



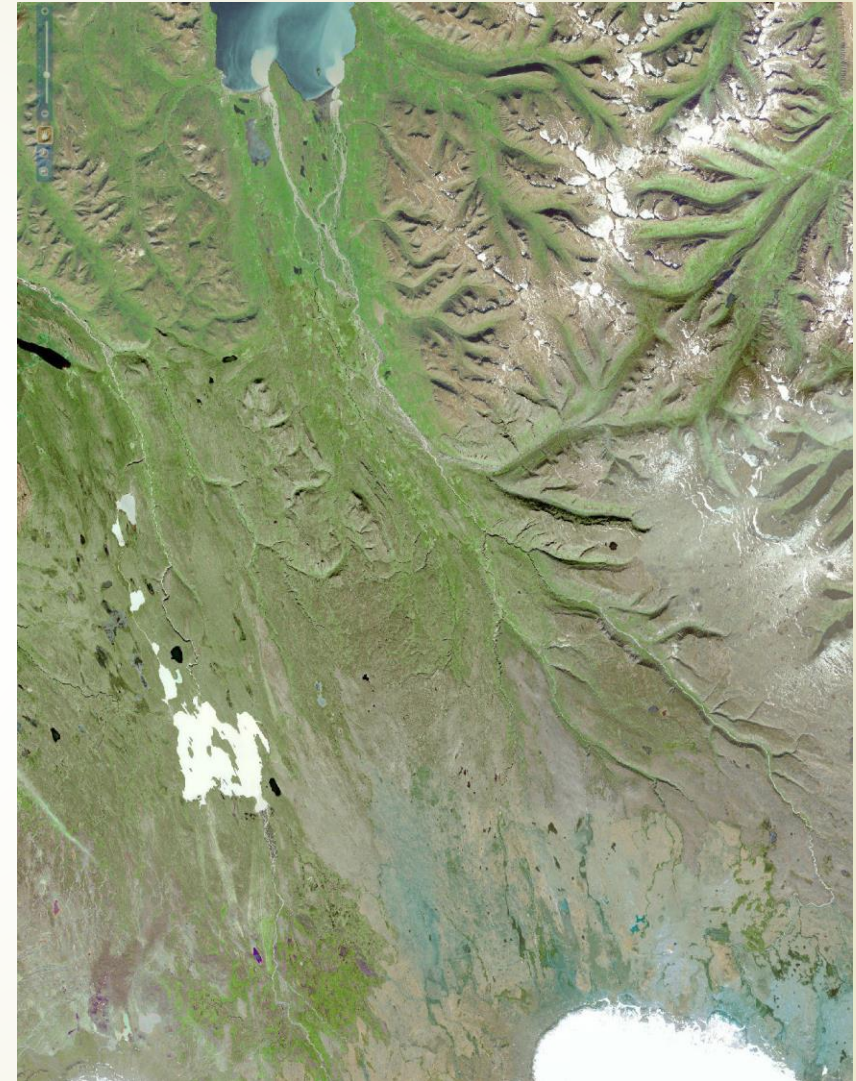
# Sambætt mat á náttúruverðmætum landssvæða við fallvötn

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

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# The subject area

- ▶ The river Héraðsvötn / Austari Jökulsá / Vestari Jökulsá
- ▶ Two rivers combine into one and divide again into two rivers
- ▶ Upper course runs through the highland plateau, cuts down the mountain slopes forming a steep valley, a gorge 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 vulnerable 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.

