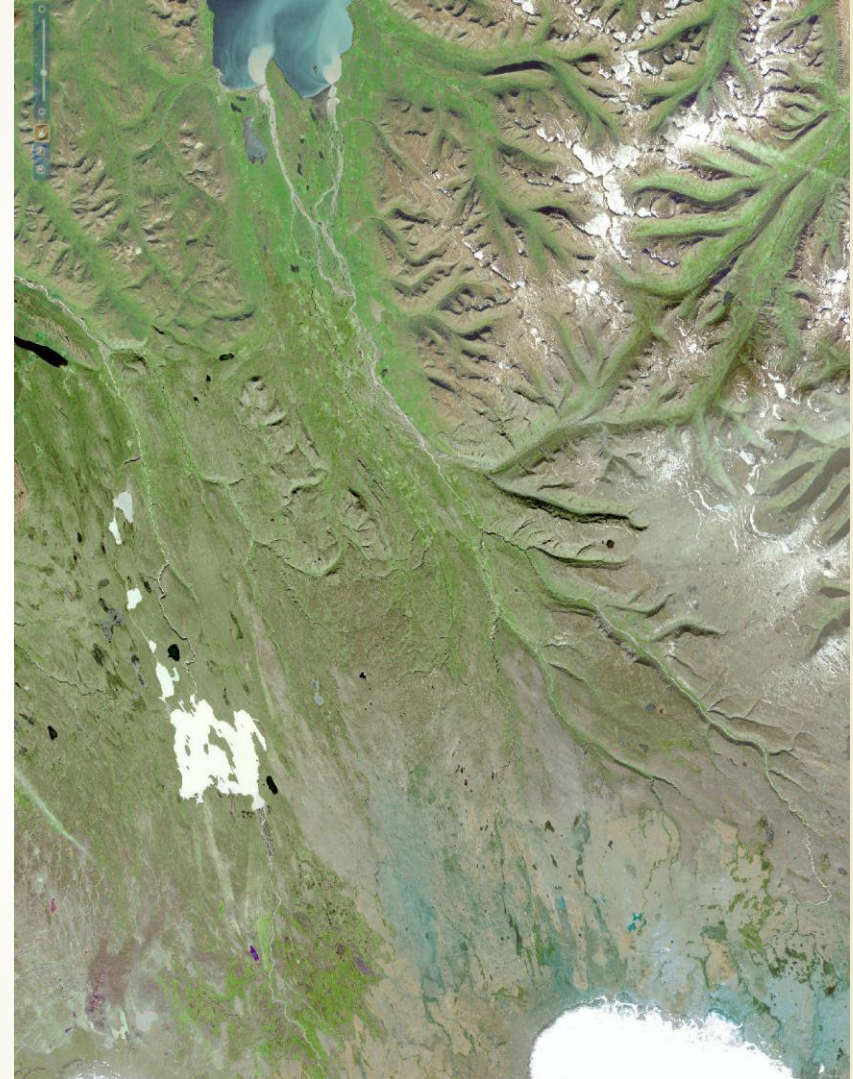
Integrated biological, geological and cultural diversity of river basins with hydroelectric potential

Thorleifur Eiríksson, Sigmundur Einarsson,
Tómas Grétar Gunnarsson and Skúli Skúlason

The Icelandic Master Plan for Nature Protection and Energy utilization, Icelandic Museum of Natural History, RORUM ehf, University of Iceland, Hólar University College

The subject area

- ▶ The river Héraðsvötn/ Austari Jökulsá/ Vestari Jökulsá
- ▶ Two rivers combine into one and divide again into two rivers
- ▶ Begins in the highland plateau, goes down the mountain slope into a valley and then flood plains
- ▶ Large area
- ▶ High total diversity



Assessment

- ▶ Reference for rating in estimate of value. Example of higher plants.
- ▶ Values are absolute and not relative to local conditions.

