Riparian forest management

LIFE IS SALACA

Adaptation of Water Framework Directive and Habitats Directive harmonization and integrated actions for freshwater quality improvement in Salaca river sub catchment

Mārcis Saklaurs, SILAVA, Rīga, 09.10.2025.

Projektu līdzfinansē Eiropas Savienība

Riaprian forests_200 000ha

- Two ecosystems – river and forest
- Moisture, relief, soil, including light, wind, nutrient input
- Characteristic feature of the forest stand – continuous variability of factors (thickness, species composition, height)
- 8 ecosystem functions (such as water quality, microclimate, hydrology, biodiversity, recreation, etc.)
- Approximately 40 ecosystem services (nutrient accumulation, erosion prevention, mushroom picking, etc.).

Table 1: Benefits of wetland (riparian) buffer zones for a range of chemical, physical and ecological functions

Function	Benefit
Water Quality	• Protection of surface water runoff from surrounding land into the wetland (i.e. filtering/trapping of toxics) • Reducing sedimentation (soil erosion, trapping sediment) • Reducing eutrophication (excess nutrients, e.g. from fertilizers) – serving as nutrient sinks for surrounding watershed • Reducing pollution and spray drift (e.g. pesticides/herbicides, heavy metals) • Protection from rising salinity • Protection of inflowing groundwater quality
Microclimate	• Maintain microclimatic gradient • Provide shading and moderate water temperature • Provide wind break
Hydrology	• Reducing peak floods – water fluctuations • Moderate the impacts of altered hydrologic regimes and flooding • Stabilising stream channels and banks (e.g. enabling roots to hold soils) • Increase flood storage capacity of wetlands • Serving as key recharge points for renewing groundwater supplies • Protecting hydroperiod (which can influence ecology) • Reducing rate of infilling from sedimentation • Influences depth of water table • Enhances stream 'roughness' which affects flow regime • Groundwater interaction – prevention of groundwater drawdown
Wetland Fauna Habitat	• Maintenance of ecological processes • Providing feeding habitat - maintain productive food webs in-stream • Provision of a source of carbon to the wetland • Providing leaves and woody debris critical for aquatic organisms • Providing breeding/nesting habitat • Providing shelter/cover/overwintering sites • Protection of biodiversity • Minimisation of invasion by exotic species/weeds • Absorbing 'edge effects' on ecology • Protection from rising salinity
Wildlife Corridor	• Contribute to wildlife corridors between wetland and adjacent wetlands or bushland or other habitat fragments (i.e. for dispersal, migration, foraging etc.)
Fauna Protection	• Reduce disturbance from surrounding development (e.g. noise, light, movement from residential development; human activities) • Absorbing 'edge effects' on ecology • Provide a transition zone between upland and lowland habitats • Promote gene flow
Aesthetics/ Recreation	• Provide buffer between residential areas and nuisance insects e.g. midges, mosquitoes • Create a screen from incompatible scenery (e.g. industrial development) • Provide area for passive recreational activities (e.g. bird watching)
Management Tool	• Achieving desired values, processes, functions and other attributes/ ecosystem services of wetlands • Mitigate fragmentation and increase connectivity of isolated habitats • Protection against margin dieback • Biodiversity conservation and reserves of native species • Accommodate for 'fuzziness' of wetland boundaries (i.e. allow for expansion in times of flood)