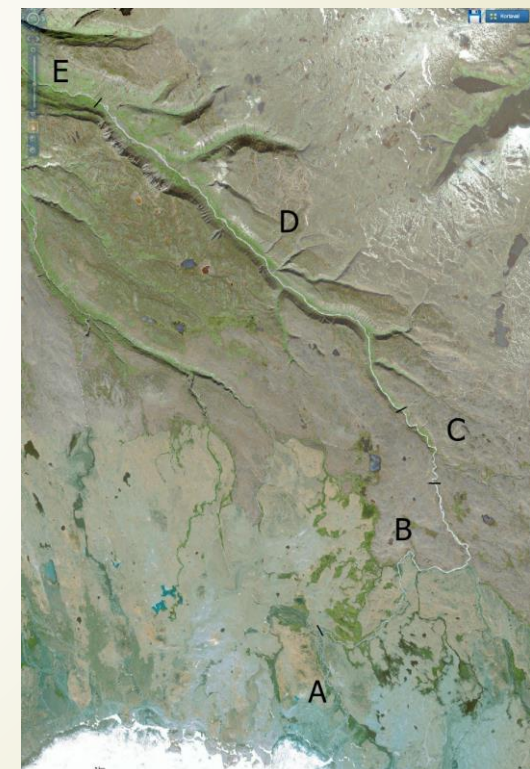
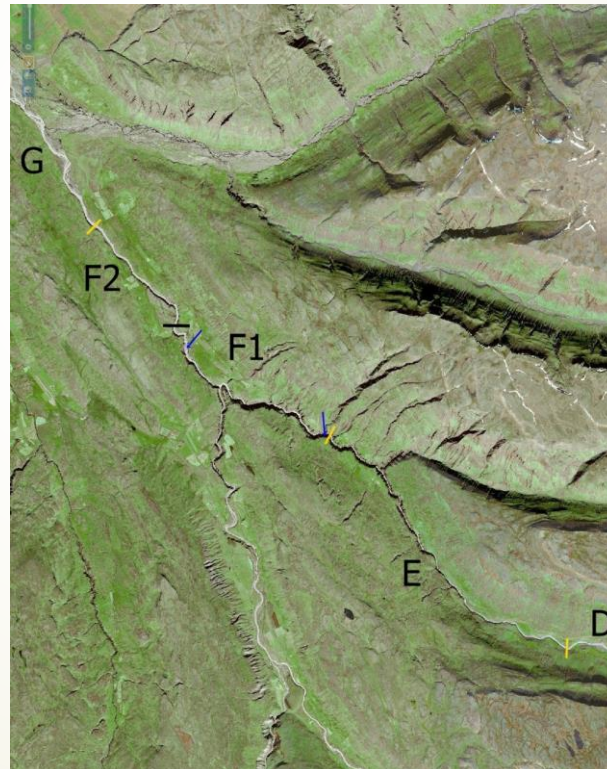
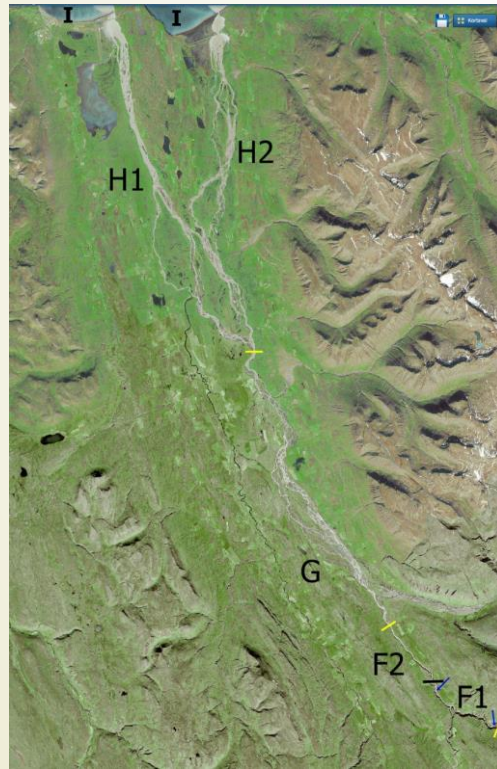


# Development of method

- ▶ The method was developed in a specialist group estimating the value of land and impact from powerplants on different aspects 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 into 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 forces.
- ▶ Zonation of the river Héraðsvötn/ Austari Jökulsá/ Vestari Jökulsá.

