

Prioritization of conservation areas

Spatial prioritization approach to identify irreplaceability and cost-effective improvement opportunities in a protected area network

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METZO II –project (funded by the Finnish Ministry of Environment)

Metsähallitus, Parks & Wildlife Finland

CAFF meeting

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METSÄHALLITUS

Prioritizing protected areas?

Operative model to solve wicked problems

To link ecological uniqueness and irreplaceability with possible threats and pressures

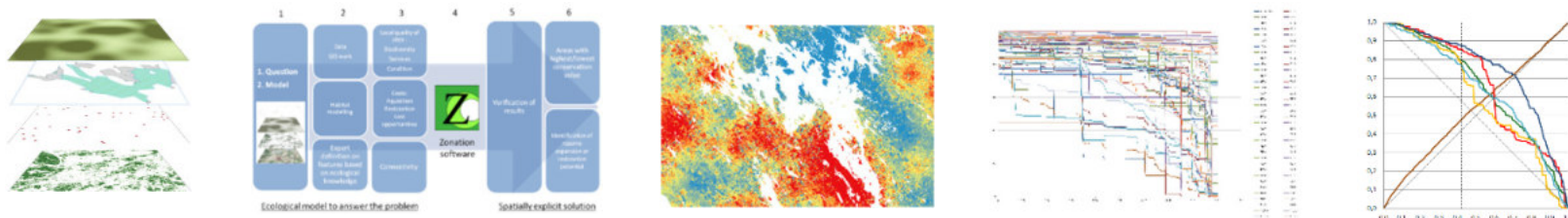
To identify cost-effectiveness and potential for ecosystem improvement

Quantitative evaluation of related social-ecological trade-offs

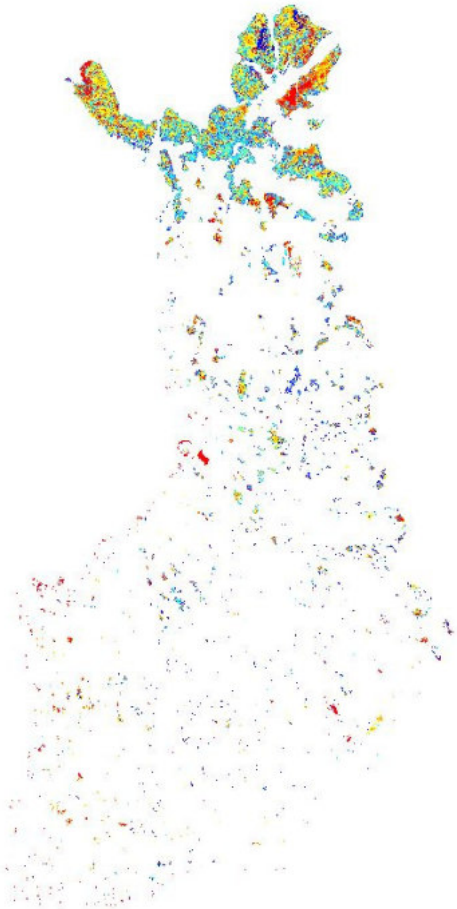
Avoiding harmful opportunism in decision-making

Finding the balance!

Defining and recognizing opportunities

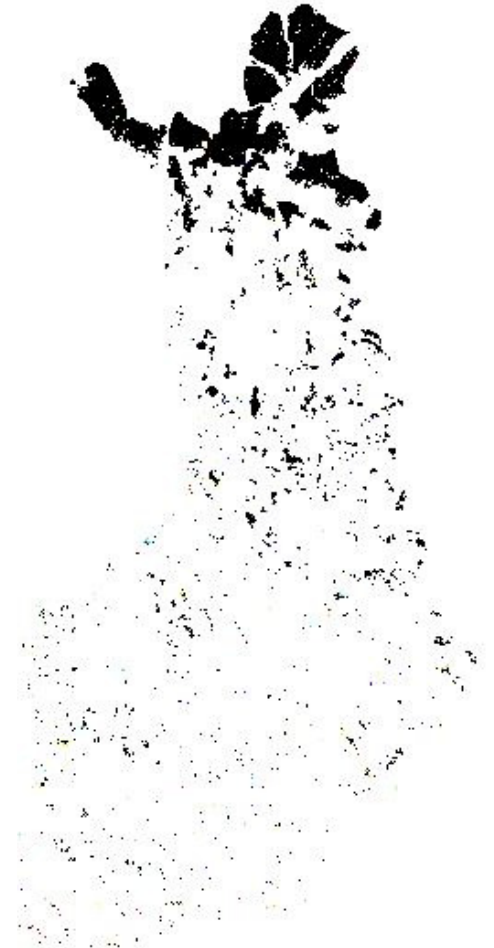


Irreplaceability



Same areas,
same data,
but different question

Restoration potential



Irreplaceability - Identifying ecological uniqueness within the protected N2000 area network

