Assessment of Sustainability at protected areas

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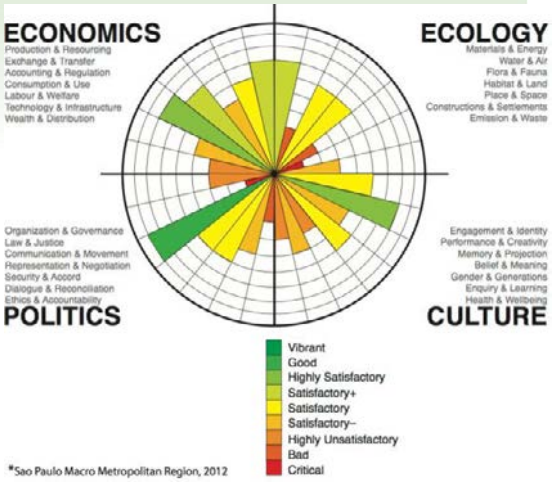
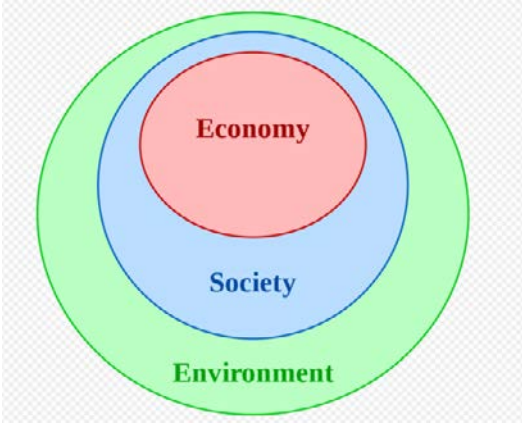
Outline

- Concept of sustainability
- Cultural landscapes and settlements vitality index
- Visitor monitoring system in Estonia
- Visitor counting. Our experiences
- Bog surface carrying capacity – trampling experiment in Kullisoo, Estonia

Sustainability

- **Sustainability** is the ability to exist constantly.
- The capacity for the biosphere and human civilization to coexist.
- The sustainability of natural ecosystems can be defined as the dynamic equilibrium between natural inputs and outputs, modified by external events such climatic change, etc
- Modern use of the term sustainability is broad and difficult to define precisely
- The Circles of Sustainability approach distinguished four domains of economic, ecological, political and cultural sustainability

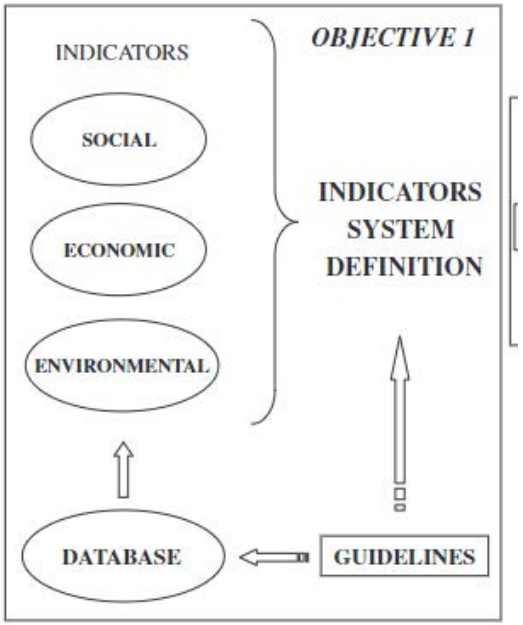




The concept of sustainability

Fundamental questions:

- Which system, subsystem, or characteristics are to be sustained;
- For how long they are to be sustained;
- When we can assess whether the system has actually been sustained
- How we assess the sustainability
- What are the best indicators.
  - Social
  - Economic
  - Environmental



The concept of sustainability in South-America

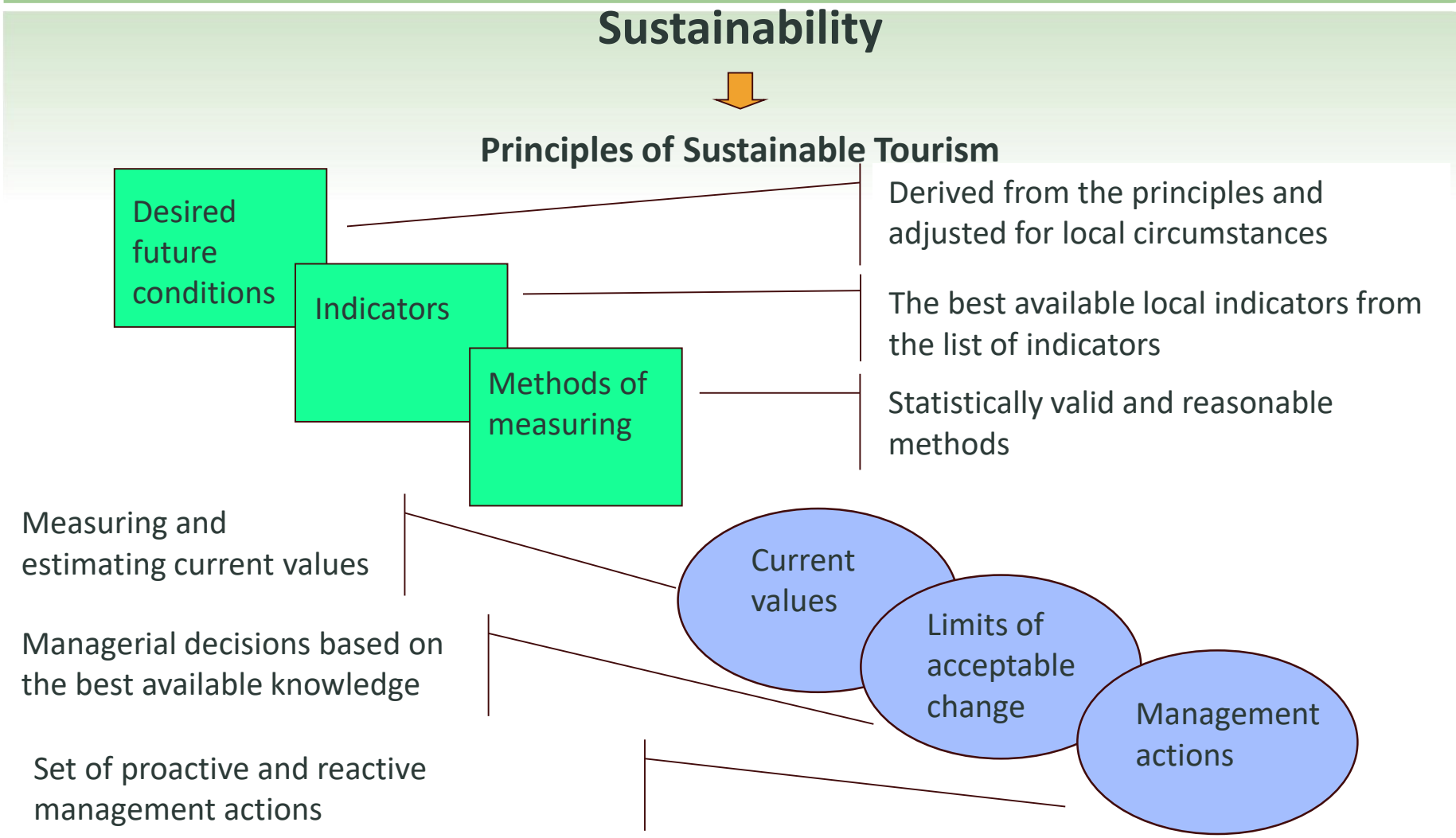
- The concept of the “threshold of sustainability.” This is the minimum level of investment in the tourism management capacity of a protected area needed to ensure that the area’s natural capital does not decline.

- The threshold of sustainability is reached by ensuring adequate investment in each of five key management capacity areas:
  - impact monitoring;
  - basic infrastructure;
  - security;
  - interpretation and information;
  - staff salaries and training

Social indicators of sustainable tourism

Sustainability issue	Practical component	I_j	Indicator
Social–cultural effects of tourism on the host community	Capacity of services for sports activities	I_{K1}	Sports facilities per inhabitant
	Capacity of health services	I_{K2}	Health-care equipment
	Capacity of transport services	I_{K3}	Number of passenger transport vehicles per inhabitant
	Capacity of financial services	I_{K4}	Number of financial establishments per inhabitant
	Capacity of other services	I_{K5}	Number of service sector establishments per inhabitant
	Capacity of chemist's services	I_{K6}	Number of chemist's per inhabitant
Local public safety	Tourist satisfaction with destination safety	I_{K7}	Evaluation of destination safety by tourists
Conservation of the cultural heritage	Heritage designated as assets worthy of cultural protection	I_{K8}	Number of cultural sites designated as "assets of cultural interest"
	Voluntary contributions to preservation of cultural heritage	I_{K9}	Number of cultural volunteers
	Intensity of heritage use	I_{K10}	Pressure on cultural heritage
Effects on the local population structure	Sustaining population levels	I_{K11}	Variation of population levels
	Increase in the young population	I_{K12}	Percentage of young population
	Ageing of the population	I_{K13}	Percentage of non-active older population
	Population density	I_{K14}	Number of individuals per unit destination area

Limits of Acceptable Change (LAC) as Applied in Finland (Kajala, 2012)