Enrichment/diversity

Rarity

1 Very little species diversity . All species common; no species with high conservation value

1 no species with high conservation value

4 Species diversity just below average

4 at least one endangered or vunrable species (not critically endangered) rare species / localized finding place

8 Species diversity average

8 2-3 endangered species /rare species / localized finding place

13 Species Diversity just above average. Several endangered/rare species / localized finding place

13 Several endangered species /rare species / localized finding place

20 Great species diversity

20 Several endangered species /rare species / localized finding place

The problem

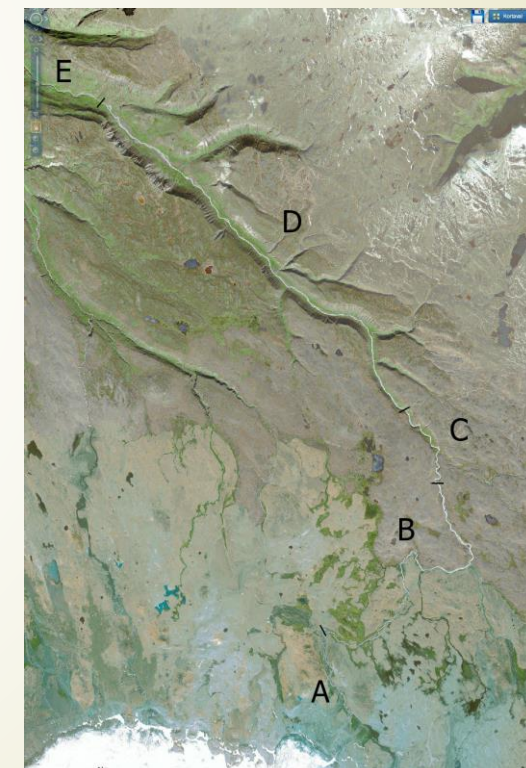
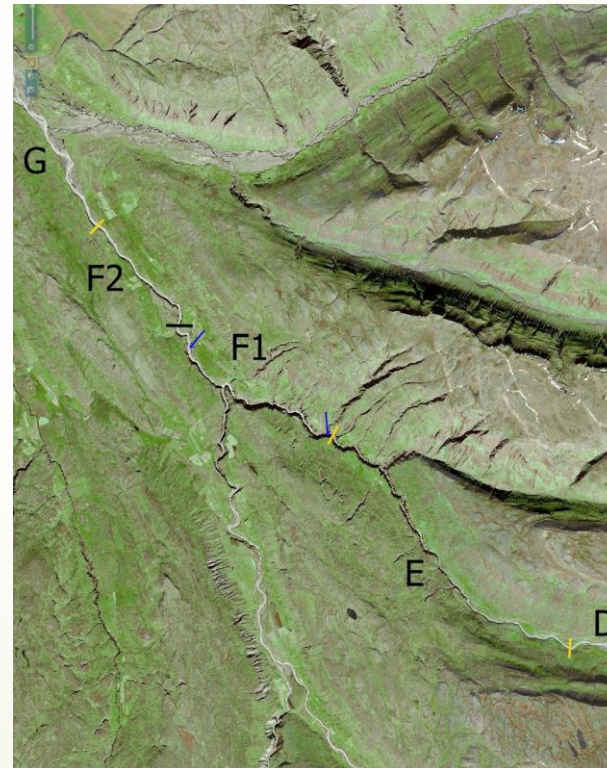
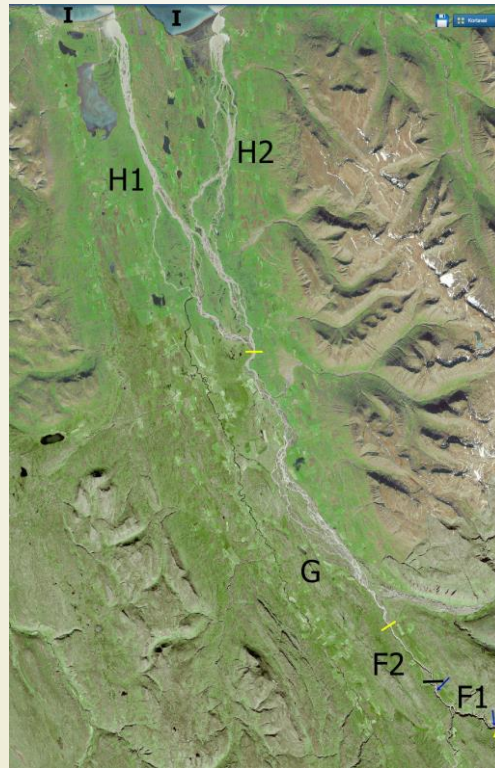
- ▶ Using absolute assessment over large areas with a diversity gradient underestimates the value of subareas with low diversity even if the area represents important natural or cultural elements.

