

Simulating forest management in Europe applying the LPJ-GUESS management module

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Outline

1. Research questions
2. Management in three countries
3. First simulation results:
 - Modelling case study in Slovenia
 - Modelling on the European level
4. Discussion

Research questions

1. How is carbon storage influenced by different management strategies and climate change?
2. What is the effect of foreign tree species on forest stability and development (e.g. Douglas Fir)?
3. What are the best management strategies to increase forest stability and reduce damage from extreme climate events?

Comparison of forest management in 3 countries

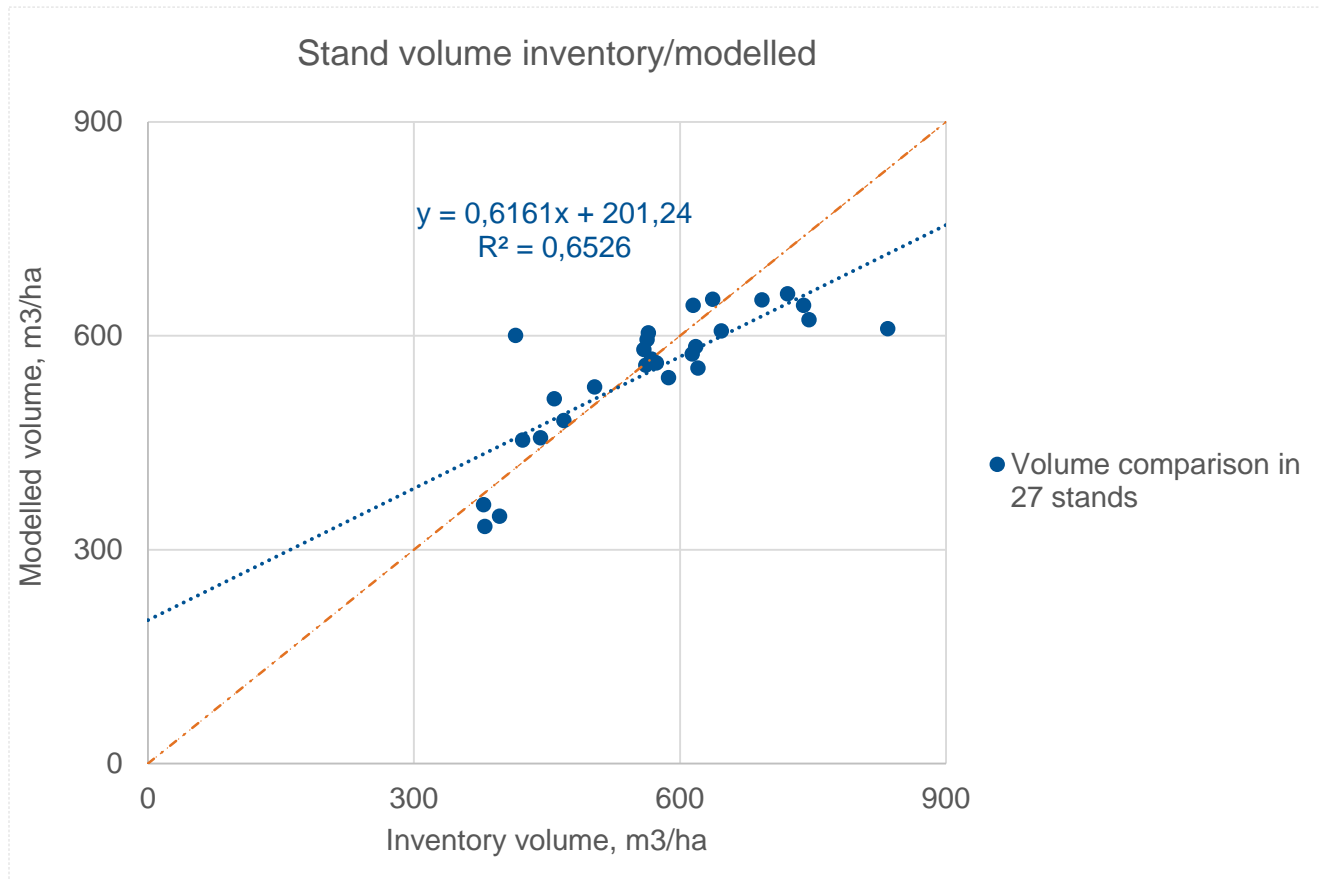
	Gemany	Sweden	Slovenia
Forest area	32% = 11.419.124 ha	60% = 28.263.000 ha	60% = 1.163.812 ha
Main management system	Crop tree management	Clear-cut with shelterwood	Single tree selection (5%) Irregular shelterwood (90 %)
Average increment	10.8 m ³ /ha	5.3 m ³ /ha	7 m ³ /ha
Harvest, % of increment	87%	66%	80 %
Type of ownship	48% privat 52% public	75% private 25% public	75 % private 25% public
Main tree species	Spruce, oak, beech, pine	Spruce, pine, beech, birch	Beech, spruce, oak, fir, pine
Main stand type	Monocultures; mixed Even age; uneven age	Monocultures Even age	Mixed Uneven age
Regeneration	85% natural	Planting/sowing Beech - natural	95% natural
Main adaptation strategies for climate change	Monocultural (spruce-) stands into mixed stands	Pure spruce stands into mixed birch-spruce	Stable structure of mixed forests Climate adapted species
Dead wood, % of growing stock	Left on the sight 6%	3%	3 %