Table 2: Recommended buffer zone widths for wetland/riparian ecosystems

Aspect	Objective	Recommended buffer width*	References
Temperature	Water temperature moderation/ shade	12 – 30 m	Castelle *et al.* 1994
		20 m[a]	Davies and Lane 1995
	Maintain microclimate gradient	45 m	Fischer *et al.* 2000
Nutrients	Reduce nutrient inputs (removal)	100 m[b]	Davies and Lane 1995
		200 m (sandy soils)	WRCWA 2000
	(reducing nitrate)	30 m	Wenger 1999
		30 – 48 m	Castelle *et al.* 1994
	(removal of phosphorus)	9 – 30 m	McElfish *et al.* 2008
	(removal of nitrogen)	30 – 48 m	McElfish *et al.* 2008
Pollution	Reduce pollution (heavy metal) input	100 m[b]	Davies and Lane 1995
		200 m (sandy soils)	WRCWA 2000
	Reduce pollution (pesticide removal)	> 15 m	Wenger 1999
Sediment	Reduce sedimentation (removal)	9 – 30 m	McElfish et al 2008
		30 m	Wenger 1999
		10 – 65 m	Castelle *et al.* 1994
		100 m[a]	Davies and Lane 1995; WRCWA 2000
Water quality	Improving/protection of water quality	5 – 30 m	Fischer et al 2000
		≥ 6 m[c]	DSE 2005
	Protection from land use	30 - 60 m	Semlitsch and Jensen 2001
Ecological processes	Maintain ecological processes/major food webs	10 – 30 m	Wenger 1999
	(carbon flow)	20 – 50 m[d]	Davies and Lane 1995; WRCWA 2000
	(large woody debris and organic litter)	30 – 50 m	Wegner 1999
Bank stability	Protect bank stability	20 – 30 m	DPIPWE 2003
Biodiversity	Protect biodiversity (species diversity)/ wildlife/ habitat	30 – 90 m	McElfish *et al.* 2008
		3 – 120 m	Castelle *et al.* 1994
		> 100 m	Wenger 1999
		100 – 170 m	Brown *et al.* 1990; Keller *et al.* 1993
	Bird habitat	40 – 500 m	Fischer *et al.* 2000
	Reptile/amphibian habitat	30 – 1000 m[e]	Fischer *et al.* 2000; Semlitsch and Bodie 2003
	Mammal habitat	> 50 m	Fischer *et al.* 2000
	Maintain benthic invertebrates in streams adjacent to logging	32 m	Erman *et al.* 1977 and Newbold 1980 in Castelle *et al.* 1992
Insects	Nuisance insects	100 – 800 m[f]	Davies and Lane 1995; WRCWA 2000
Groundwater	Protection of inflowing groundwater quality	2000 m[g]	Davies and Lane 1995; WRCWA 2000; DSE 2005
	Minimise groundwater drawdown	[h]35 – 170 m	Brown *et al.* 1990
Salinity	Protection from rising salinity	250 m	Davies and Lane 1995; DSE 2005

Challenges

- **Policy for adhering to the precautionary principle** in land management, which means banning or preventing any economic activities in riparian forests
- **Continuous efforts are made to limit long-term human presence** according to today's economic and social regulations
- There are **no alternative economic solutions** for the long-term coexistence of humans in riparian forests
- **An ecosystem service assessment system has not been established** for evaluating individual riparian forests or their parts
- Changes in **the overall value of ecosystem services have not been assessed** based on existing land principles or alternative land management regulations and options.

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Overgrown EU specially protected habitats 6230, 6410, 6450

Buffer zone law

- Article 7.
- Buffer zones for surface water bodies
- (1) The buffer zones for surface water bodies are determined for:
- water bodies, watercourses, and artificial water bodies, **to reduce the negative impact of pollution on water ecosystems**,
- **prevent** the development of **erosion** processes,
- limit economic activities **in flooded areas**,
- as well as **preserve** the characteristic **landscape** of the area.
- Conclusion: Certain **ecosystem services are granted exclusivity status**, degrading other ecosystem services without recognizing their value and significance.