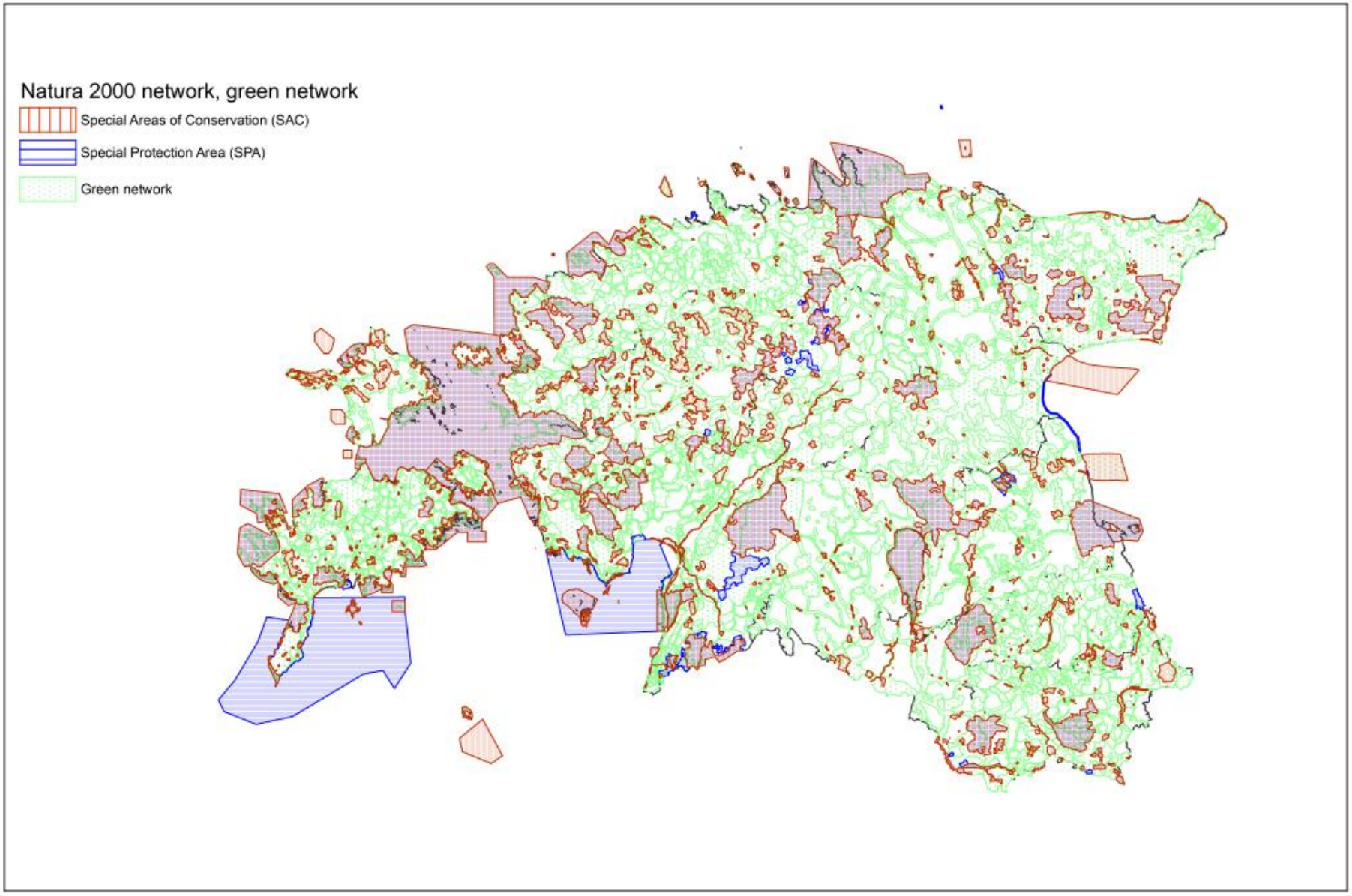


Protected Areas Are Used for…

- Nature protection
- Research and Education
- **Outdoor recreation**
- Traditional use of nature resources
    - hunting, fishing and reindeer husbandry
- Promoting local economy and communities
- **Nature tourism**

- Protected areas are also a living environment for locals
- Many nature protection values are related to **cultural landscapes**

- → **Requirement of Sustainability**


Natura 2000 network, green network
Special Areas of Conservation (SAC)
Special Protection Area (SPA)
Green network

Protected areas in Estonia

All sites are protected by Nature Conservation Act as (01.09.2019):

- Protected areas:
  - National parks (6)
  - Nature conservation areas (172)
  - Landscape protection areas (153)
  - Other protected areas (63)
- Limited conservation areas (326)
- Species protection sites (609)

In total 18.8 % of Estonian land territory is protected,
95% of nationally protected areas are Natura 2000 sites

Management of protected areas

Institutions:

- Environmental Board
- State Forest Management Centre
- Environmental Agency
- Environmental Inspectorate

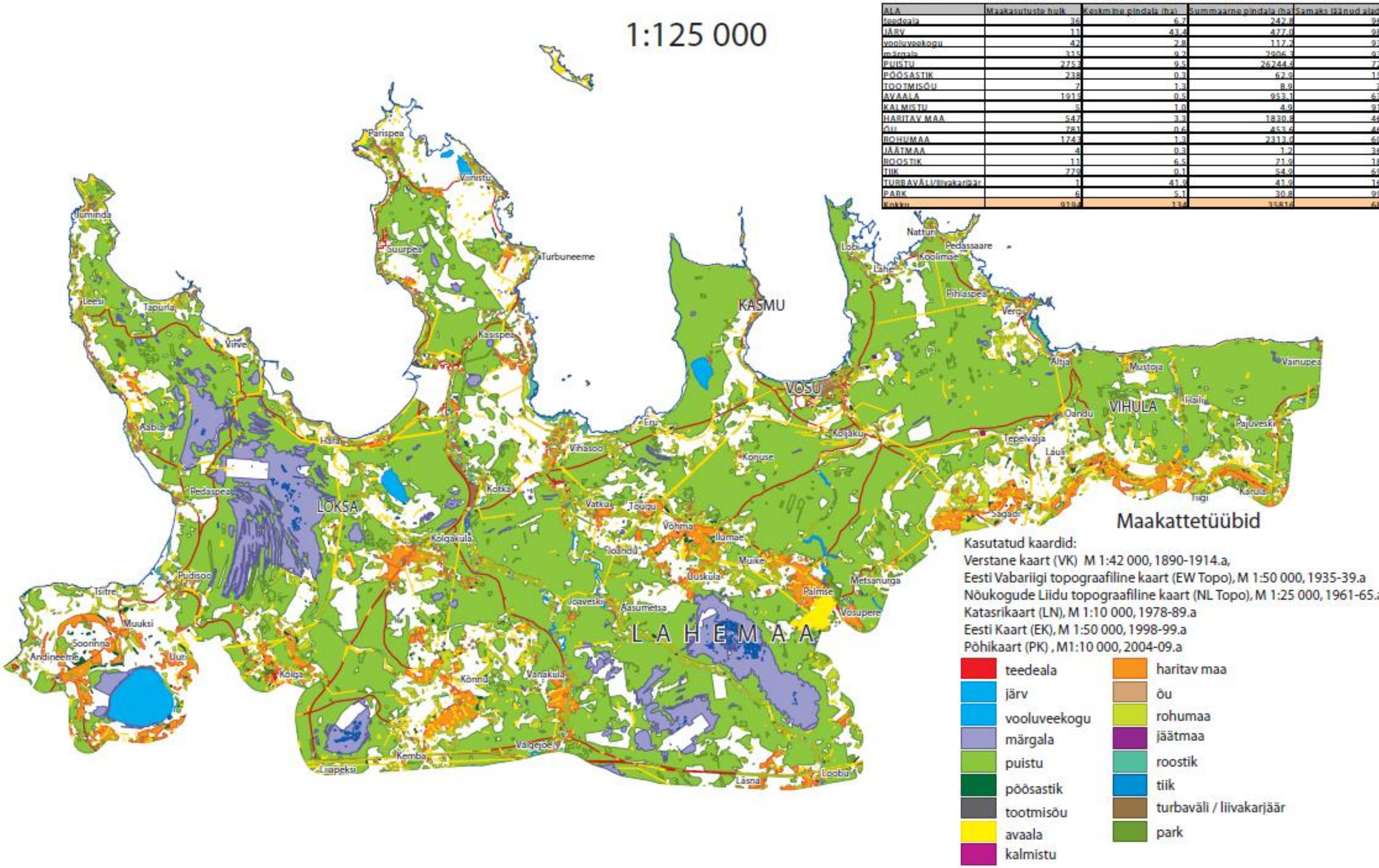
Based on protection rules and site level management plans.

EB – the administrator of all protected areas (e.g. Natura 2000 sites), also responsible for the management of the sites in private lands.
RMK – responsible for the management of protected sites in state owned lands, including restoration of habitats, visitor management etc
EEA – responsible for monitoring and databases
Env Inspectorate – responsible for supervision

Landcover(use) change – sustainability of land cover

Samaks jäänud maakattetüübid 120 a. jooksul (VK, EW Topo, NL Topo, LN, EK, PK)

ALA	Maakasutuste hulk	Keskmine pindala (ha)	Summaarne pindala (ha)	Samaks jäänud alade %
teedeala	36	6.7	242.8	96.96
JÄRV	11	43.4	477.0	98.16
vooluveekogu	42	2.8	117.2	93.03
märgala	315	9.2	2906.3	93.56
PUISTU	2753	9.5	26244.6	72.00
PÕÕSASTIK	238	0.3	62.9	15.24
TOOTMISÕU	7	1.3	8.9	7.91
AVAALA	1915	0.5	953.1	63.46
KALMISTU	5	1.0	4.9	91.81
HARITAV MAA	547	3.3	1830.8	46.44
ÕU	781	0.6	453.6	46.65
ROHUMAA	1743	1.3	2313.0	60.86
JÄÄTMAA	4	0.3	1.2	36.57
ROOSTIK	11	6.5	71.9	18.38
TIIK	779	0.1	54.9	69.26
TURBAVÄLI/liivakarjäär	1	41.9	41.9	16.37
PARK	6	5.1	30.8	99.33
Kokku	9194	134	35816	68.97