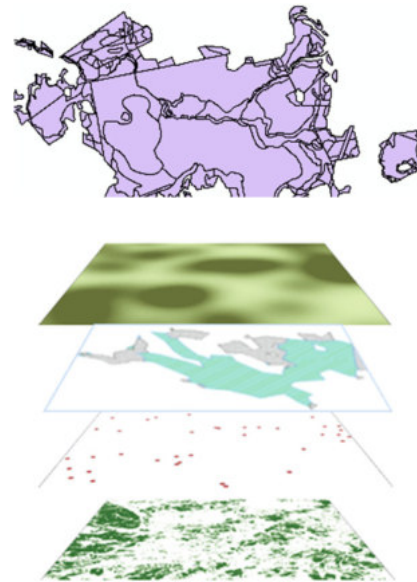
Data: Natura habitats + threatened species

Irreplaceability in prioritization (Zonation):
proportion of habitats' and
species' total abundances occurring
at certain area

Why to do this?

Recreational pressures

Nearby land-use...



Ecosystem restoration and management potential - Identifying areas for cost-effective ecosystem improvement within the N2000 network

Mapping restoration potential

Prioritizing N2K areas for restoration and management based
on their improvement potential

Identifying good opportunities conceptually and on the map

Which areas, when improved, would give **cost-effective increase in
the protected area network's overall ecological (biodiversity) value?**

Balancing: common-rare, cheap-expensive

COST-EFFECTIVELY IMPROVE THE PERSISTENCE OF BIODIVERSITY



Ranking protected Natura 2000 areas for restoration and management potential

Main elements from databases and Finnish Restoration Prioritization -project

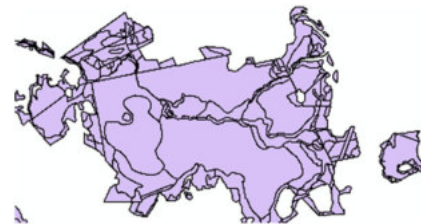
100 habitat experts working group defining:

Current methods

Effects of the methods

Costs of the methods

**Fine scale geographic information for
67 N-habitat types + threatened species
+ current state** for each habitat patch
from the **Parks & Wildlife habitat database**



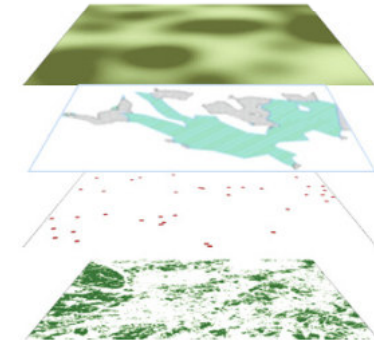
How good they will be
How much they are improved
Loss if not managed



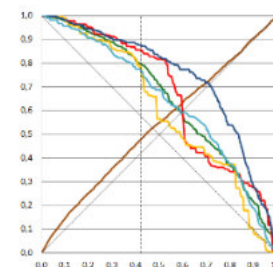
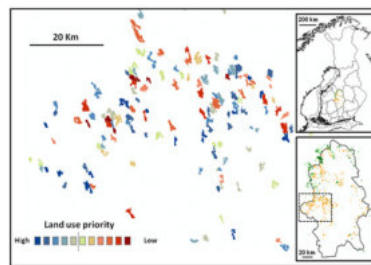
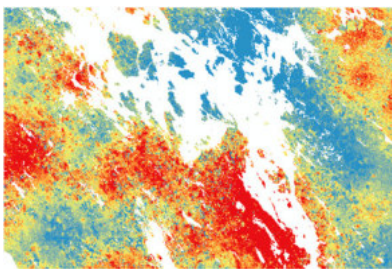
Zonation

Ranks areas (pixels to any size planning units) according to their conservation value, based on:

- Aims to maximize ecological value of the solution (set of areas) considering simultaneously data for multiple habitats and species
- Complementarity (identifying what is missing or poorly represented)
- Connectivity, Condition, Cost-effectiveness



Produces data for trade-off evaluation (how the solution changes / area / costs)