Case study in Slovenia: mountain plateau Pokljuka; Spruce stands

- 27 pure spruce stands
- longitude 13.90
- latitude 46.20
- thinning every 10 years

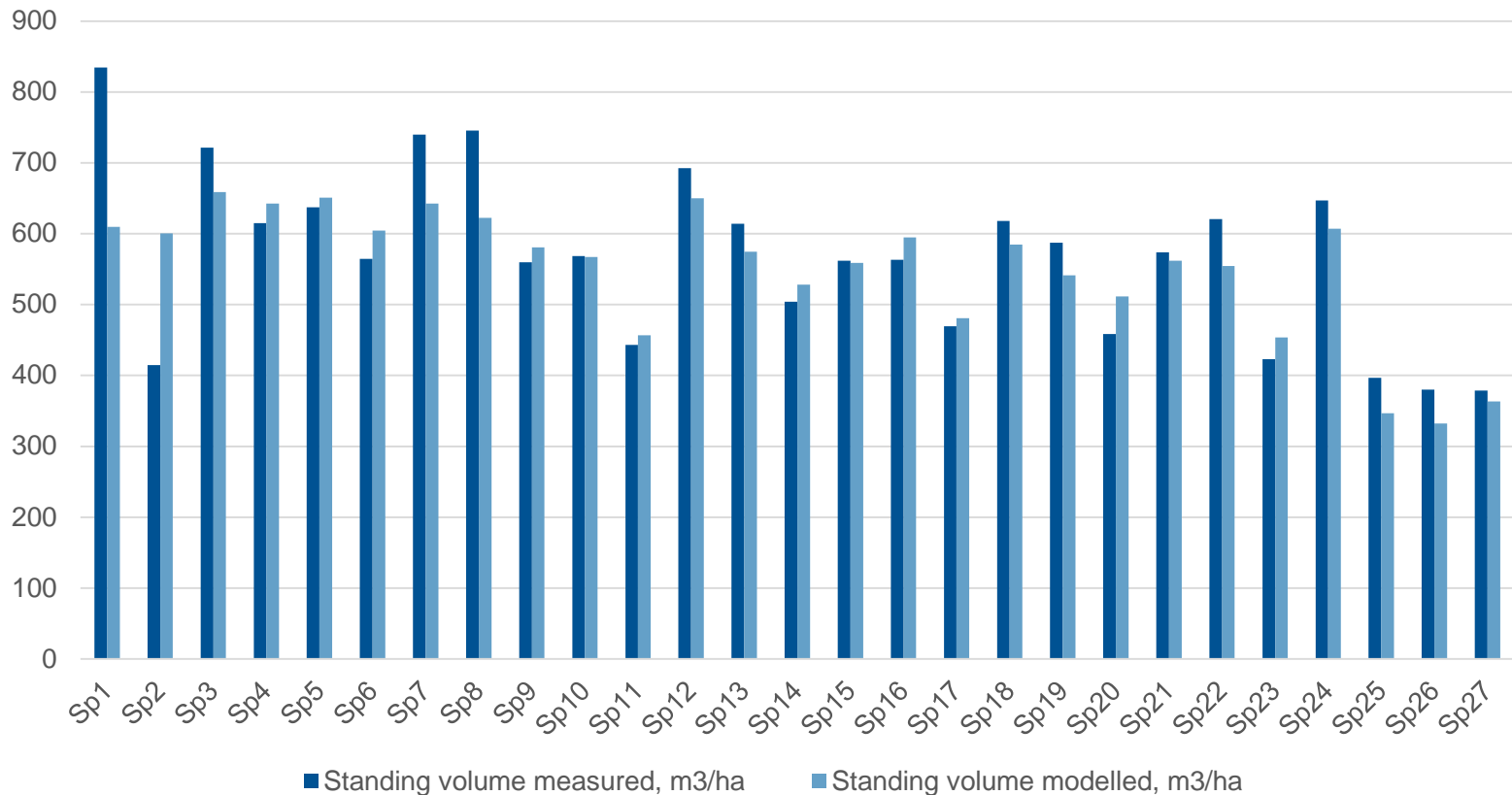
N of stand in simulation	Age2015	Volume 2015, m3/ha	Thinning every 10 years, %	Modelled volume 2015, m3/ha	% difference model/inventory	Modelled volume 2015 without thinning	% difference inventory/modelled without management
Sp1	135.71	834.55	9	609.72	-26.94	720.44	-13.67
Sp2	122.99	414.68	8	600.34	44.77	701.14	69.08
Sp3	143.49	721.59	7	658.77	-8.71	790.13	9.50
Sp4	144.31	615.12	9	642.72	4.49	792.66	28.86
Sp5	138.35	637.21	8	651.01	2.17	741.58	16.38
Sp6	108.52	564.73	4	604.22	6.99	622.66	10.26
Sp7	136.13	739.73	7	642.54	-13.14	748.70	1.21
Sp8	134.61	745.75	8	622.25	-16.56	723.32	-3.01
Sp9	117.27	559.72	9	580.73	3.75	666.61	19.10
Sp10	103.40	568.35	8	567.34	-0.18	642.99	13.13