Sustainability of Cultural landscapes
The Hamlets and Villages in Estonia

- Assumption: presence of settlement (and population) are absolutely necessary for maintaining valuable cultural landscapes
- This means the presence of population with balanced age-structure
- Measuring: via index of settlement vitality on hamlets/village level
- Ca 4,500 in total, Average size of population: 40; 102 of them without population (2017)
- The biggest: over 5000 inh., Average size of territory: 10 km^2

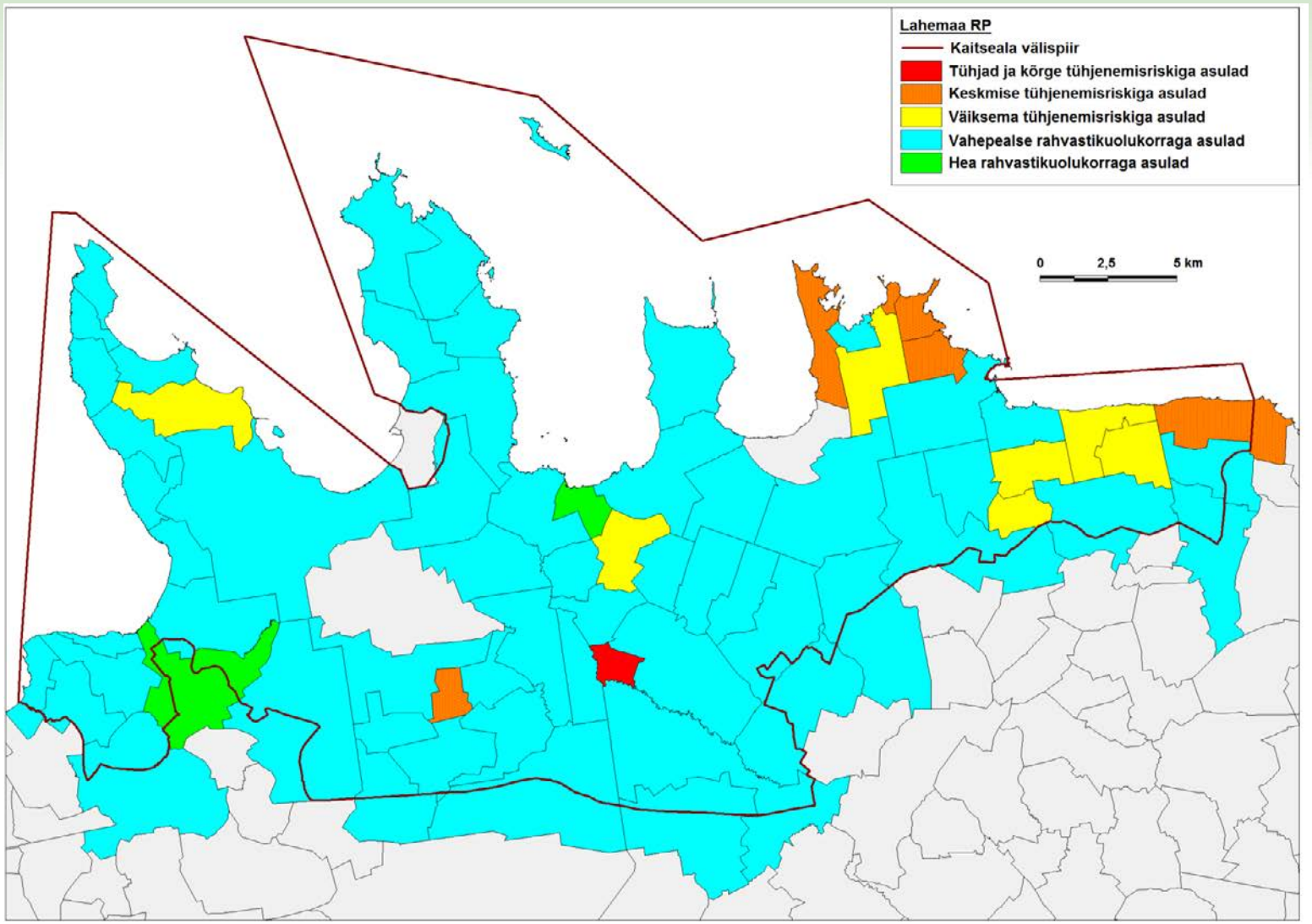
Vitality Index of Settlements and Indicators

SETTLEMENTS	INDICATORS
1. Empty and with high de-population risk	(1) No inhabitants; (2) or: 100% share of population 65+; (3) or: population present only in one 5-year age group
2. With medium de-population risk	(1) Population less than 10 (5-9); (2) or: population present in two 5-year age groups; (3) or: 50+% share of population 65+;
3. With smaller de-population risk	(1) Population less than 10 (5-9); (2) or: population present in three 5-year age groups;

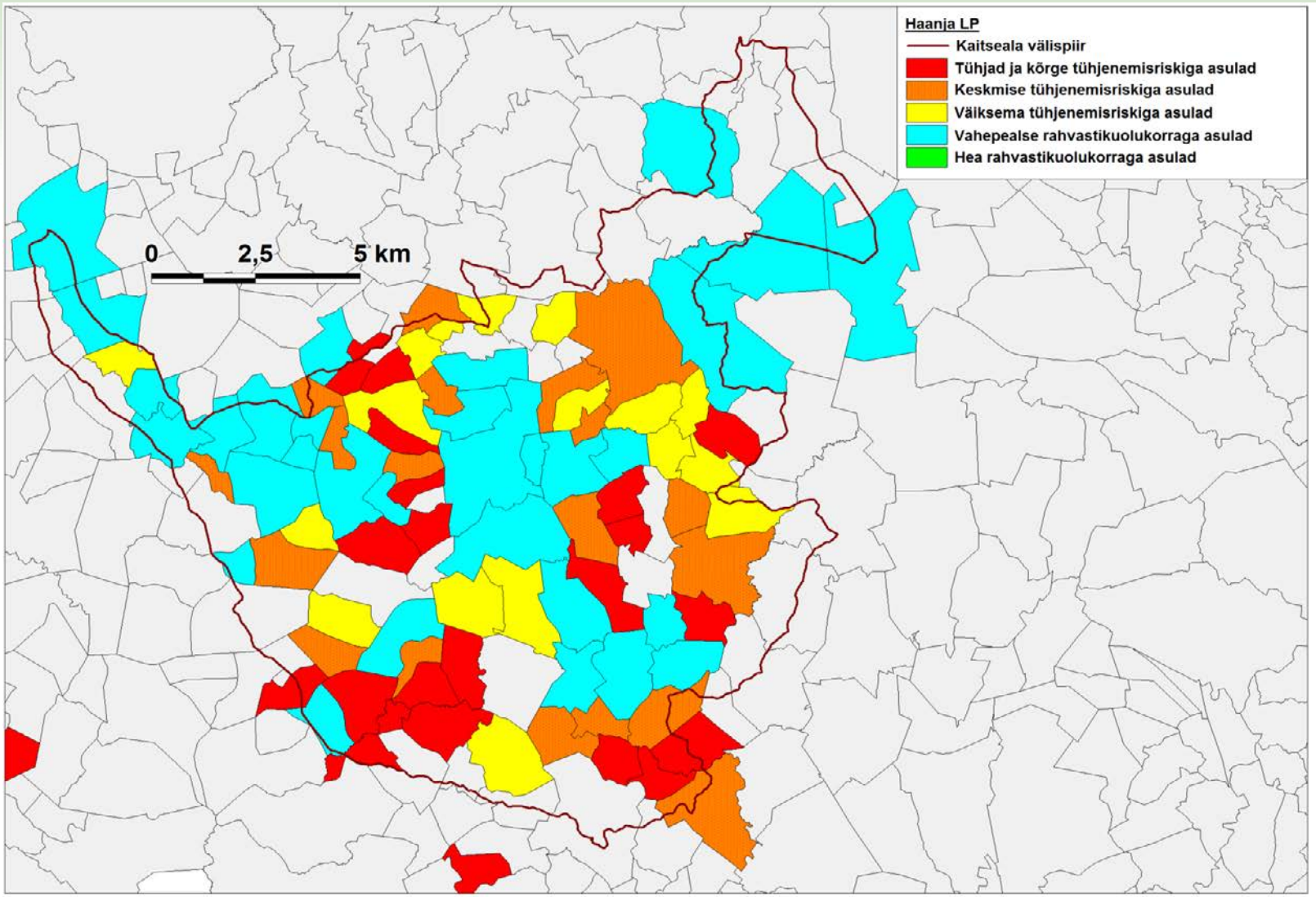
Results: Settelements Vitality

	ESTONIA, TOTAL	PROTECTED AREAS	LÜMANDA PARISH
1. Empty and with high de-population risk settlements, %	5	10	8
2. With medium de-population risk settlements, %	8	11	12
3. With smaller de-population risk settlements,%	7	9	16
1+2+3	20	30	36

Results: Settlements Vitality Index in Lahemaa National Park



Results: Settlements Vitality Index in Haanja Nature Park



Types of Settlements Vitality

Growth type			Score	Class
1. period	2. period	3. period		
			10	1. Viable
			6	2. rather viable
			5	2. rather viable
			4	2. rather viable
			3	3. rather non-viable
			1,5	3. rather non-viable
			1	3. rather non-viable
			0	4. non-viable

Types of Settlements Vitality. Protected areas

	1989	2000	2011
Average (arithm.) score	1.5	2.1	1.8
Median score	2.0	1.5	1.5
Share of non-viable settlements, %	60	41	32