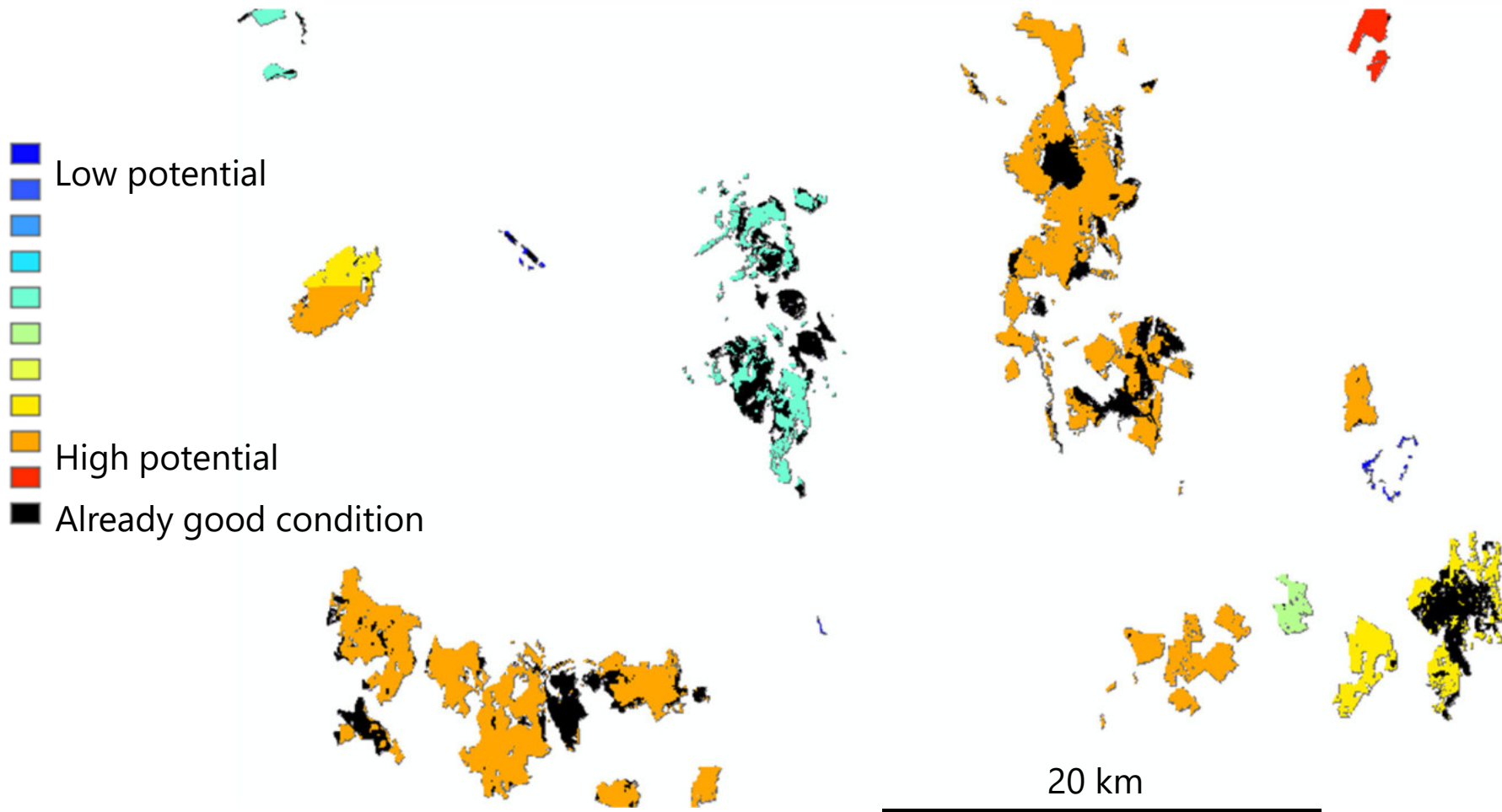


Kareksela et al. 2013 *Conservation Biology*

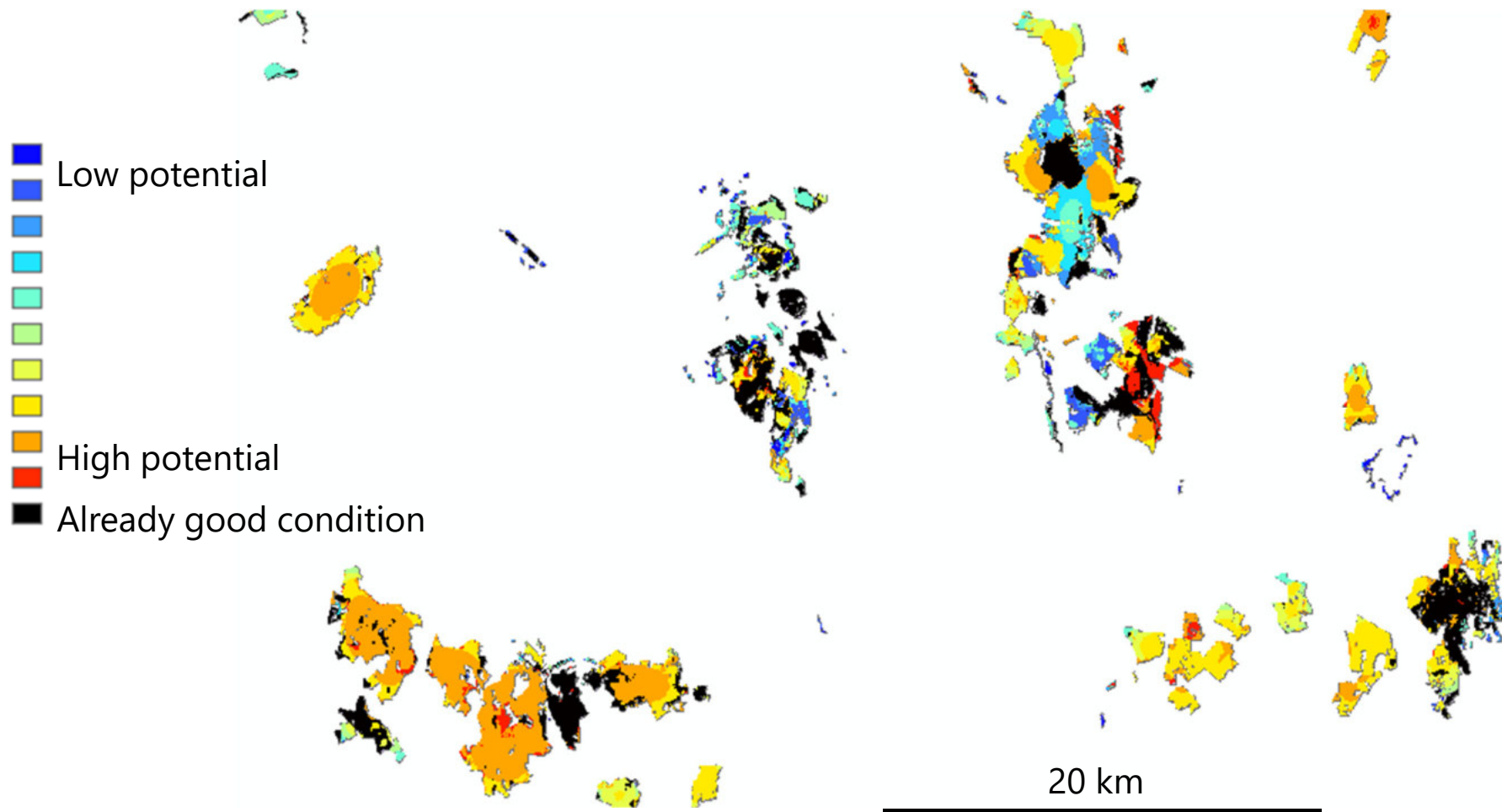
Ranking protected Natura 2000 areas with respect to their irreplaceability and improvement potential

What we get?