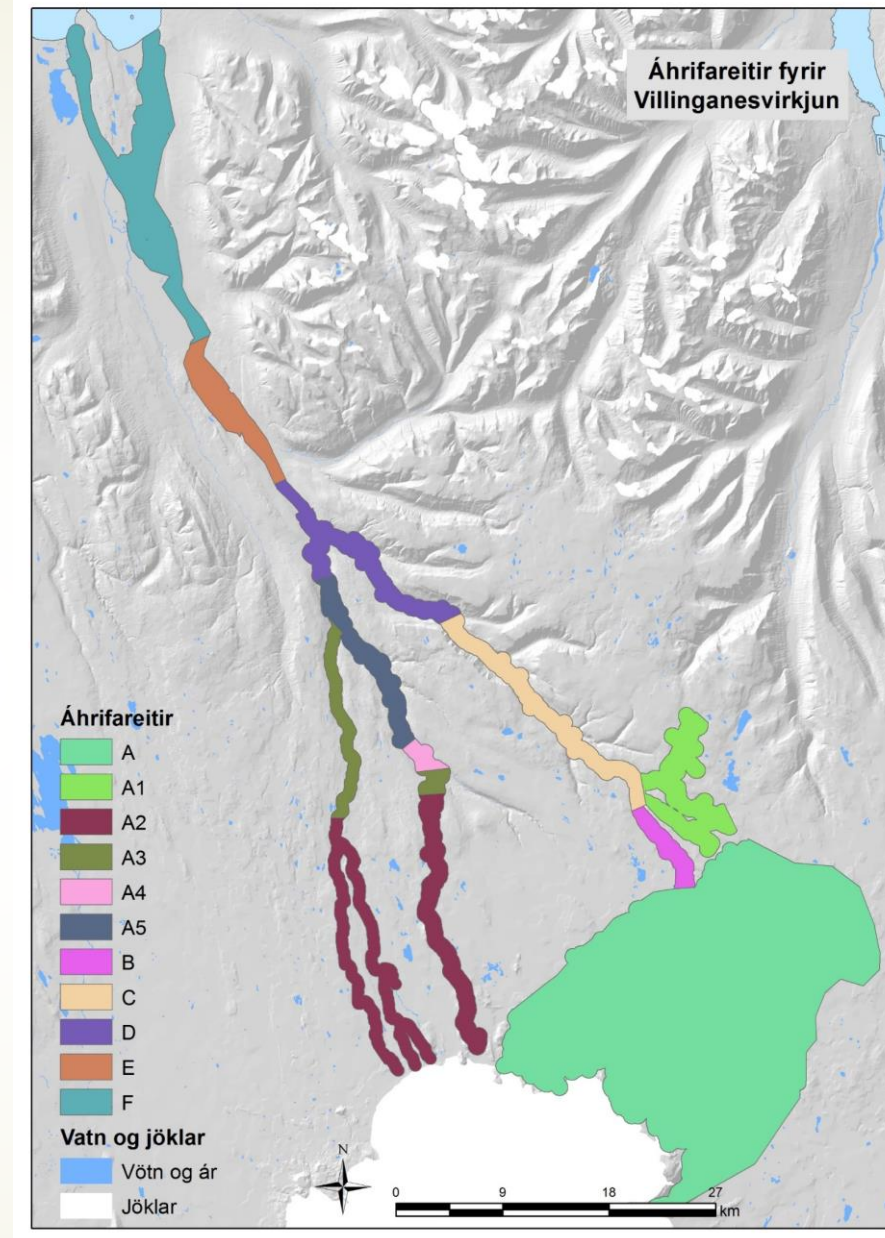


# Zonation parameters (geomorphology)

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

# The Zones

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







# Diversity classes

Fish communities are divided into 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 into 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 settlement).

# Comparisons of zones

- Skatastadir power development. Impact assessment Zonation - Fish

<b>Aquatic life</b>		<b>Zone A1</b>	<b>Zone A2</b>	<b>Zone B</b>	<b>Zone C</b>	<b>Zone D</b>	<b>Zone E</b>	<b>Zone F</b>	<b>Zone F1</b>	<b>Zone F2</b>
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 each zone.



# Compatible estimate method

- ▶ Different subjects: geology, biology or cultural heritage
  - ▶ Same method to estimate e.g. diversity or richness
  - ▶ Therefore comparable
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- ▶ 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:
- ▶ Ása Lovísa Aradóttir - plant ecology
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- ▶ Gísli Már Gíslason - fresh water ecology
- ▶ Kristján Jónasson - geology
- ▶ Sólborg Una Pálsdóttir - cultural heritage
- ▶ Sólveig K. Pétursdóttir – microorganism (bacteria)
- ▶ Thorvaldur Thórdarson - geology
- ▶ Thorvardur Árnason - landscape