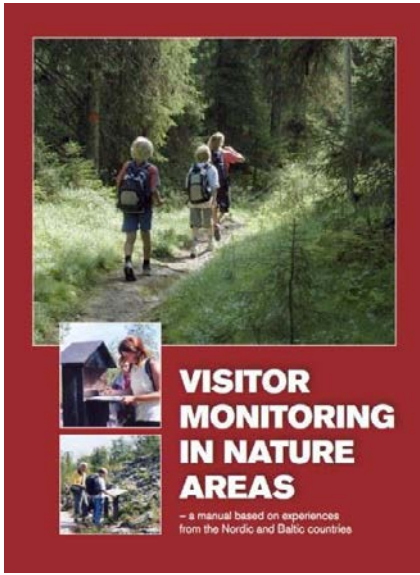
	Average score
Ahja	4
Kurtna	3
Alam-Pedja	2
Soomaa	2
Lahemaa	2
Vooremaa	2
Otepää	2
Kõrvemaa	2
Emajõe Suursoo	1
Karula	1
Loodi	1
Silma	1
Matsalu	1
Paganamaa	1
Puhtu	1
Endla	0
Nigula	0

Controversial objectives of protection and visitation: Estonian case

- Developing the nature protection system (env. board, state forest management centre, tour operators, local authorities, etc): the need for a formalised cross-sector monitoring system that ensures better services, articulates needs, maintains recreational value
- Sites with low levels of visitation are primarily visited by the locals and the more adventurous independent travellers, few crowded heritage sites
- Growth of visitation and use of sites, changes over time rather quickly

Estonian background: historic review of surveys and experiences

- 1977-85: visitation surveys in Nigula, Viidumäe protected areas and in Sõrve Saaremaa
- 1988: Roosaluste on recreation impact on wetland communities
- 1980-90s: Forest Institute on recreation impacts on forest, cadastre of recreational forests
- 2002: RMK run visitor monitoring and surveys
- 2003: Leito&Poola survey on tourism impact on Kõpu coastal plants
- 2006: Sepp&Noorkõiv survey in Elva
- 2007: Kajala (ed) Visitor Monitoring manual
- 2008: Roose survey combining monitoring methods
- 2009: State Forest Centre began automatic counting
- 2009: Hurt et al methods to assess carrying capacity
- 2011: Roose & Sepp et al visitor monitoring methods, manual
- 2017: Kullisoo experiment. Bog surface carrying capacity
- 2019: Mobile positioning at Lahemaa and Alutaguse national Parks and Methodology how to measure vistor impact



Estonian background: Institutional settings

- **RMK** (State Forest Management Centre of Estonia) has pioneered and run visitor monitoring and surveys systematically since 2002 in forest sites
- **Environmental Board** has initiated comprehensive system development in 2009-2011.
- Visitor monitoring is still quite loose and needs harmonising in regard of multitude of stakeholders and multi-layer nature protection system

Visitor monitoring model – integrated into protection management

Objectives of visitor monitoring system

To introduce comprehensive national visitor monitoring system for nature protected areas

- Reporting and statistics
- Assessment of protection actions (efficiency) and change monitoring, human impact
- Reacting to inconsistencies and mitigating risks in case of negative impacts
- Planning protected area management and efficiently allocating resources
- Local development dimension: economic and social added value of nature tourism

Visitor monitoring system three modules

Visitor counting

Counting:

- Manual
- Semiautomatic
- Automatic

Impact monitoring

- Biophysical features
- Field surveys on indicators
- Ecosystem and landscape surveys
- Impact assessments

Visitor survey

- Visitor questionairre
- Client surveys

Visitor monitoring method

- Based on best practice and data (testing and piloting)
- Applicable on protected area and regional level, allows national reporting and international comparisons
- Based on instrumental and automatic monitoring, analysis is based on latest research methods, critical approach, impact assessment
- Applicable by area officers and rangers

Indicators of visitor monitoring

Module	Indicators
I Visitor counting (3 indicators)	Number of visitors annually Number of visitors – weekly max Number of visitors – daily max Trends
II Impact on physical environment and trail erosion (3 indicators)	Weight of category Changes/trends in category Unplanned trails
II Ecological impact (0-2 indicators)	Status class of Natura area (A, B, C), Status of indicator species
II Firewood and waste management (3 indicators)	Volume, uncontrolled fireplaces, uncontrolled littering (location)
II Quality of infrastructure (1 indicator)	Status class
III Visitor survey (10 indicators)	Charateristics of visitors (age, sex, education, activities, overnights rate, motives, satisfaction, expenditures, arrival mode, location of origin)
III Entrepreneur survey and feedback (2 indicators)	Number of accommodation units, staff

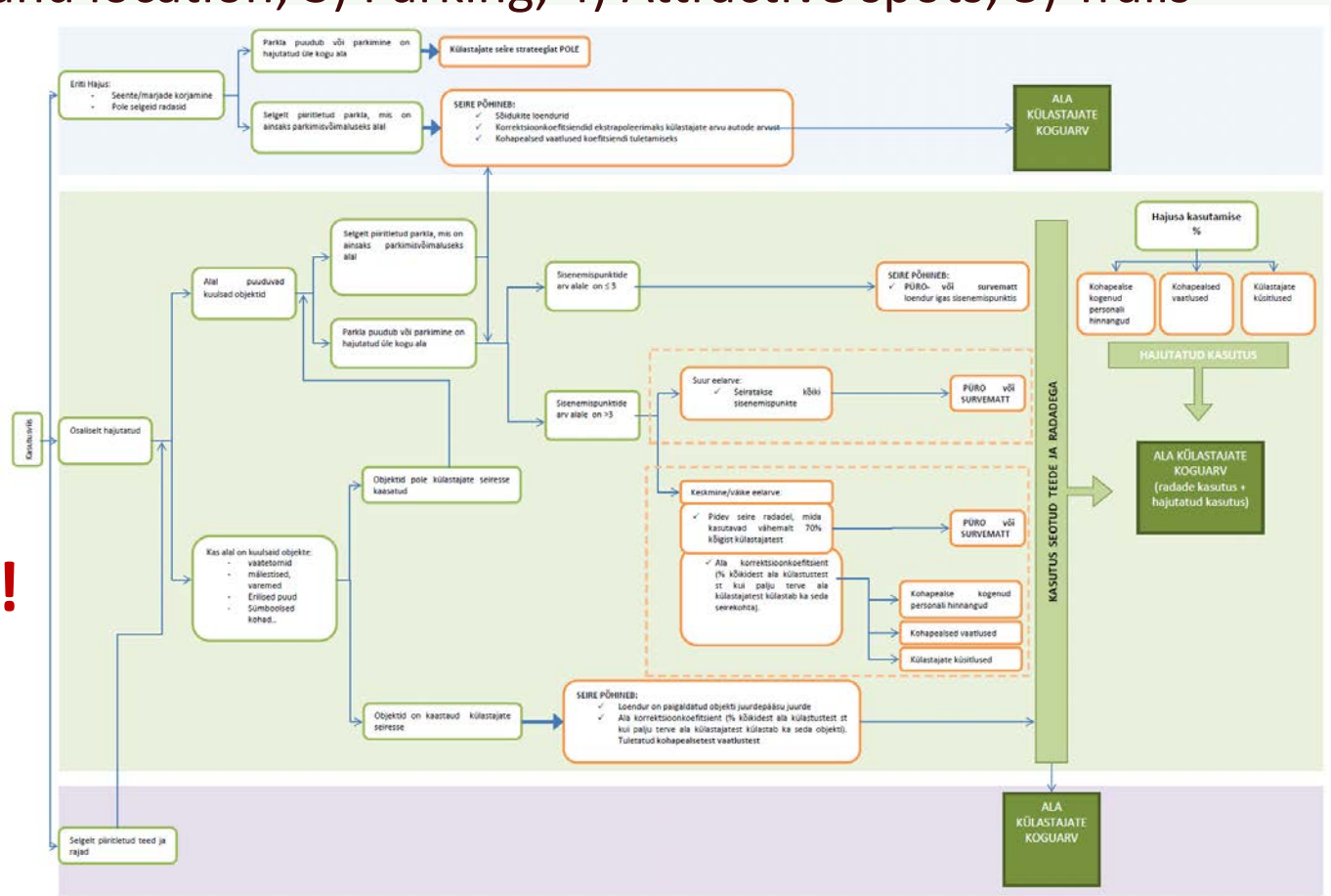
Criteria for selection of monitoring site

Criteria	Condition	Weight
Type of protected area	National park Landscape protection area Nature protection area	**5** **3** **2**
Visitor infrastructure at Natura priority areas		**3**
Visitor infrastructure	Visitor's centre, trail, tower etc (more than 3 units)	**3**
Location from country centre	Areas located near-by city or up to 20 km	**3**
Accessibility	Good Average Poor	**3** **2** **0**
Tourism impact on protected area (previously)	Expert assessment: high Average Low	**3** **2** **0**
Attractive leisure spot (e.g beach)		**3**
Event site (concerts, sports etc)		**3**

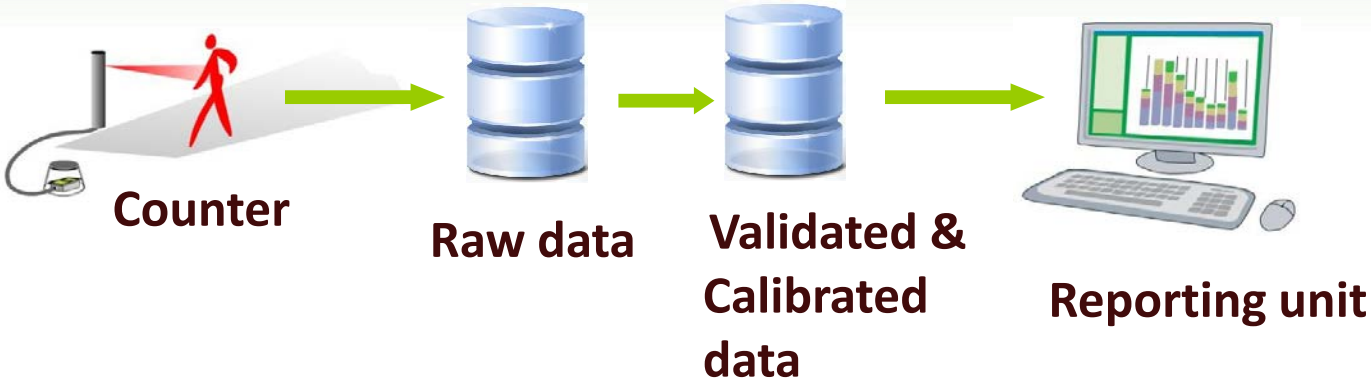
Visitor counting

Decision tree – choosing technical solution and monitoring scheme for specific area. Based on physical impact: 1) Type of tourism use; 2) Geography and location; 3) Parking; 4) Attractive spots; 5) Trails

Each location is unique!