MAPS - whole N2K areas ranked according to their improvement potential



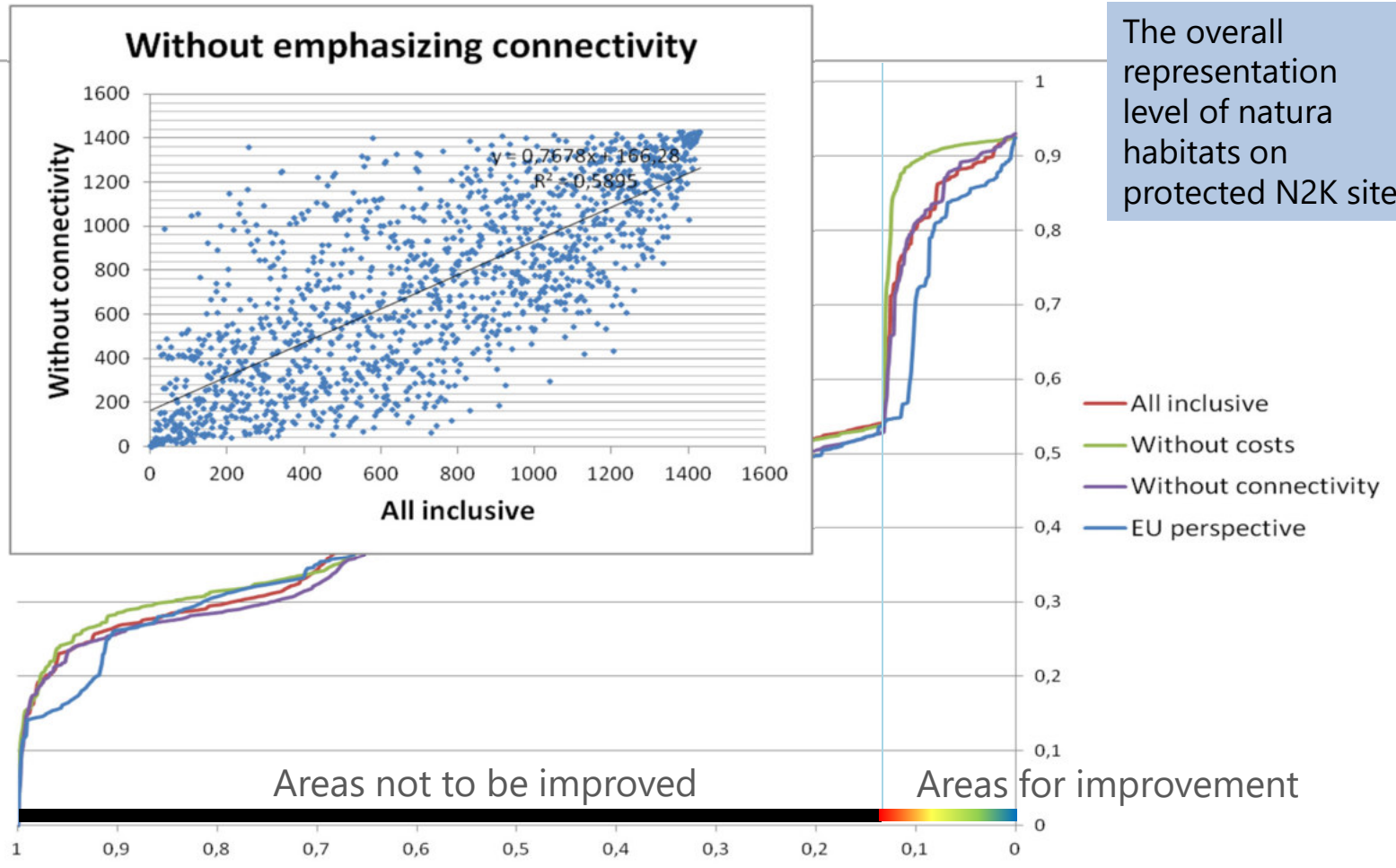
MAPS - showing also more detailed priorities



Comparison of trade-offs
Avoiding opportunism

Graphical analysis of the performance COMPARING TRADE-OFFS

Representativeness of habitats at the analysis area

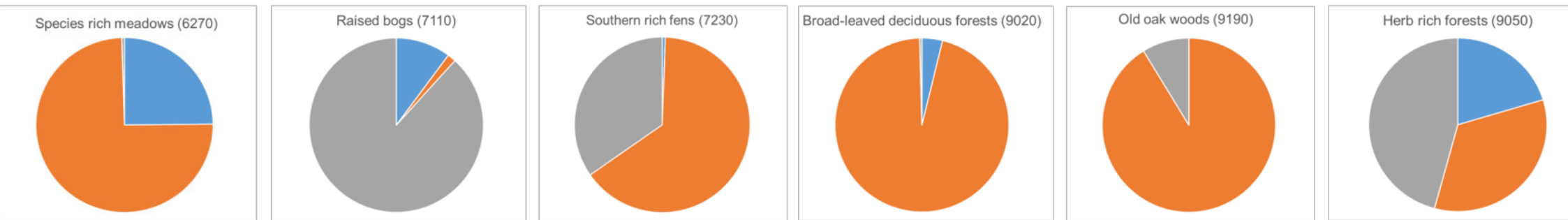


Total area included in the analysis = protected N2K areas in Finland

Investigate trade-offs: Habitat specific level of improvement in different analysis version