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Situation – influence of the legislation

- Law on buffer zones and its (non)management principles
- Objective - reduction of erosion and nutrient runoff
- Thousands of cubic meters of sediment reach rivers each year
- Deposited in fast-flowing (fresh water) habitat areas
- Promotes rapid eutrophication
- Polluted with sediments
- Loses water self-purification functions
- Reduced value of ecosystem services in watercourses

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Situation in the nature

- **Until** the early **1990s**, the existence of long-term residents in riparian forests **was economically viable**.
- Currently, with a series of **management activities prohibited** for humans and market economy dictating conditions, people have **retreated from these areas**.
- **The previously existing mosaic structure** (meadows, forests, riparian openings) has transformed, **overgrown** with grey alders, including the **loss** of unique meadows with high species diversity.
- The **grey alder stands** have now reached 30 years and are **collapsing intensively**.
- **Repeatedly releasing nutrients** and being washed into rivers promotes eutrophication (overgrowth of rivers).
- The mentioned examples show that the goal of the Buffer Zone Law, to reduce the negative impact of pollution on watercourses, is not being met or is only partially fulfilled, and **the existing regulation demonstrates its inefficiency**.

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Objective in riparian forests

Humans, as long-term managers of the territory, balanced **consumers** of local ecosystem services, and **providers** of necessary services to society, interact with riparian forests (e.g., drinking water, landscape, etc.).

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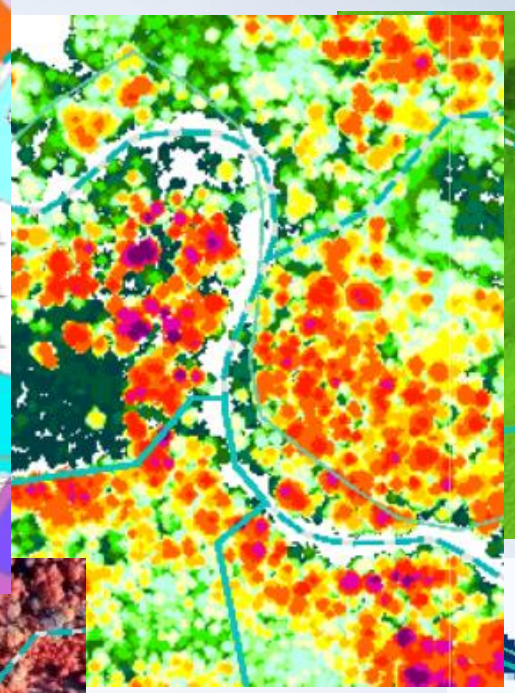
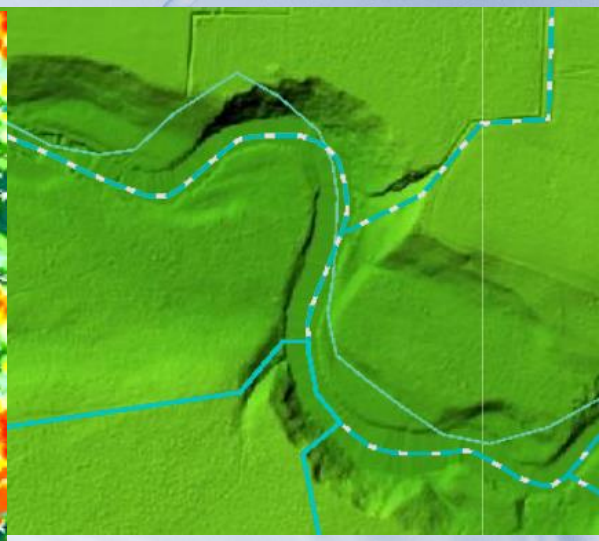
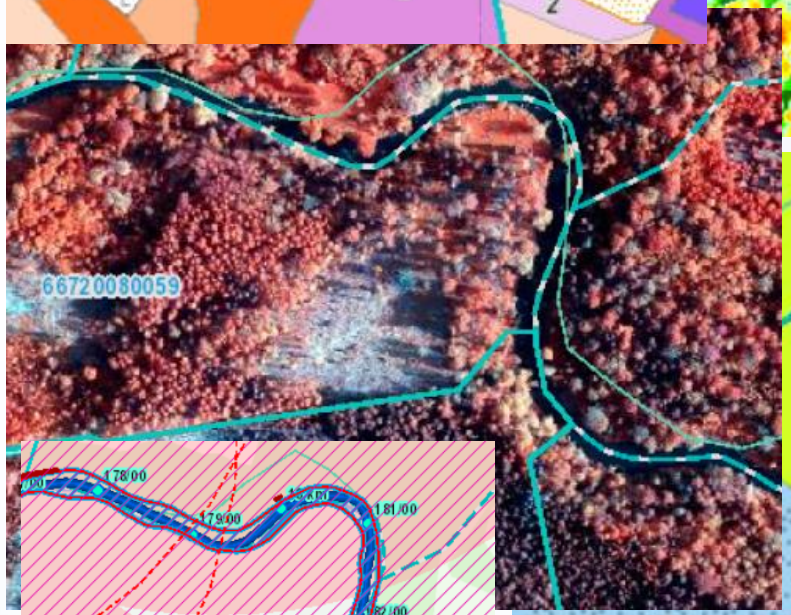
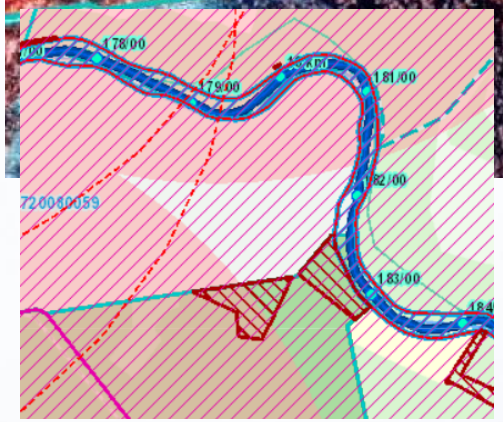
Solutions