Data processing:
Data flow from the counters to the end-user



- Monitoring requires **validated** and **calibrated** data
- Both raw data and calibrated data have to be kept in different databases to avoid misuse and misinterpretations.

Two counting systems – one unified database

- Data is centralised and processed in **one single database for** consistency and homogeneousity
- Allows for quick and simple data storage and retrieval
- Allows for easy access to data
- Allows for simple analysis and comparison of data
- Serves as a backup

Visitor counting

Vooremaa landscape reserve:

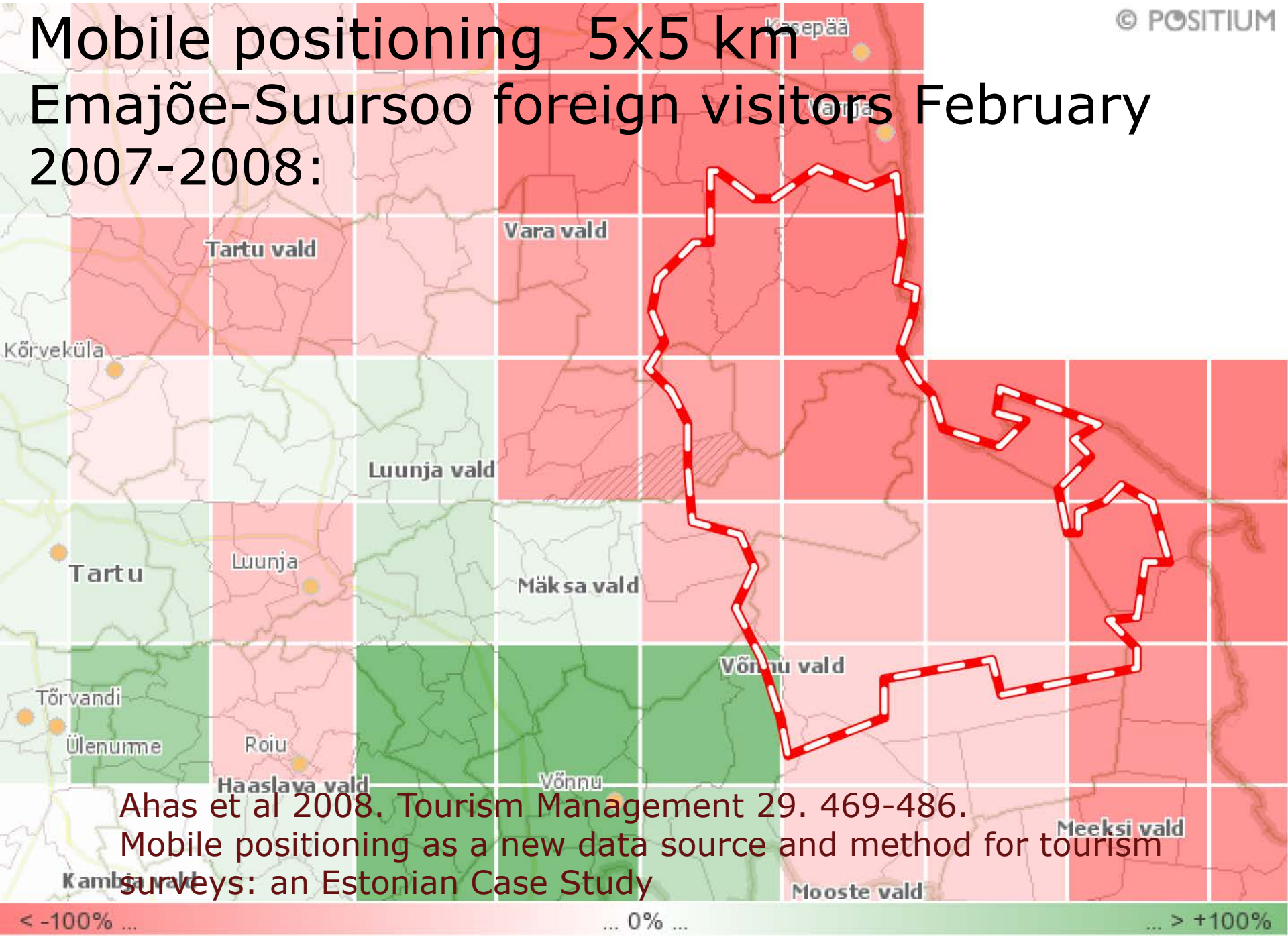
Open cultural landscape, multiple gates, commonly accessed by numerous points around the perimeter

Visitor counting

Emajõe Suursoo mire reserve

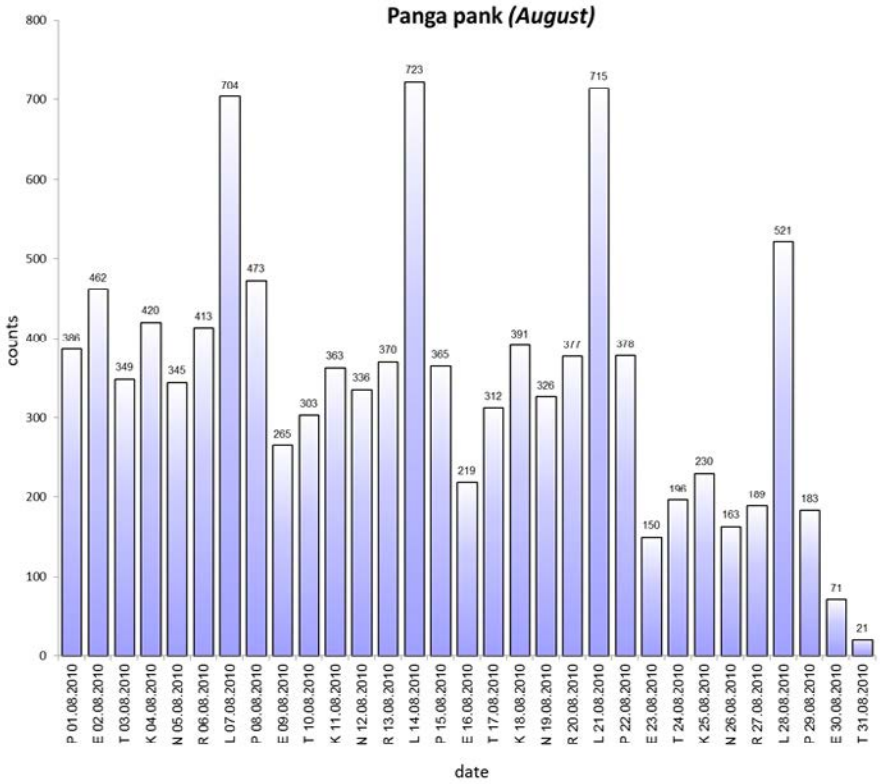
Few gates (3), naturally protected, straightforward monitoring scheme

Mobile positioning 5x5 km Emajõe-Suursoo foreign visitors February 2007-2008:



Ahas et al 2008. Tourism Management 29. 469-486.
Mobile positioning as a new data source and method for tourism surveys: an Estonian Case Study

Visitation reporting templates: Day-of-week and Time-of-day

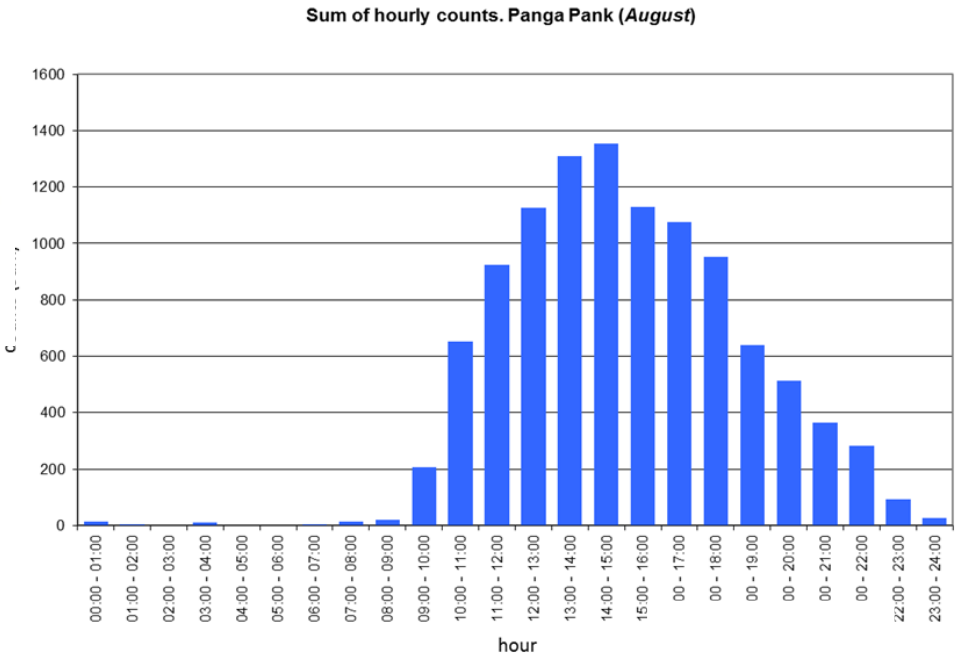


Total daily counts

Daily totals are reported on monthly basis to explore pattern of visitation.