Proportional changes for the Natura habitats when N2000 areas are improved following the prioritization																						
Osuus valittavana olevasta alasta		0,688	0,874	0,750	0,981	0,000	0,133	0,111	0,681	0,000	0,088	0,991	0,100	0,083	0,000	0,411	0,333	0,349	1,000	0,057	0,625	0,962
Erotus: nykytila - paras 20%		0,712	0,450	0,454	0,755	0,000	0,013	0,001	0,047	0,000	0,003	0,566	0,001	0,001	0,000	0,023	0,003	0,096	0,001	0,009	0,293	0,901
	Change in area	Total improvement	6230	6270	6280	7240	7110	7140	7160	7210	7220	7230e	7230p	7310	7320	8210	8220	8230	9010	9030	9050	9020
	0	0,844492	0,515	0,608	0,77	0,875	0,834	0,991	0,933	0,95	0,938	0,874	0,959	0,957	0,995	0,965	0,995	0,928	0,963	0,702	0,865	0,941
	0,001	0,844033	0,515	0,608	0,77	0,875	0,834	0,988	0,933	0,95	0,938	0,874	0,958	0,957	0,995	0,965	0,994	0,928	0,963	0,702	0,864	0,941
	0,002	0,843705	0,515	0,608	0,77	0,875	0,834	0,987	0,933	0,95	0,938	0,874	0,958	0,956	0,995	0,965	0,994	0,927	0,963	0,701	0,862	0,941
	0,003	0,842377	0,515	0,608	0,77	0,875	0,834	0,987	0,931	0,95	0,938	0,874	0,957	0,955	0,994	0,965	0,994	0,927	0,963	0,699	0,862	0,941
	0,004	0,841377	0,515	0,608	0,77	0,875	0,833	0,987	0,931	0,95	0,938	0,874	0,957	0,954	0,994	0,965	0,994	0,927	0,963	0,696	0,859	0,941
	0,005	0,83877	0,515	0,601	0,77	0,875	0,83	0,987	0,931	0,95	0,938	0,874	0,957	0,954	0,994	0,965	0,993	0,926	0,963	0,696	0,858	0,941
	0,006	0,836443	0,515	0,599	0,77	0,875	0,829	0,986	0,929	0,95	0,938	0,874	0,957	0,952	0,994	0,965	0,991	0,926	0,963	0,695	0,856	0,941
	0,007	0,835623	0,515	0,599	0,77	0,875	0,829	0,986	0,929	0,95	0,938	0,874	0,957	0,952	0,994	0,965	0,991	0,911	0,963	0,694	0,855	0,941
	0,008	0,834836	0,515	0,598	0,77	0,875	0,827	0,986	0,929	0,95	0,938	0,874	0,957	0,951	0,994	0,965	0,991	0,91	0,963	0,693	0,852	0,941
	0,009	0,833787	0,515	0,596	0,77	0,875	0,826	0,986	0,928	0,95	0,938	0,874	0,957	0,949	0,994	0,965	0,991	0,91	0,963	0,692	0,847	0,941
	0,01	0,833033	0,515	0,595	0,77	0,875	0,823	0,986	0,928	0,95	0,938	0,874	0,956	0,948	0,994	0,965	0,991	0,91	0,963	0,692	0,843	0,941
	0,011	0,827787	0,515	0,584	0,77	0,792	0,821	0,986	0,925	0,95	0,917	0,873	0,956	0,948	0,994	0,961	0,991	0,886	0,963	0,69	0,832	0,941
	0,012	0,823541	0,515	0,579	0,77	0,792	0,818	0,985	0,924	0,95	0,917	0,873	0,956	0,948	0,994	0,961	0,991	0,882	0,963	0,682	0,826	0,941
	0,013	0,815475	0,515	0,575	0,766	0,792	0,815	0,985	0,924	0,95	0,917	0,873	0,955	0,948	0,994	0,961	0,991	0,868	0,963	0,682	0,823	0,94
	0,014	0,810328	0,515	0,56	0,766	0,792	0,809	0,985	0,922	0,95	0,917	0,873	0,954	0,947	0,994	0,961	0,991	0,867	0,963	0,681	0,812	0,94
	0,015	0,804459	0,515	0,556	0,766	0,792	0,807	0,984	0,917	0,95	0,917	0,873	0,954	0,947	0,994	0,961	0,99	0,867	0,963	0,646	0,798	0,94
	0,016	0,777656	0,45	0,548	0,766	0,792	0,806	0,984	0,917	0,95	0,917	0,873	0,954	0,947	0,994	0,96	0,99	0,867	0,963	0,564	0,787	0,915
	0,017	0,773082	0,45	0,542	0,766	0,792	0,795	0,984	0,915	0,95	0,917	0,872	0,954	0,946	0,994	0,96	0,99	0,867	0,963	0,563	0,778	0,912
	0,018	0,767836	0,45	0,53	0,766	0,792	0,785	0,983	0,915	0,95	0,917	0,872	0,952	0,946	0,994	0,959	0,99	0,867	0,963	0,556	0,772	0,908
	0,019	0,764016	0,45	0,519	0,766	0,792	0,775	0,983	0,912	0,95	0,912	0,869	0,951	0,946	0,994	0,938	0,989	0,826	0,963	0,556	0,728	0,906
	0,02	0,753213	0,45	0,488	0,766	0,792	0,77	0,983	0,911	0,95	0,912	0,869	0,95	0,946	0,994	0,938	0,989	0,749	0,963	0,556	0,705	0,906
Most cost-effective 20% addition to the existing if degraded areas are restored/managed	0,021	0,748148	0,45	0,457	0,755	0,792	0,749	0,983	0,911	0,95	0,907	0,869	0,95	0,946	0,994	0,932	0,989	0,749	0,963	0,554	0,689	0,905
	0,022	0,739508	0,45	0,371	0,755	0,792	0,737	0,983	0,909	0,95	0,906	0,869	0,95	0,945	0,994	0,93	0,988	0,749	0,963	0,549	0,658	0,905
	0,023	0,721197	0,45	0,338	0,653	0,792	0,737	0,983	0,904	0,95	0,906	0,868	0,95	0,945	0,994	0,921	0,988	0,682	0,962	0,549	0,586	0,901
	0,024	0,694869	0,376	0,212	0,596	0,792	0,737	0,983	0,891	0,95	0,905	0,867	0,95	0,945	0,994	0,92	0,986	0,654	0,962	0,549	0,551	0,871
	0,025	0,631738	0,376	0,111	0,244	0,792	0,736	0,983	0,889	0,95	0,904	0,318	0,95	0,945	0,994	0,915	0,986	0,654	0,962	0,548	0,491	0,83
Representation on areas already in good condition	0,026	0,535279	0	0,003	0	0,792	0,736	0,982	0,864	0,95	0,904	0,303	0,949	0,945	0,994	0,909	0,986	0,653	0,962	0,545	0,396	0,004
	0,027	0,535148	0	0,003	0	0,792	0,736	0,982	0,864	0,95	0,904	0,303	0,949	0,945	0,994	0,909	0,986	0,653	0,961	0,545	0,396	0,004
	0,028	0,53482	0	0,003	0	0,792	0,736	0,982	0,864	0,95	0,904	0,303	0,949	0,945	0,994	0,909	0,986	0,653	0,961	0,545	0,396	0,004
	0,029	0,534557	0	0,003	0	0,792	0,736	0,982	0,864	0,95	0,904	0,303	0,949	0,945	0,994	0,909	0,986	0,653	0,961	0,545	0,396	0,004