Sp11	81.48	443.07	8	456.89	3.12	509.95	15.09
Sp12	128.20	692.75	7	650.02	-6.17	710.38	2.55
Sp13	119.04	613.87	7	574.42	-6.43	666.79	8.62
Sp14	142.58	503.90	14	528.12	4.81	768.85	52.58
Sp15	117.59	561.84	11	558.69	-0.56	666.61	18.65
Sp16	145.15	563.25	12	594.80	5.60	792.07	40.62
Sp17	115.64	469.37	17	480.97	2.47	668.32	42.39
Sp18	133.78	618.14	10	584.61	-5.42	723.77	17.09
Sp19	129.28	587.32	11	541.15	-7.86	710.79	21.02
Sp20	113.98	458.59	14	511.40	11.51	686.63	49.72
Sp21	115.34	573.60	10	561.98	-2.03	668.32	16.51
Sp22	122.80	620.49	11	554.58	-10.62	701.14	13.00
Sp23	88.48	422.90	17	453.60	7.26	953.51	125.47
Sp24	144.93	646.86	11	606.88	-6.18	792.66	22.54
Sp25	120.70	396.63	25	346.63	-12.61	688.66	73.62
Sp26	71.33	380.16	21	332.25	-12.60	451.39	18.74
Sp27	76.41	378.60	23	363.17	-4.07	480.74	26.98
Average	120.42	567.88	11.27	551.10	-1.60	695.96	26.52