Time-of-day profile

Hourly counts are summed over one month to identify peaks of use within a day, trends and patterns of use

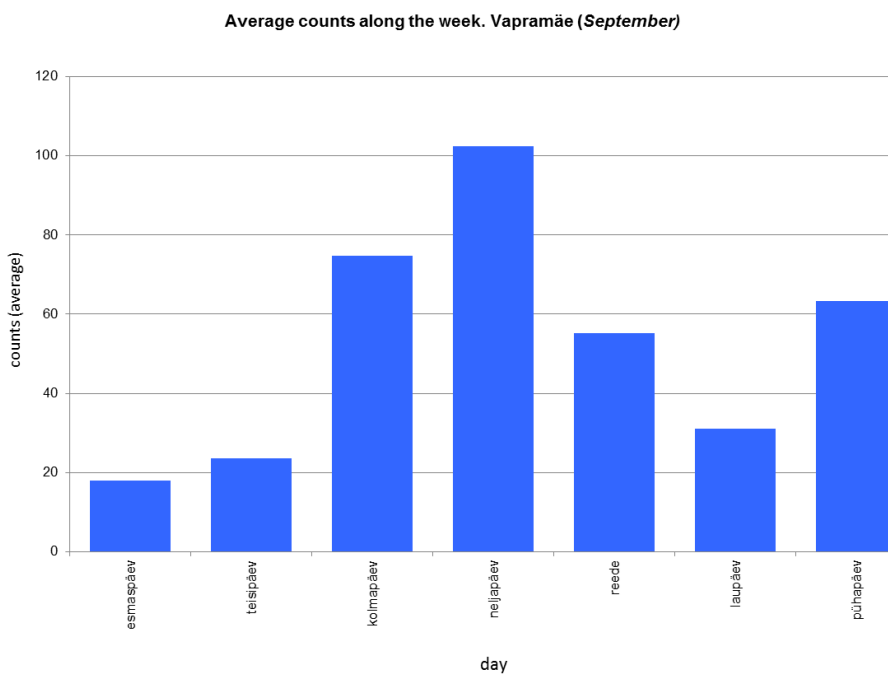


Visitation modes according to day-of-week profiles

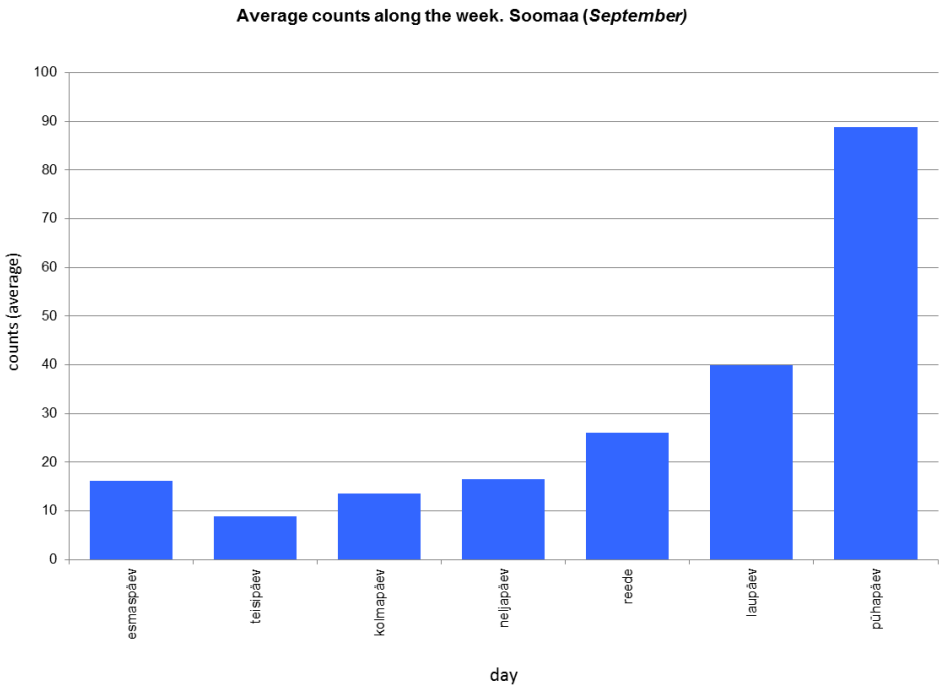
Vapramäe near Tartu/Elva Soomaa Ingatsi trail

September 2010

Periurban destinations



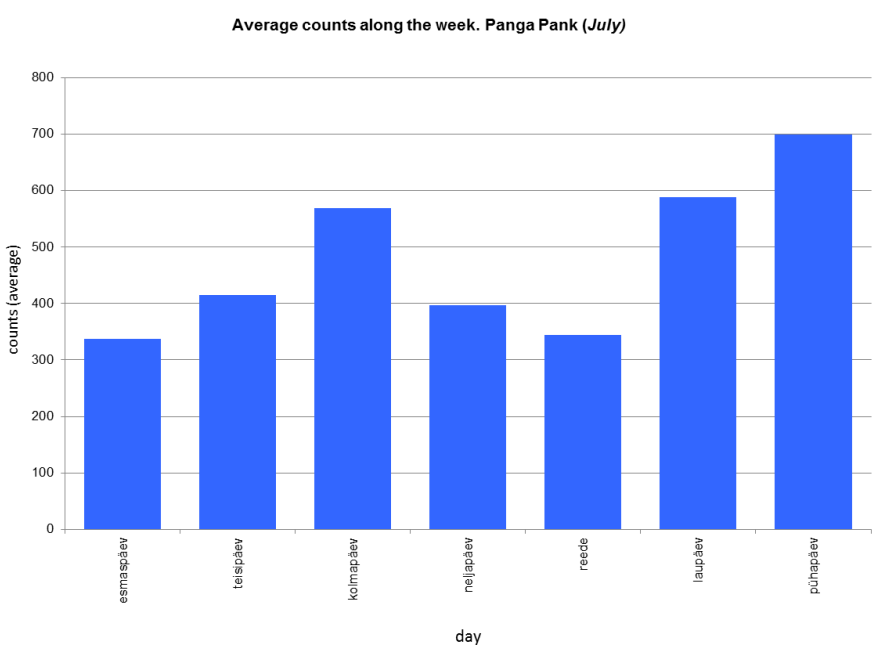
Weekend destinations



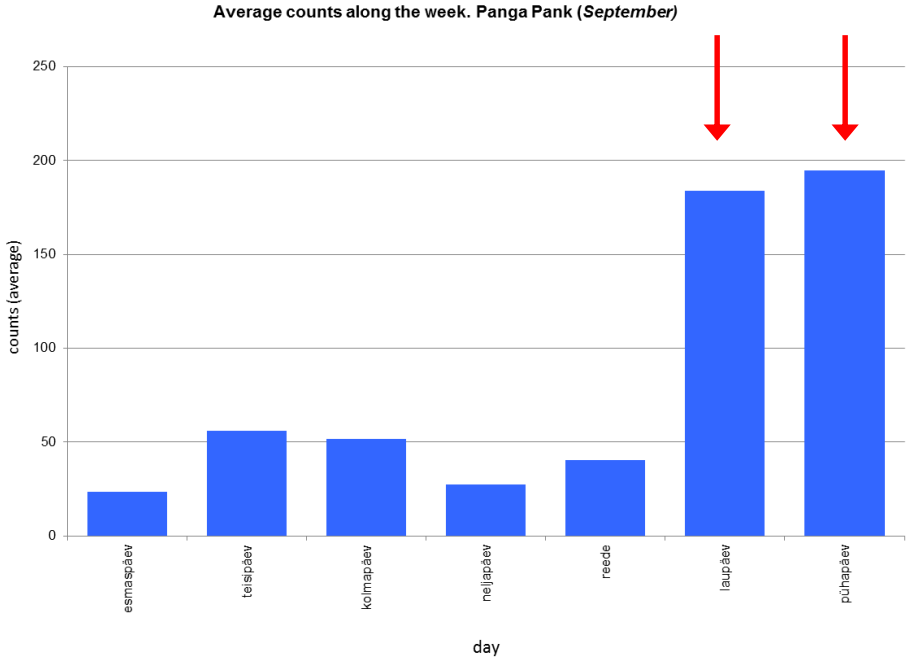
Visitation modes according to day-of-week profiles