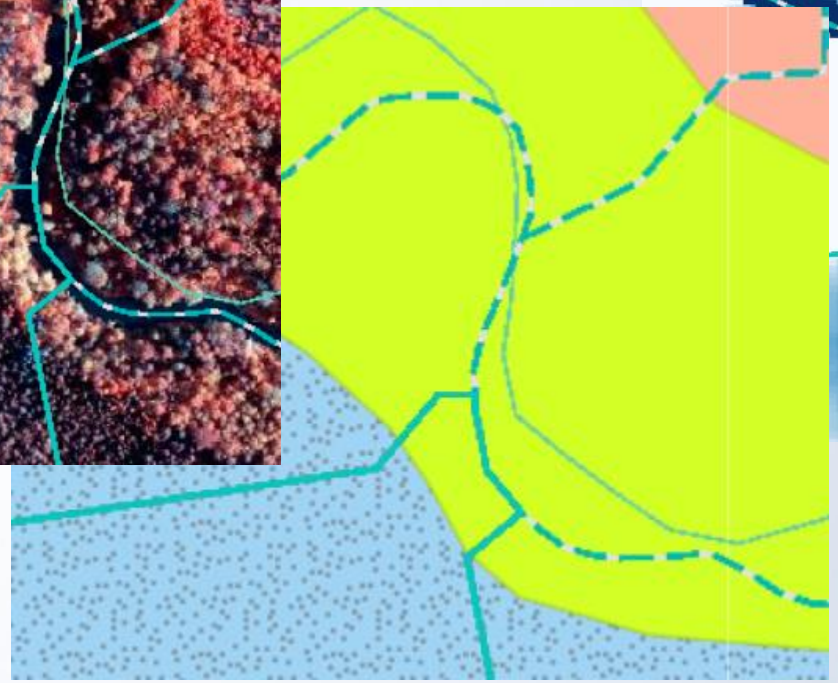
- Develop an **ecosystem services approach**
- Create **support IT tools** for decision-making in the management of riparian forests
- Do **not prioritize one ecosystem service** over others
- The **relationship** between land use and water quality **is difficult to establish** because it depends on **many factors**, such as hydrology, soil properties, topography, seasonality, and historical land use or its spatial distribution in the catchment (Allan, 2004; Rodrigues et al., 2018)
- **Improve legislation** rather than patching holes!
- **Replace the filter!**
- Punish property owners for biological waste from their properties that ends up in rivers! Perhaps?