Comparison between standing volume from inventory data and modelled standing volume, 27 stands in Slovenia



Comparison of standing volumes from inventory data with modelled volumes

27 pure spruce stands



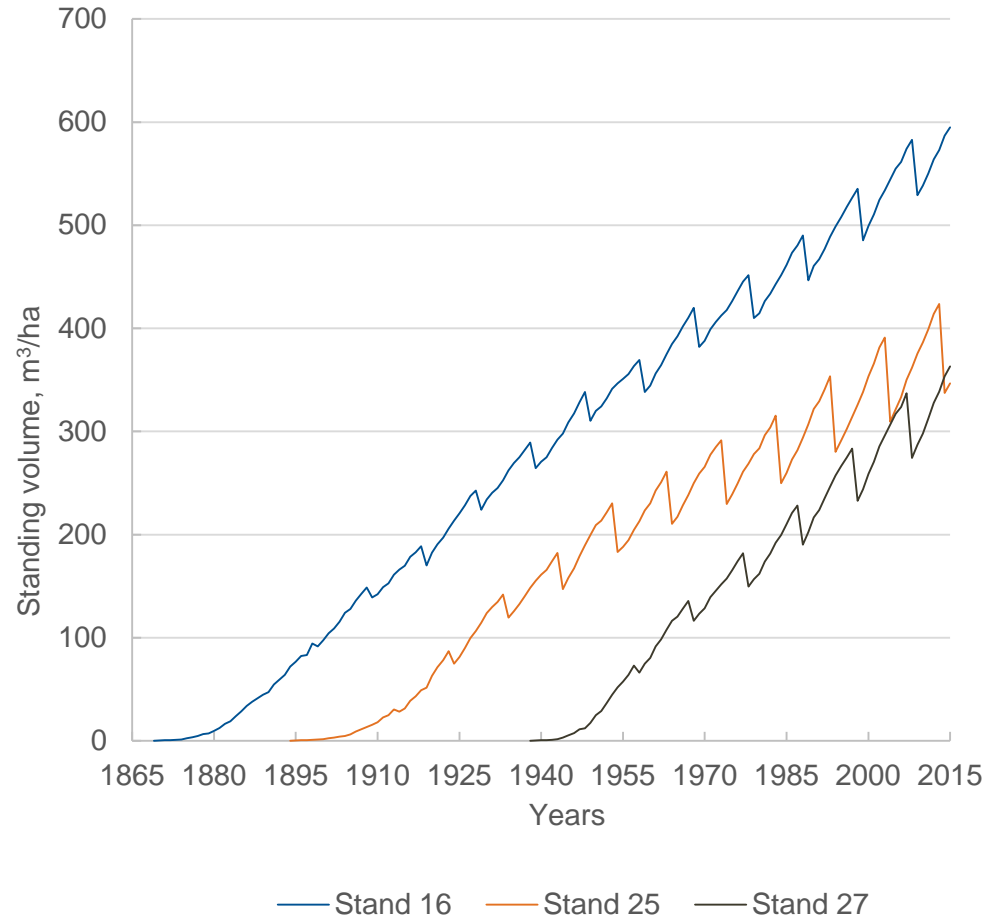
Development of the volume of 3 representative spruce stands in Slovenia

Thinning every 10 years:

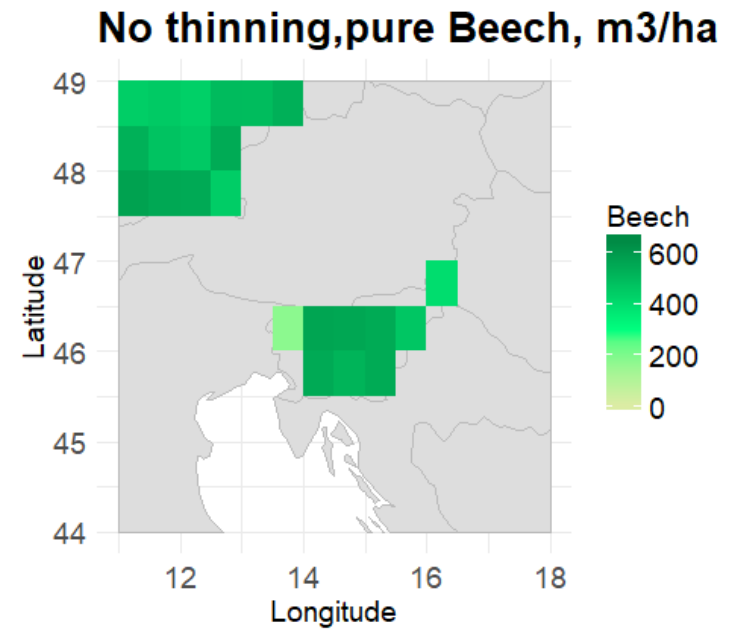
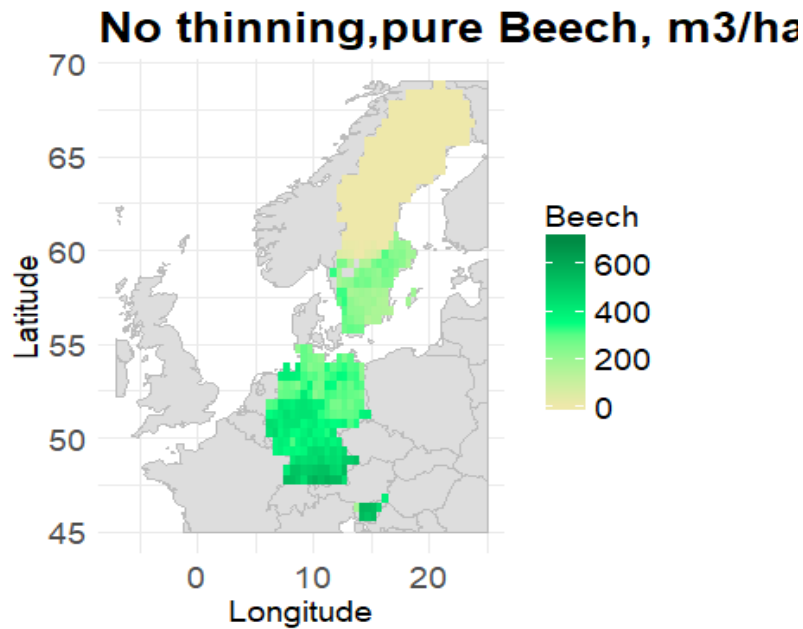
Stand 16 – age 145, 12% thinning