Panga cliff in Saaremaa

Peak season: July 2010



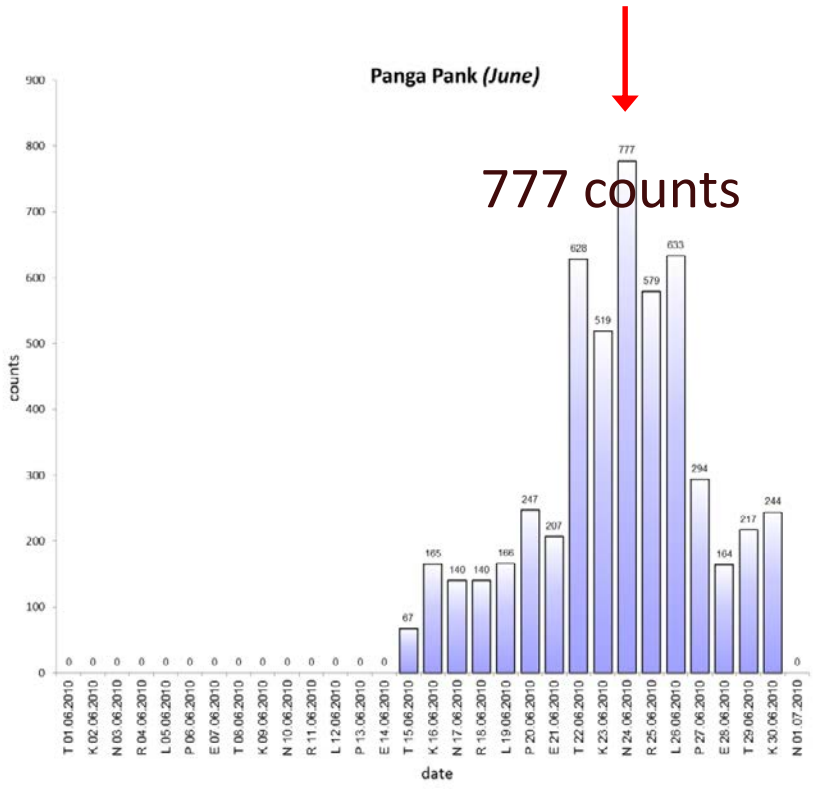
Low-season: September 2010



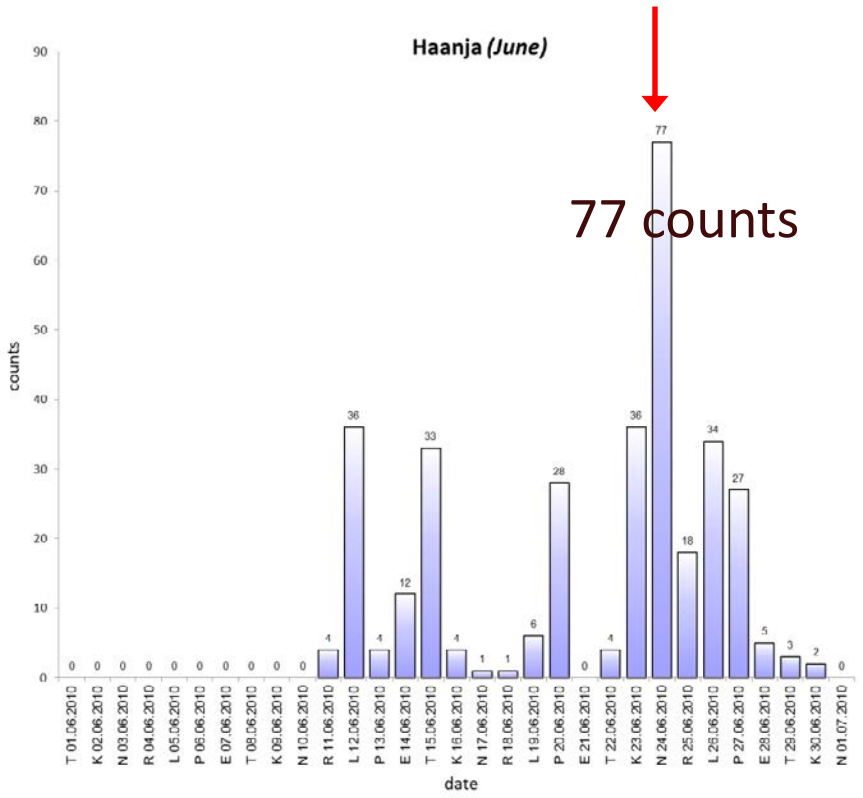
Visitation modes according to day-of-week profiles

Midsummer Day 24 June, 2010

Panga cliff in Saaremaa



Haanja upland Vällamäe trail



Issues concerning visitor monitoring system and methods

- **Institutional barriers**

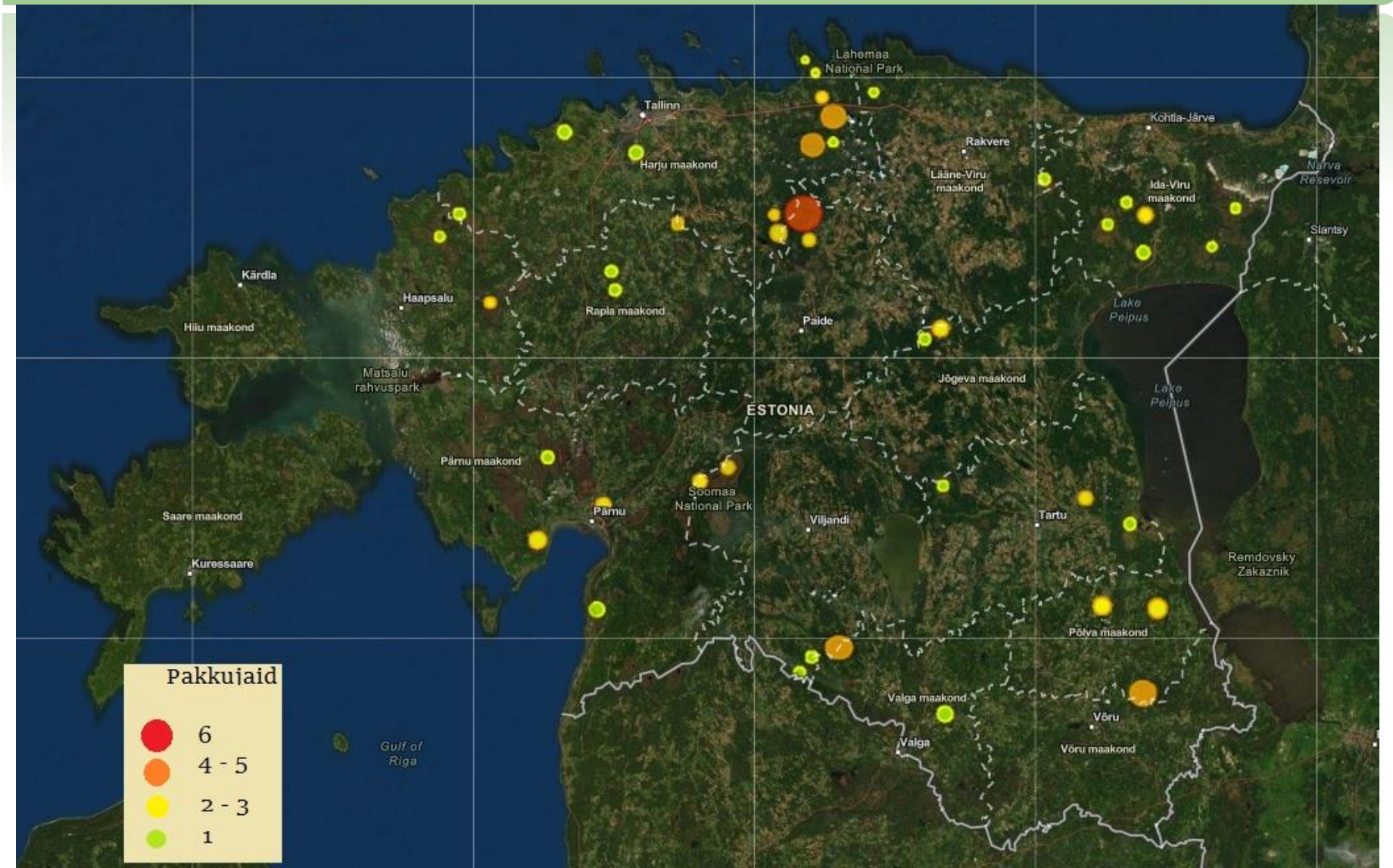
Methods:

- Statistical confidence levels?
- Locational matters: area-specific, zoning, hot spots?
- Financial constraints and cost-efficiency

Bogshoeing in Estonian mires – is it a problem?

- The mires are important resource in nature tourism and their role is increasing
- The ancient devices – bogshoes (rääts, padin jms) were taken in use about 10 years ago (used all year round)
- The remote bogs have become accessible to numerous travellers
- With increasing interest there may occur negative impact on mire ecosystems (trampling, disturbing, other?)

More than 20 companies offering bogshoes hiking in ca 45 bogs in Estonia (Erit 2019)



Methodology?

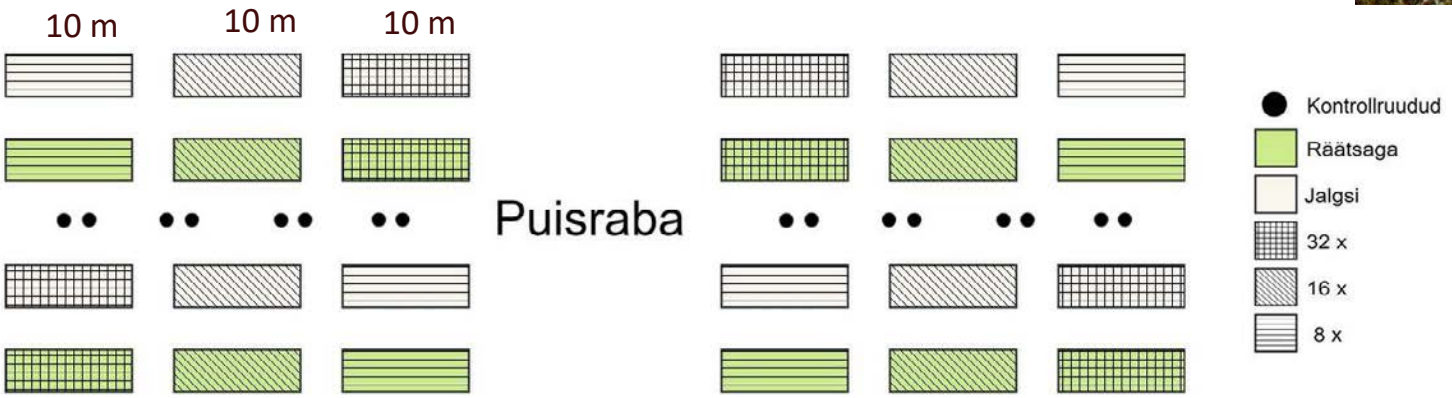
- Good methods for wildlife and mineral soils
- Some papers on trampling in bogs, no good information about recovery
- No papers or methods about bogshoeing

Foto: Räätsad. (Räätsade rent)

Foto: Räätsamatk. (Sportland Kõrvemaa Matka ja Suusakeskus)

In 2017- … a comparative trampling experiment in Kullisoo, by foot (boots) and by bogshoes

- **3 habitat types:** wooded bog, open bog with cottongrass and hollows and wooded cottongrass bog
- **3 trampling loads:** 32 times x 10 days, 16 times x 10 days, 8 times x 10 days



How to measure the impact/path on peat?