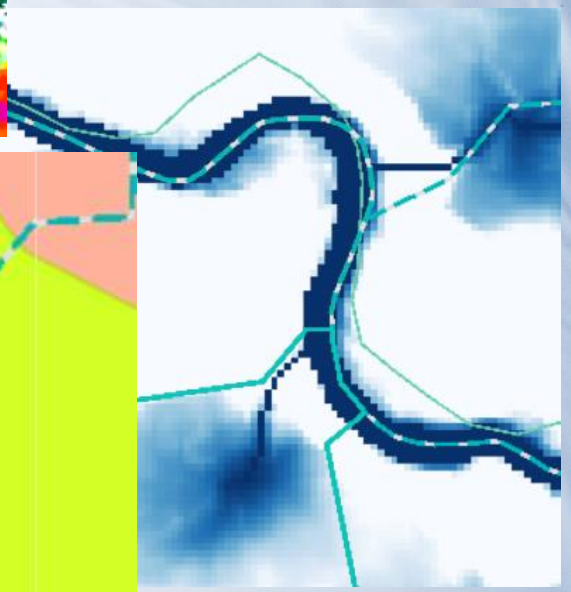












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Overall Life is Salaca project goal and objectives

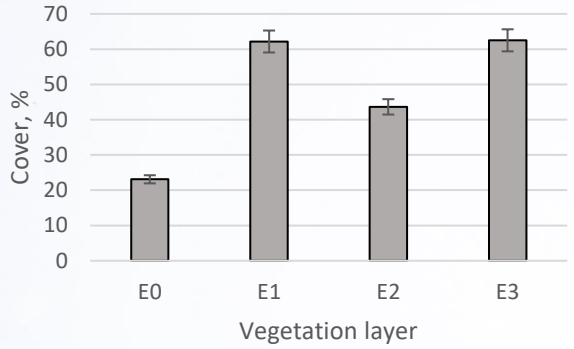
- The aim of the project is to promote the achievement of a good water condition in the rivers of the Salaca sub-catchment, as determined by the Habitats Directive, the Water Framework Directive and the objectives of the EU Biodiversity Strategy.
- 1. Harmonization of the Habitats Directive and the Water Framework Directive in the model territory – Salaca sub-catchment
- 2. Development of the nature protection plan of the Natura 2000 area “Salaca Valley” in a new framework
- 3. Improving habitat availability, quantity and quality for ecologically sensitive fish species
- 4. **Management of riparian forests**
- 5. Application of ecosystem service assessment in land use modeling

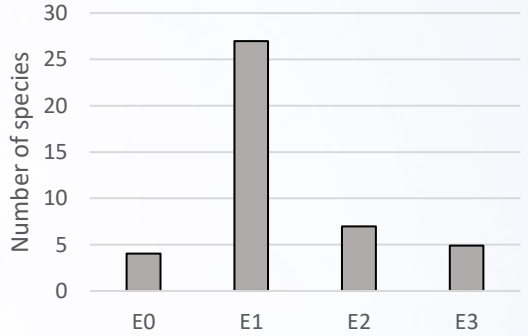
Aim for riparian forests

- **Assessment of ecosystem services** in riparian areas (River and forest ecosystems)
- **A new approach** to base riparian forest management on the assessment and use of ecosystem services
- **Creation** of a unique **model area** in commercial forests with real examples of grey alder replacement and various fellings/care

LIFE IS SALACA riparian forest works

- field data collected – vegetation
- tree stand (83 sample plots established), 32 tree and shrub species, 205 herbaceous, moss, lichen species identified
- data collection with drone





