

A Swedish regional level simulator for forest projections and analyses

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Outline of presentation

1. Background to Swedish land-use and forests
2. The regional level simulator for forest projections and analyses
3. Use of simulator in EFORWOOD
4. Conclusions



Land-Use classes

Total land area of Sweden, by land-use, 1000 ha

Land-use class	1000 -ha	Share, %
Forest (FRA 2005)	28500	69,5
- of these Forest available for wood supply	22900	55,9
Other wooded land	3400	8,3
Agriculture	3400	8,3
Other	5700	13,9
Total land area	41000	100,0





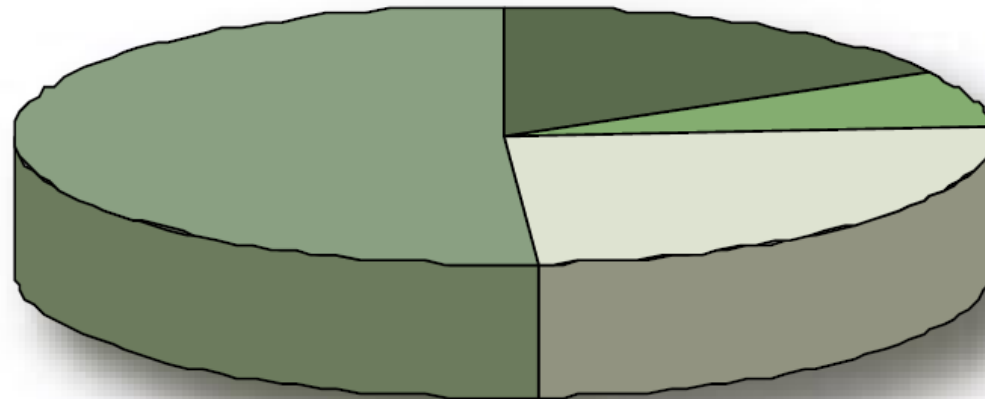
Ownership structure

The ownership structure of forest land

Private persons 51 %

State Forest 18 %

Other public 7 %



Private Company
Forest 24 %



Assumptions about land-use

- Transitions between land-use classes will be small in future as it has been historically
- Changes in forest management will or can have a large impact on the forest resource and the landscape



Current issues – questions to handle

Impact of changes in forest management on;