Development of method

- ▶ The method was developed in a specialist group estimating the value of land and impact from powerplants on different aspect of natural history or cultural heritage.
- ▶ The group: geology, plant ecology, zoology (birds), fresh water ecology, zoology (fish), microorganism (bacteria), archaeology, landscape.
- ▶ The idea was to use the same estimate on the different aspects of the subject even if they were considered not comparable.
- ▶ Use relative estimate.
- ▶ Divide the area in different zones with parameters independent from the subject.
- ▶ Use the zones as a basis for relative estimate

Erosional surfaces

- ▶ the process of eroding or being eroded by wind, water, or other natural agents.
- ▶ Zonation of the river Héraðsvötn/ Austari Jökulsá/ Vestari Jökulsá.

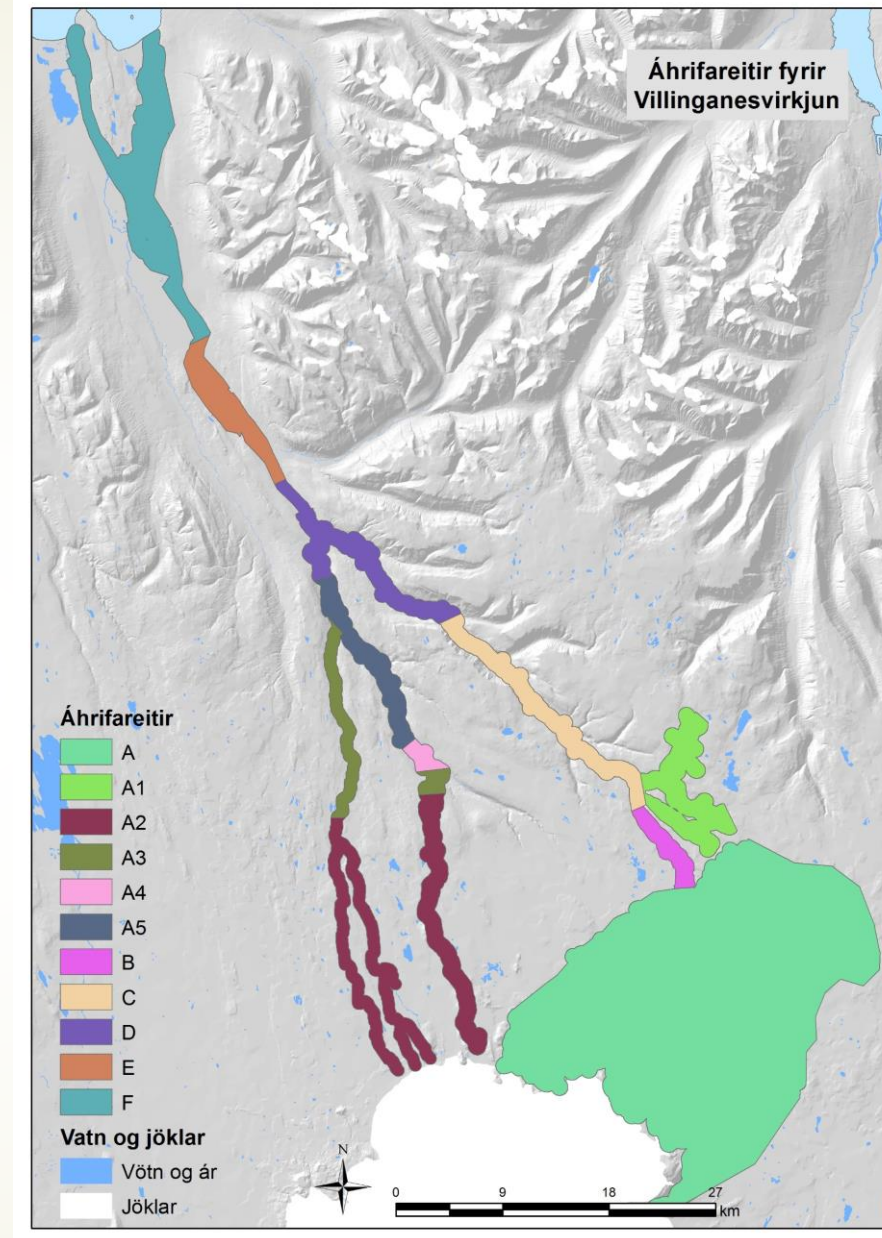


Zonation parameters (geomorphology)