Species		Kopā %:	COUNT	Kopā%:	COUNT	Kopā %:	COUNT	*Kopā %:*	*COUNT*
Kadastrs	Nogabals	E0	E0	E1	E1	E2	E2	E3	E3
66880040017	3	3,3	5	13	22	28	4	115	4
66880040017	5	52	6	169	26	41,3	8	60	1
66880040017	18	9,2	5	59	50	42,6	12	77	5
66880040017	30	75	4	37	30	58,6	10	48	4
66720090210	5	6,2	5	25	17	40,1	7	110	7
66720090210	12	7,3	5	55	22	23,2	6	130	5
66720090210	10	9,2	5	85	21	30,1	7	81	7
66720090210	8	63	3	80	13	16	6	123	7
66720090210	7	2,1	3	156	18	4,4	6	111	7
66720090210	6	6,1	2	120	18	18,2	8	88	8
66720090210	15	10,2	5	67	33	22	3	45	3

Species	Kadastrs	66880040017	6688004001
	Nogabals	3	
	Stāvs		
Atrichum undulatum	E0	1	1
Brachythecium rutabulum	E0		
Calypogeia	E0		
Cirriphyllum piliferum	E0		
Climacium dendroides	E0		
Conocephalum conicum	E0		
Dicranum polysetum	E0		
Dicranum scoparium	E0	0,1	
Dicranum spp.	E0		
Eurhynchium angustirete	E0	2	

Kadastrs	Nog	N	E
66720080059	1	396901	529202
66720080059	4	396851	529380
66720080059	14	396868	529727
66720080059	2	396943	529186
66720080059	11	396878	529657
66720080059	13	396876	529758
66720080059	9	396880	529589
66720080059	3	396873	529243
66720080059	18	396800	529272
66720080059	15	396803	529734
66720090020	1	395971	532449
66720080021	5	396595	529899
66720080021	6	396556	529853

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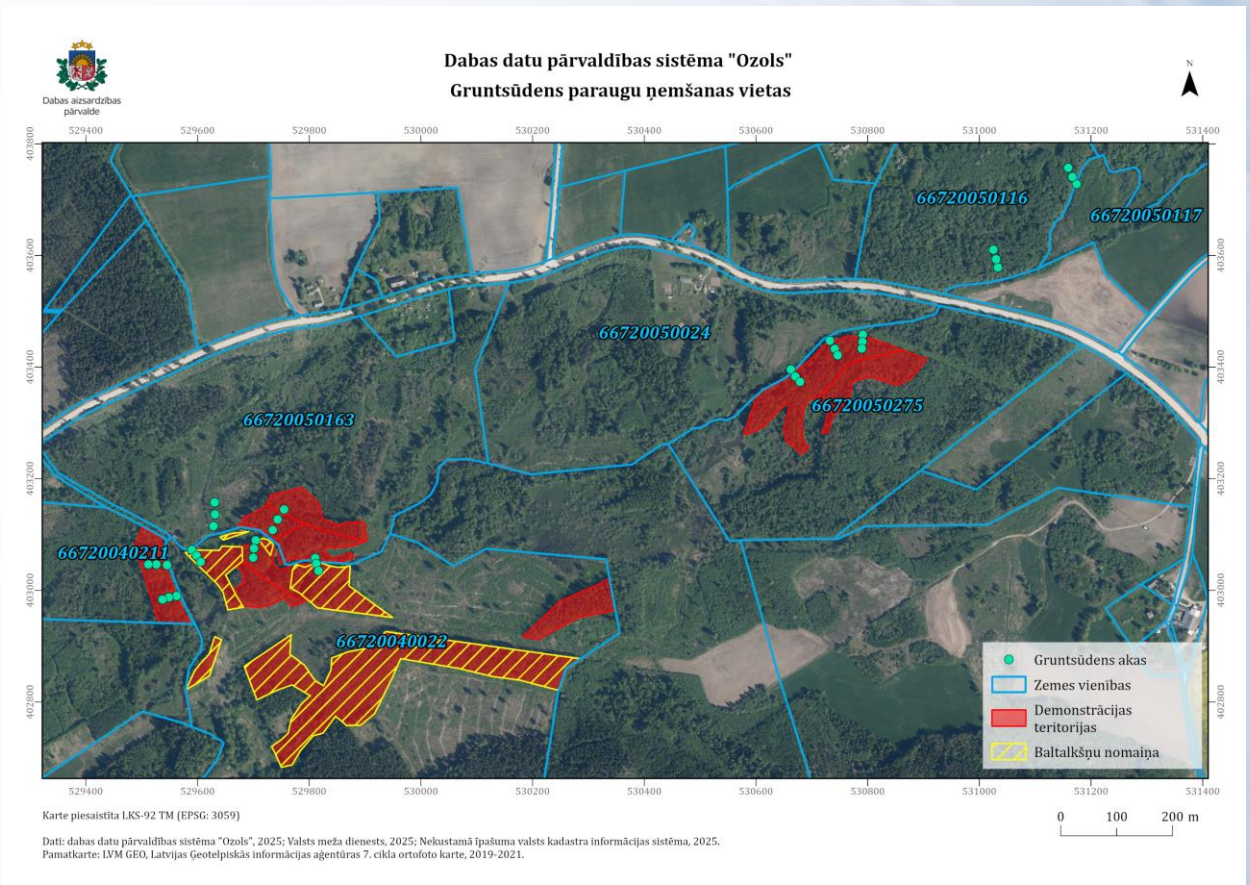
LIFE IS SALACA riparian forest works