- Wood balance
- Biodiversity
- Forest energy
- Carbon sequestration

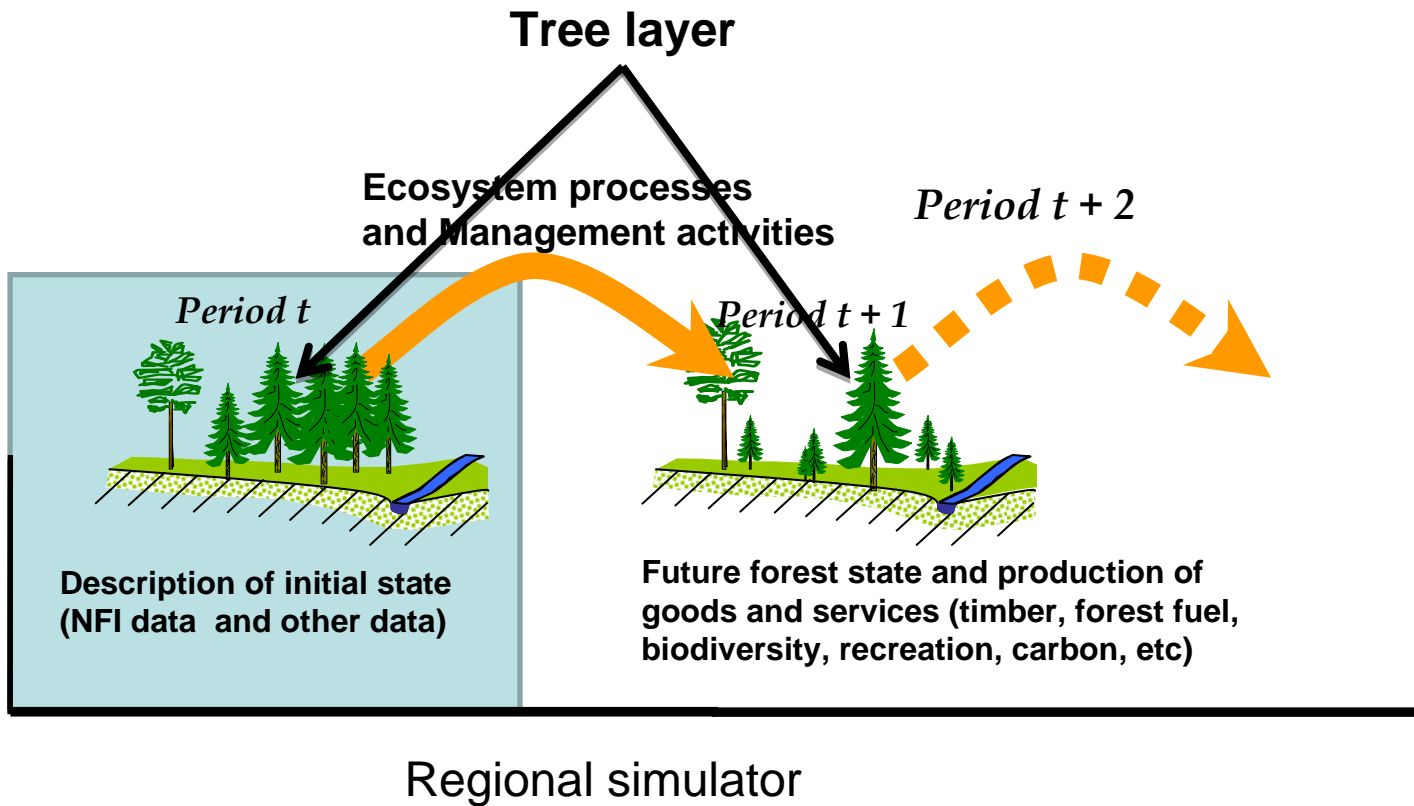
What should a regional level simulator be able to do?

- Assess impact of policy changes and changes in the use of the forest resource and impact on its **goods and services**.
- Give decision support to policy makers and users of the forest such as national and regional authorities, forest companies and forest owners associations.

Goods and services includes production of timber, bio energy, biodiversity, carbon stocks, and recreation services.



Approach



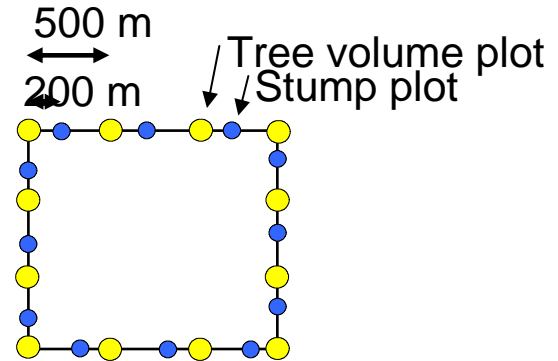
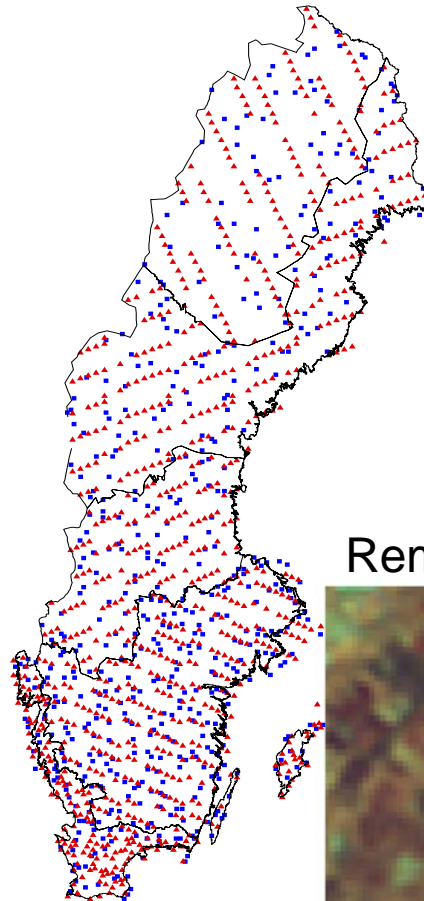