Zones	Distance	Elevation	Fall	Slope	Riverbed		Grain size	Stratum on bank	Stratum on bank	Changes
						Width (m)				
	km	m	m	%	Single/multiple			Right	Left	
A	10	800-750	50	5	Multiple (sand) – outwash plain/Lichenes	Undefined	Clay-coarse gravel	Sand, moraine, tuff	Sand, moraine, tuff	None
B	90	750-660	90	4,3	Single/multiple outwash plain	30-50 (300)	Clay- Cobblestones	Moraine	Moraine	Land goes under water resevoir, ground water level rises
C	7	660-560	100	14,3	Single rock/outwash plain	30-40 (150)	Hnullungamöl	Rock	Rock	Chanced apperance – lesser flow(%) – erosion lessens
D	30	560-250	310	10,3	Multiple outwash plains/Lichenes	100-200	Gravel - cobblestones	Outwash plain, rock, talus	Outwash plain, rock, talus	Chanced apperance – lesser flow(%) – erosion exeades accumulation
E	4,5	250-160	90	20	Single Rock	10-30	Boulders	Rock	Rock	Chanced apperance – lesser flow(%) – erosion lessens
F1	7	160-90	70	10	Roc/ outwash plain		Cobblestones	Rock	Rock	Chanced apperance – flow
F2	7	90-80	60	8,5	Single rock/ outwash plain		Gravel - cobblestones	Rock	Rock	Chanced apperance – lesser flow (%) – erosion lessens
G	80	80-0	80	1	Multiple outwash plains/ Lichenes		Clay - Gravel	Flood plain	Flood plain – partial canyon	Chanced apperance – lesser flow (%) – flood lessen
H1										
H2										
I	0	0	0	0	Sandy beach – river outlet		Sand-gravel	–	–	Soil erotion (?)

The Zones

Zonation of the river Héraðsvötn/ Austari Jökulsá/ Vestari Jökulsá and the river Fossá.



Diversity classes

Fish communities is divided in to four diversity classes:

- ▶ 1. Landlocked Arctic charr populations.
- ▶ 2. Land locked salmonid populations with access to streams (i.e. small local charr).
- ▶ 3. Anadromous charr
- ▶ 4. Salmon and brown trout.

Cultural heritage is divided in to three diversity classes:

- ▶ 1. Nucleated settlement (settlement relatively stable up to the 20. century).
- ▶ 2. Rural settlement (unstable and/or seasonal settlement).
- ▶ 3. Wilderness (no settlement and no records of a settlement).

Comparisons of zones

- Skatastadir power development. Impact assessment
Zonation - Fish

Aquatic life		Zone A1	Zone A2	Zone B	Zone C	Zone D	Zone E	Zone F	Zone F1	Zone F2
Fish	Diversity class	1	1	1	1	4	4	4	4	4
	Richness- diversity	13	8	13	13	8	4	13	13	13
	Rarity	13	13	8	8	4	4	4	4	4
	Size, completeness, pristineness	13	13	8	8	8	4	8	8	8
	International responsibility									
	Information value									

- No fish passage into area D

The process

- 1. Specification of the subject area to be rated.
- 2. Division of subject area into zones in consideration to geomorphology.
- 3. Definition of diversity classes of different subjects.
- 4. Rating of subjects in different zones.
- 5. Summary of score for the zone.

Compatible estimate method

- ▶ Different subjects: geology, biology or cultural heritage
- ▶ Same method to estimate e.g. diversity or richness
- ▶ Therefore comparable

- ▶ Estimate of different subjects in an area accumulative
- ▶ Different areas therefore comparable

- ▶ Therefore ranking possible

Thank you

- ▶ Thanks to the others in the working group:
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- ▶ Sólborg Una Pálsdóttir - cultural heritage
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- ▶ Thorvaldur Thórdarson - geology
- ▶ Thorvardur Árnason - landscape