Stand 25 – age 120, 25% thinning

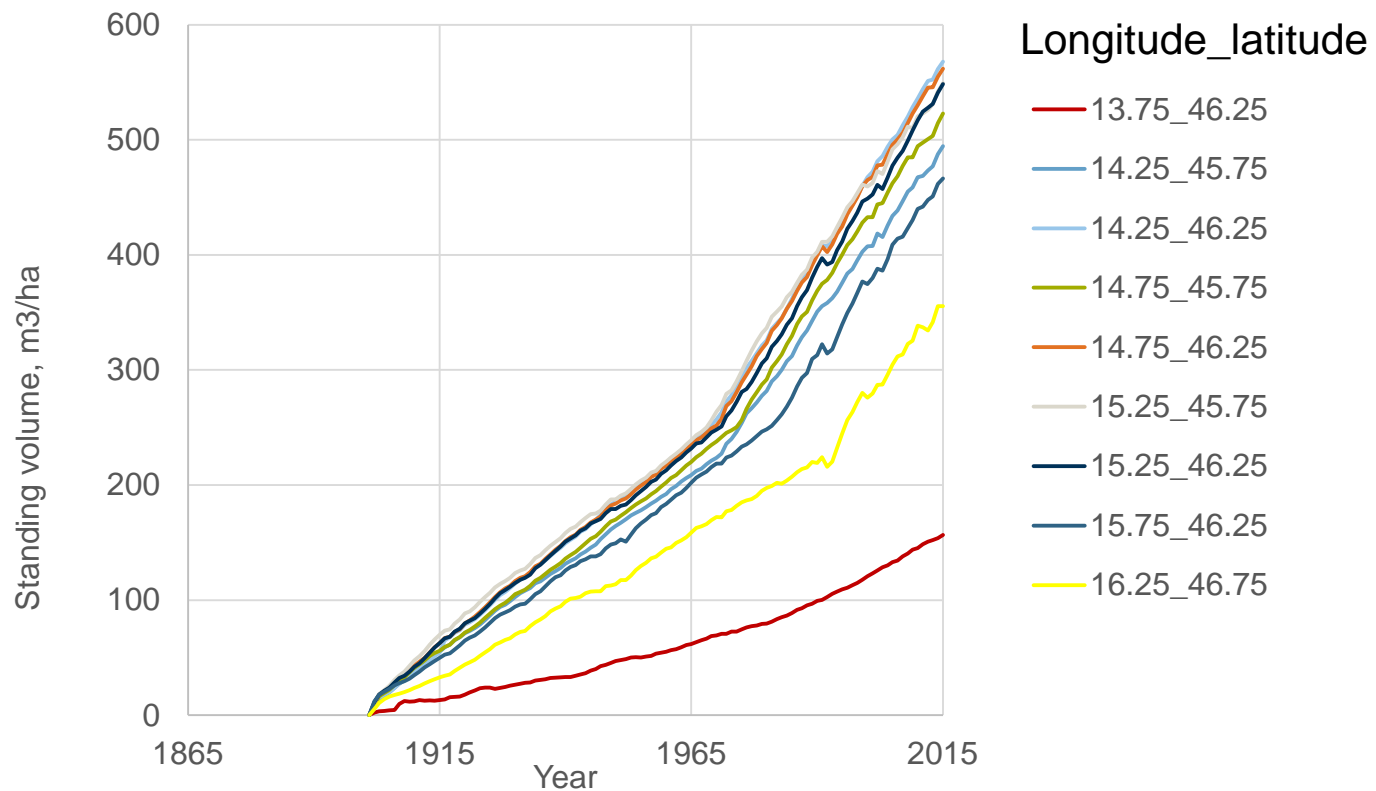
Stand 27 – age 76, 23% thinning



Testing natural range of beech, 2015, 115 years old stand



Modelled development of pure beech stands in Slovenia, 9 sets of coordinates



Summary and discussion

1. Data for further model validation
2. Adaptation strategies in Slovenia
3. Most common stands
4. Thinning types, intensities, periods

Thank you for your attention