Input data

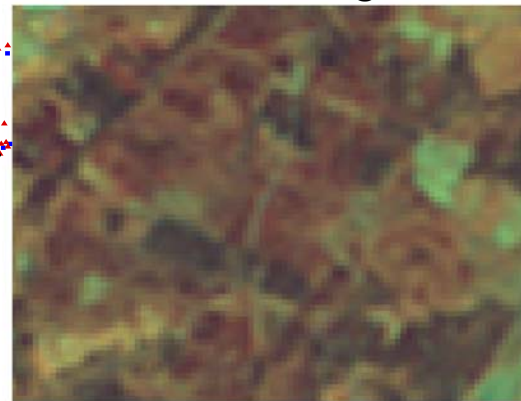
National Forest Inventory data

One years tracts
(2004)

- Temporary tracts (530 st)
- ▲ Permanent tracts (852 st)



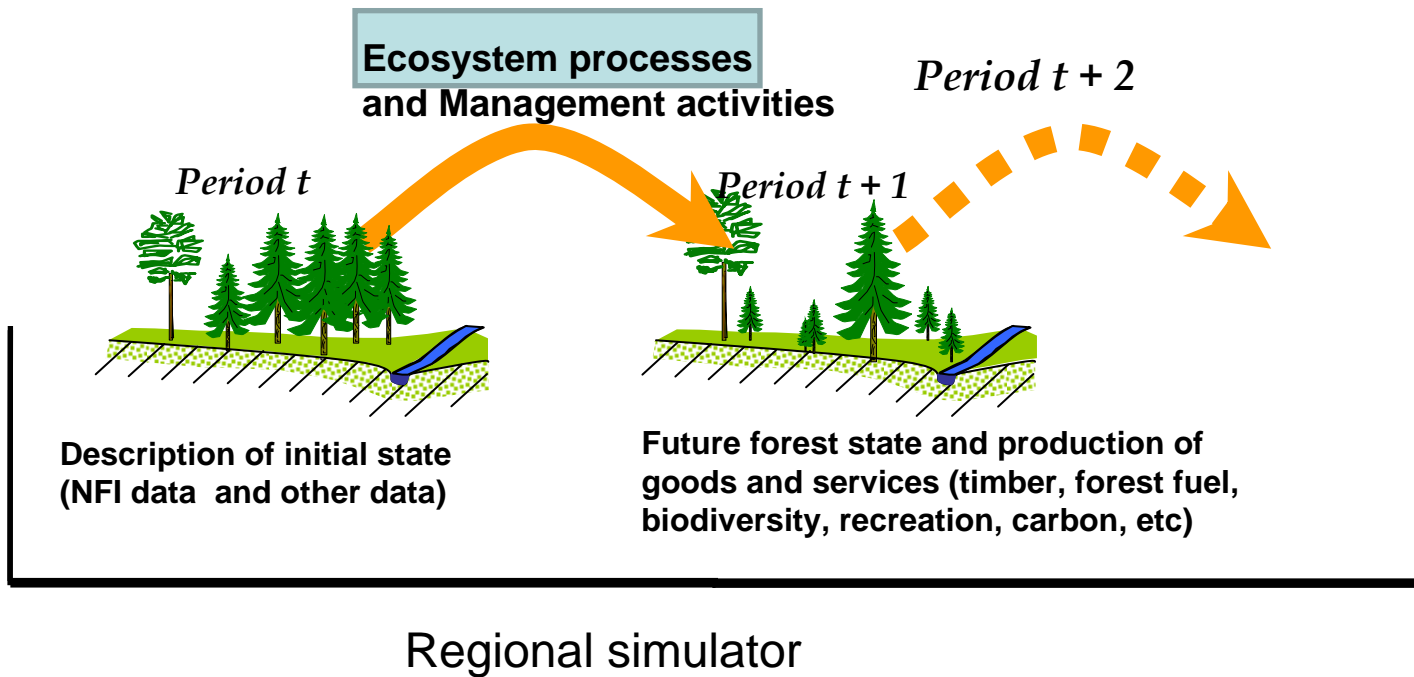
Remote sensing data



Digital map data



Approach

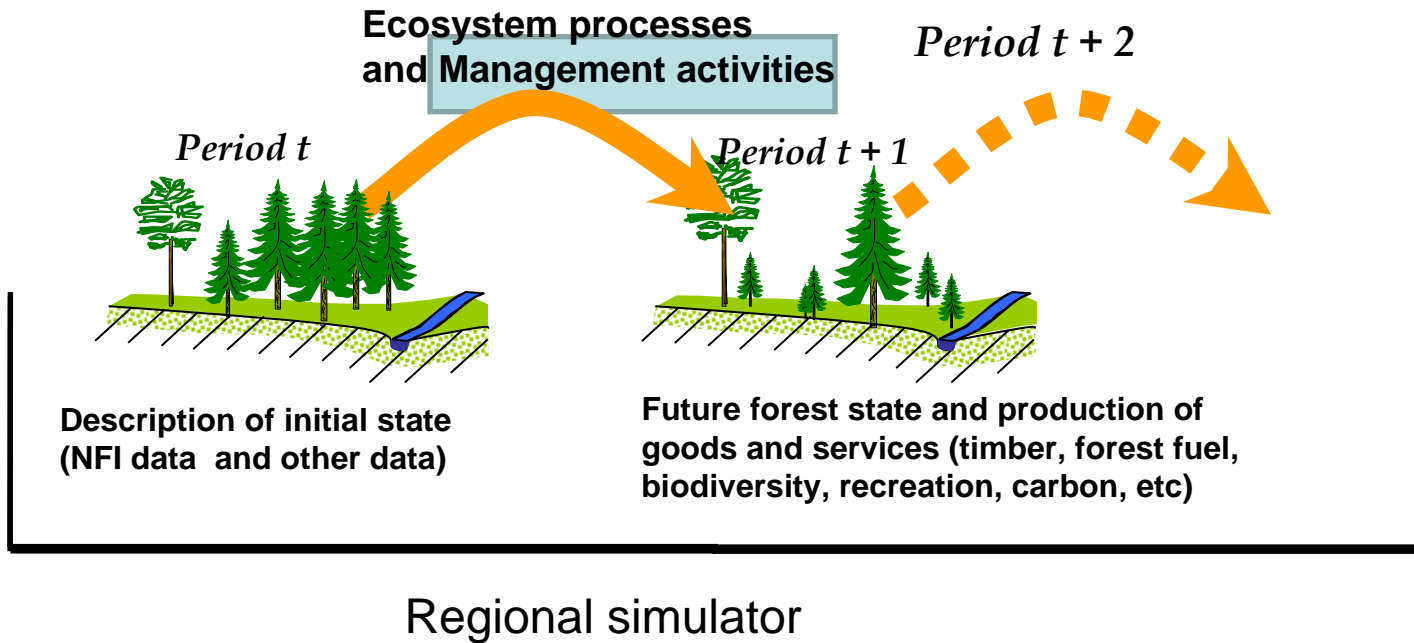


Ecosystem processes – example of models