- 36 groundwater sampling sites installed in Korģe riparian forests
- LVGMC installed 8 hydrological/chemical monitoring stations in the Svētupe sections



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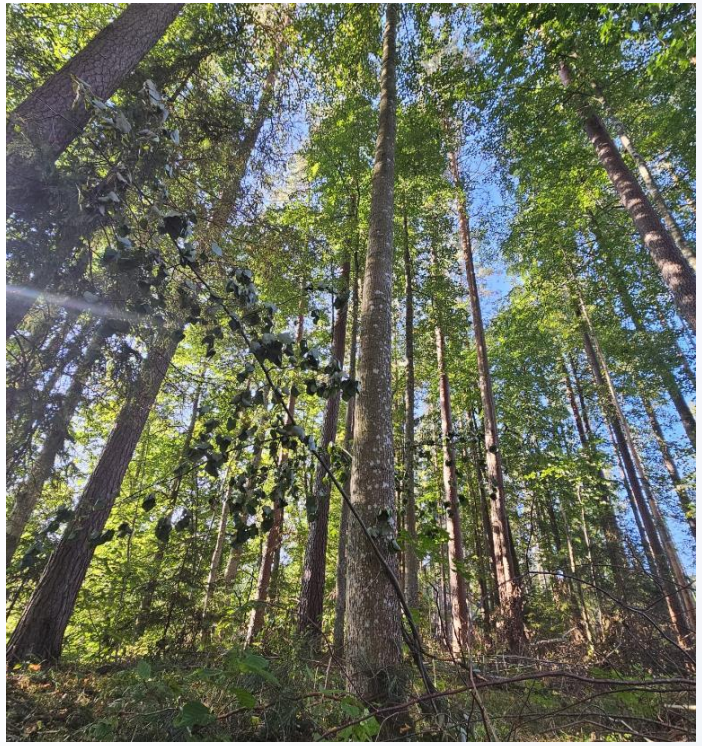
LIFE IS SALACA project experience in riparian forest forest maintenance and grey alder replacement

- Demo area 65ha for activities – 20 properties, 6 private individuals, 5 legal entities
- Change in forestry practices – preservation of the new trees, selection of trees to ensure cross-sections, other target tree species, more gentle forestry with machinery and technology



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Creating new forest

- Openings – natural or man-made
- Natural or man-made new forest
  - Generation in naturally thinned forest
  - Planting new trees in man-thinned forest
- Ideal example, man-made abandoned manor parks
  - Rich vegetation cover
  - All tree species
  - Various ages
  - Various thicknesses
  - Various ecosystem services

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Future opportunities and solutions in riparian forest management

- Using the ecosystem services approach
- IT solutions in the decision-making process
- Future scenario modeling and use in forest management
- Legislative changes - health sector solutions in Europe
- Riverside forest management practices in the management of other forests

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