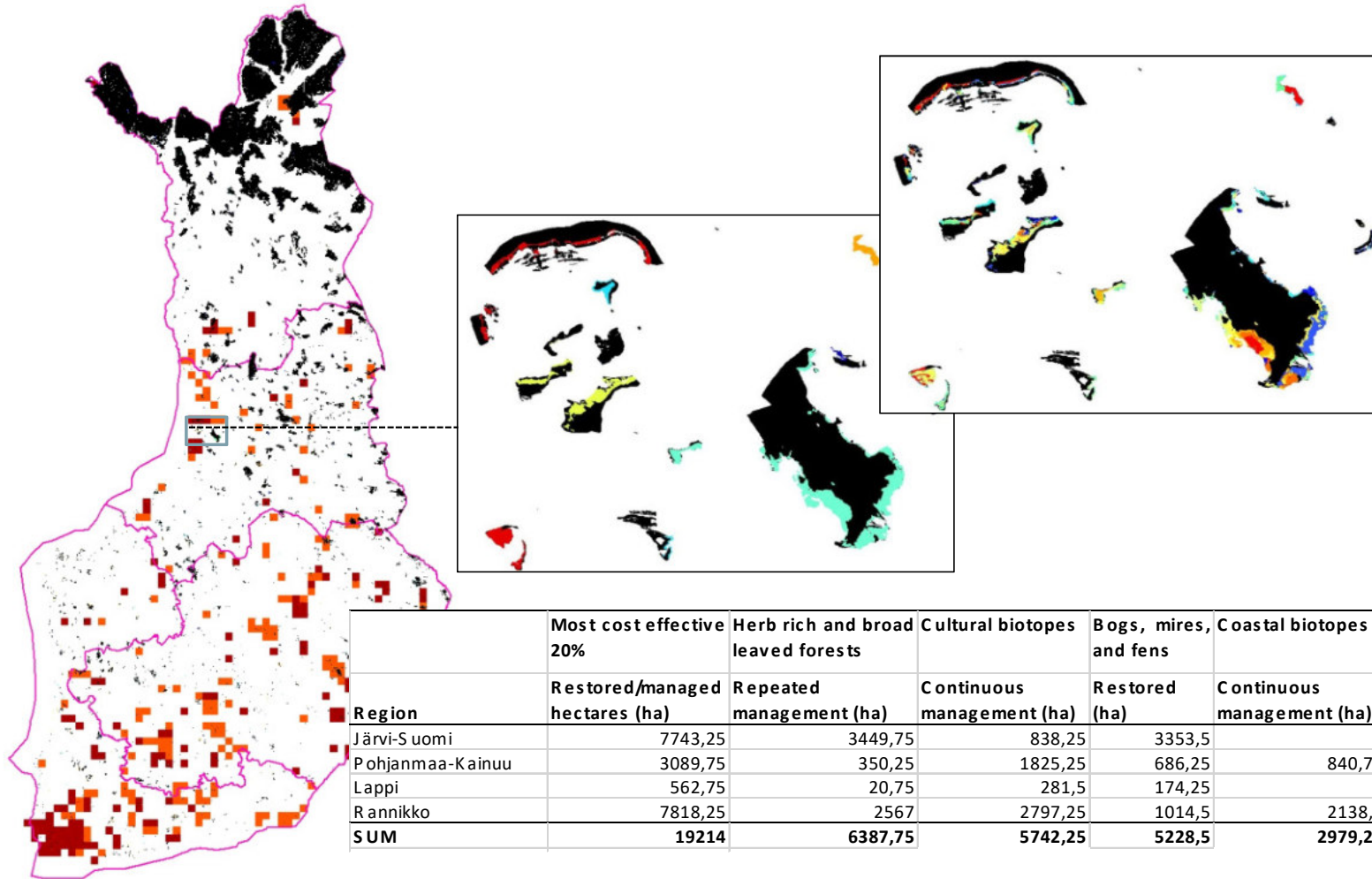
- Good condition or not realistic
- Potential and will be improved (best 20% solution)
- Potential but not treated if "only" best 20% is done