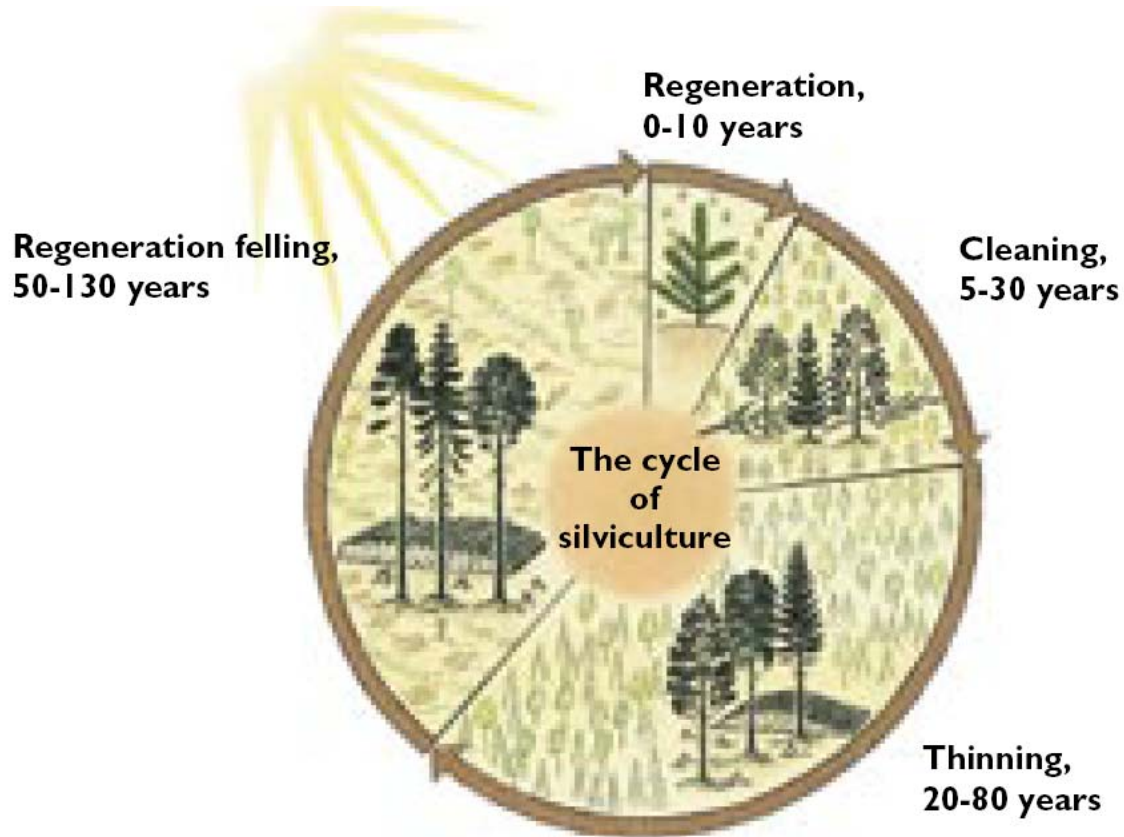
- Growth models for tree layer
- Mortality models for tree layer
- Biomass models for parts of trees as branches and roots