- Transects – 10 m, 4 plots on each
- Geobotanical analyse – 0.5 x 0.5 m plots
- Surface profile (compared to reference flagpole)

MEASUREMENTS:

- 2017 July – (trampling)– Sept-Oct
- 2018 August – Sept
- 2019 late August

Some results (visual estimation):

- Bogshoes leave as noticeable traces on bog surface as ordinary trampling by foot in most habitats and microforms
- Small groups/trampling loads (8 x 10) recover well in 2 years by both trampling types
- Bogshoe damages in wet sites with heavy loads become well evident only after some years (hard to estimate, if *Sphagnum* is dead or not)
- *Sphagnum rubellum* is more tolerant than others to trampling and is first moss to recover

Timeline: Bog woodland, 16 x 10, bogshoe

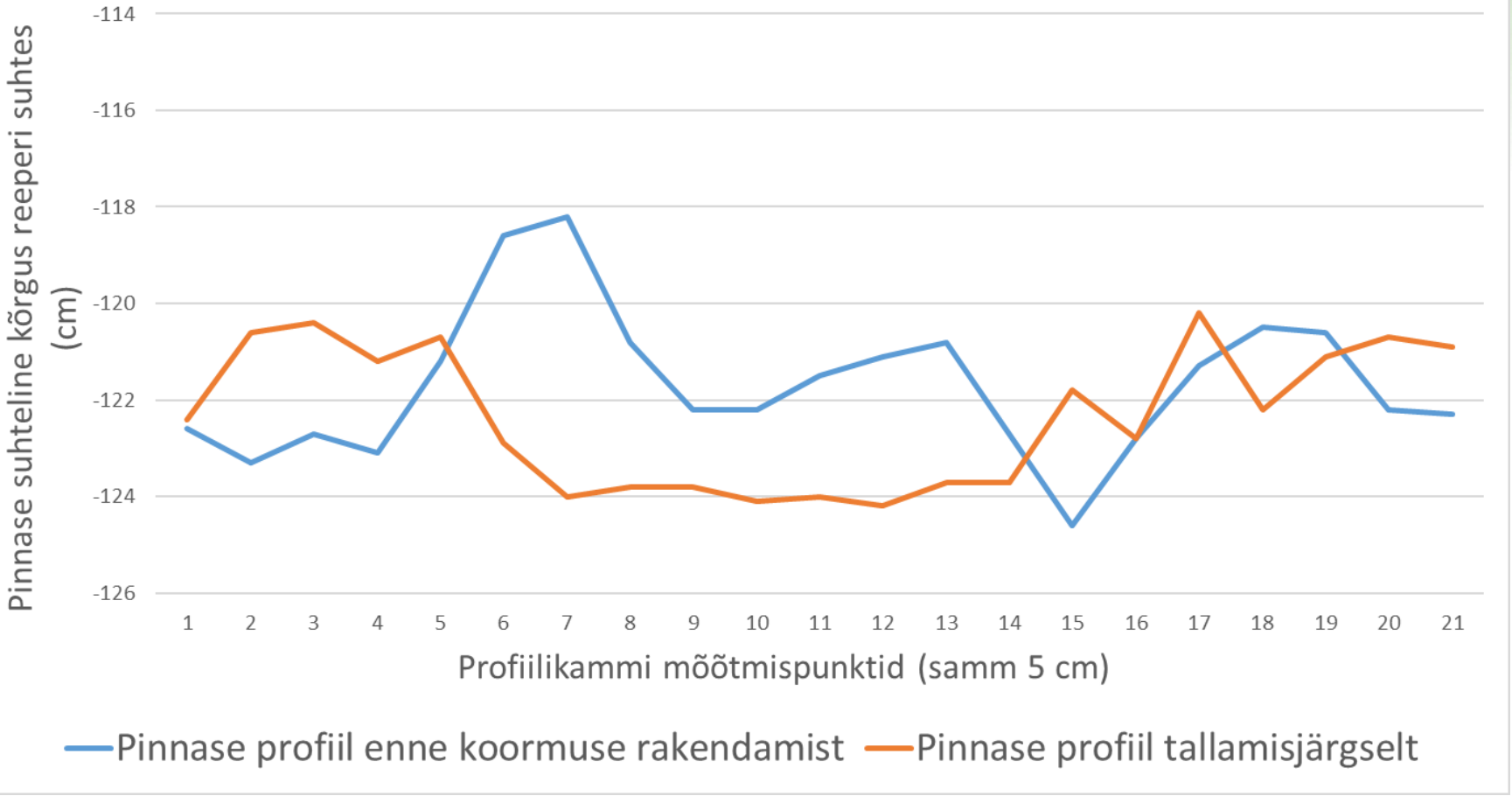
2017 before

2017 after

2018

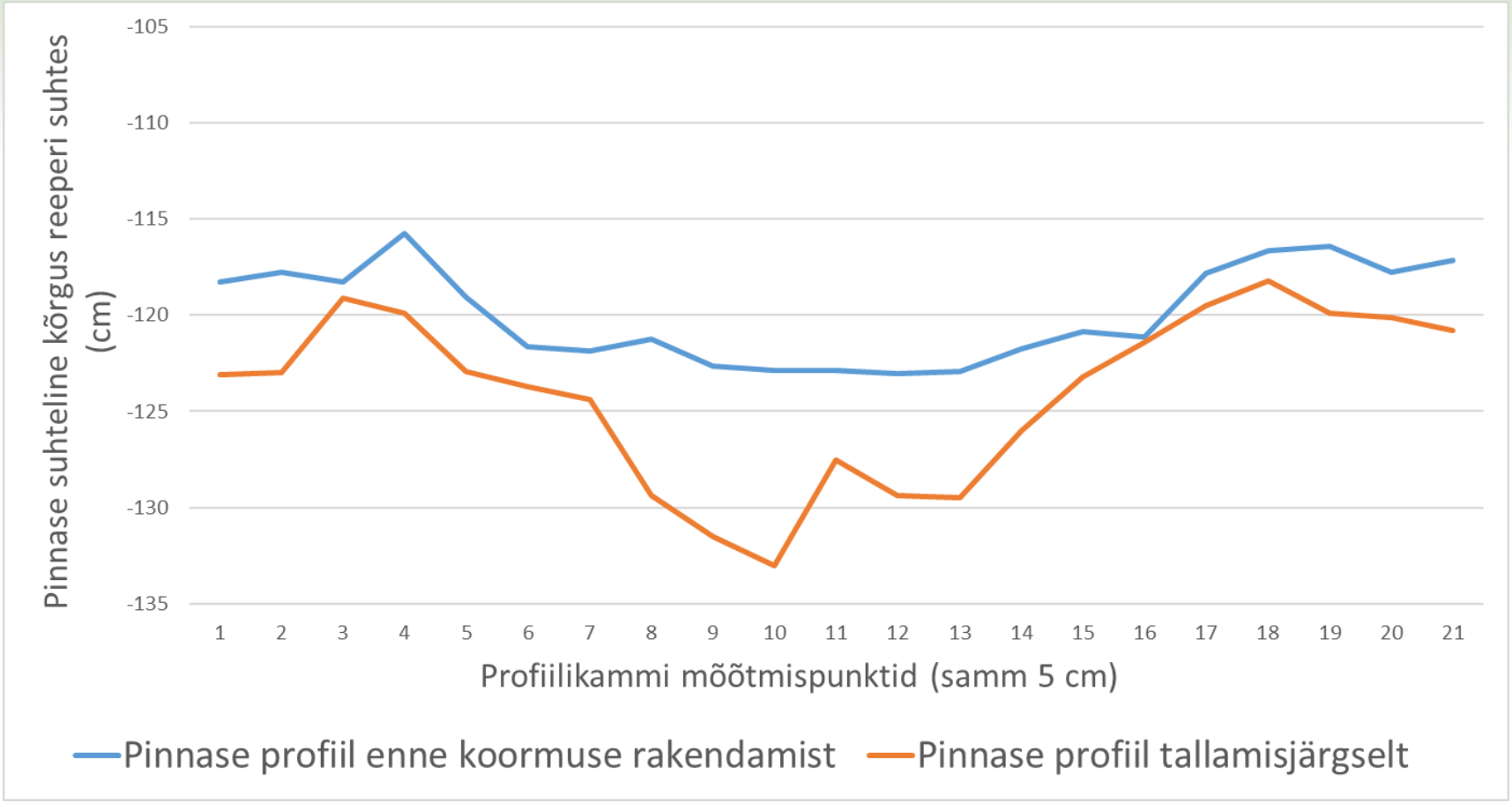
2019 other angle!

By bogshoes



Wooded bog, trampling by bogshoes (32x) blue – before and red after trampling

By foot, in the wooded bog, 32 x 10



Wooded bog, trampling by foot (32x) blue- before trampling, red – after trampling

Timeline: Wooded bog with cottongrass, bogshoe, 32x10

2017 before

2017 after

2018

2019 ohter angle

Timeline: open bog, bogshoes 32 x 10

2017 before

2017 after

2018

2019

In wet habitats, hollows, the impact is bigger than in ohter places!

- Bogshoe, 32 x 10, in 2018

Small groups do not leave visually significant impact

Bogshoe, 2018, 8 x 10

Developing visitor mangement policy and infrastructure

- Visitor management system should be unified with protection policy and system, harmonised with protection plans and measures
- To intensify visitor counting and visitor questionnaires and to move forward to carrying capacity surveys.
- Focus on target group based management & marketing not just universe message and action-lines