Comparing how habitat representations differ with different analysis perspectives

How the solution changes if we change:
connectivity? costs? species? habitat rarity/representation in the boreal region or EU27?

Spatial identification of responsibilities? (spatial allocation of most cost-effective restoration and management between Parks & Wildlife Finland regions)



Prioritization model for environmental change

- Protect/prioritize from land-use areas that are not irreversibly affected by climate change – emphasize irreplaceability!!
- Prioritize also areas with irreplaceable conservation (biodiversity) value where resistance and resilience with respect to environmental change can be cost-effectively increased through ecological management and restoration
- Identify and avoid areas with significant negative changes that cannot be mitigated
- Add uncertainty multiplier when appropriate

1) ANALYSIS TECHNIQUES EXIST: CONSULT AND COLLABORATE

2) FACILITATE DATA

3) ANALYSE: IDENTIFY TRADE-OFFS AND FIND COST-EFFECTIVE BALANCE

Some conclusions

Current methods allow ecologically sophisticated and meaningful analysis with considerations of ecosystem changes, IF THE DATA EXISTS

Proper analyses also enable proper investigation of the trade-offs, which helps to compare different solutions and to implement the results!

Implementation is however still a challenge

Tools/methods/approaches (irreplaceability, uncertainty, connectivity, costs...) also to build a prioritization model for consideration of environmental change

Possibilities to identify ecological irreplaceability and to make ecologically significant improvements cost-effectively

Thank you!

Ari Lahtinen, Marja Hokkanen, Jussi Päivinen, Tuula Kurikka, Tuomas Haapalehto, Katja Raatikainen, Janne Kotiaho, Atte Moilanen, Ninni Mikkonen, Niko Leikola

More information

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Our prioritization project, (<http://www.metsa.fi/web/en/zonation>)