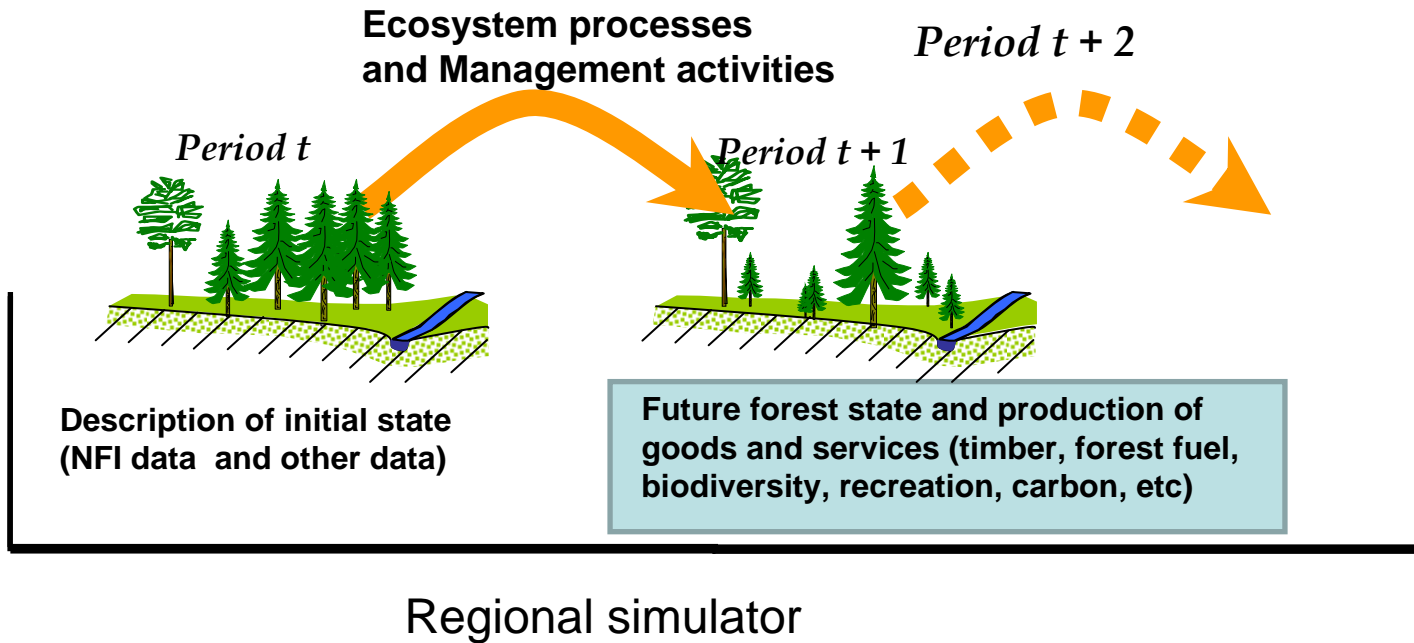
Approach



Forest Management



Approach



Output data - growth

Annual growth and natural mortality, million m3sk

Period	Pine	Spruce	Contorta	Birch	Other	Total
1 Growth	0.285	0.659	1.180	0.196	0.279	2.598
Natural mortality	0.071	0.153	0.127	0.040	0.033	0.424
Net growth	0.214	0.506	1.053	0.156	0.246	2.175
2 Growth	0.264	0.570	1.148	0.185	0.509	2.676
Natural mortality	0.045	0.133	0.082	0.043	0.066	0.371
Net growth	0.219	0.436	1.065	0.142	0.443	2.305
3 Growth	0.228	0.465	1.281	0.175	0.643	2.792
Natural mortality	0.039	0.111	0.039	0.042	0.083	0.313
Net growth	0.189	0.355	1.242	0.132	0.561	2.479
4 Growth	0.180	0.386	1.041	0.156	0.675	2.437
Natural mortality	0.036	0.098	0.017	0.035	0.107	0.293
Net growth	0.144	0.288	1.024	0.120	0.567	2.144
5 Growth	0.148	0.361	0.853	0.143	0.543	2.049
Natural mortality	0.037	0.087	0.015	0.039	0.123	0.301
Net growth	0.111	0.274	0.838	0.104	0.420	1.748





Output data – wood supply

Treatment summary

CLEAR CUT

Per	Area 1000ha	Volume		Distribution %					Mean age
		Total milj m3sk	Mean m3sk /ha	Pin	Spr	Co	Bir	Oth	
0	0.0	0.0	0.0	0	0	0	0	0	0
1	57.6	18.7	323.9	34	62	0	4	0	128
2	95.2	19.8	208.4	36	59	0	5	0	125
3	101.2	17.2	169.8	28	54	0	14	4	103
4	87.5	13.9	159.0	20	60	0	4	16	84
5	141.0	11.5	81.6	4	20	0	10	67	65

THINNING

Per	Area 1000ha	Volume		Distribution %					Mean age
		Total milj m3sk	Mean m3sk /ha	Pin	Spr	Co	Bir	Oth	
0	0.0	0.0	0.0	0	0	0	0	0	0
1	9.5	6.0	633.3	4	0	96	1	0	34
2	25.1	7.2	287.5	2	15	58	5	19	40
3	31.7	6.8	213.7	7	11	73	2	7	39
4	30.4	7.0	229.4	3	7	80	3	6	41
5	38.1	4.7	124.6	13	16	65	3	3	50

Output data - Carbon storage

Amount of carbon on forestland, million ton C

Period	Area 1000ha	All parts	Part of stem				Soil
			Stem	Branch	Needle	Stump + root	
0	556	36.3	17.6	2.9	1.4	14.3	4.3
1	556	40.0	19.3	3.3	1.6	15.7	3.8
2	556	36.1	17.3	3.1	1.4	14.2	3.9
3	556	30.0	14.2	2.8	1.2	11.8	4.0
4	556	25.1	11.7	2.5	1.0	9.9	4.0
5	556	21.3	9.8	2.3	0.9	8.4	3.9

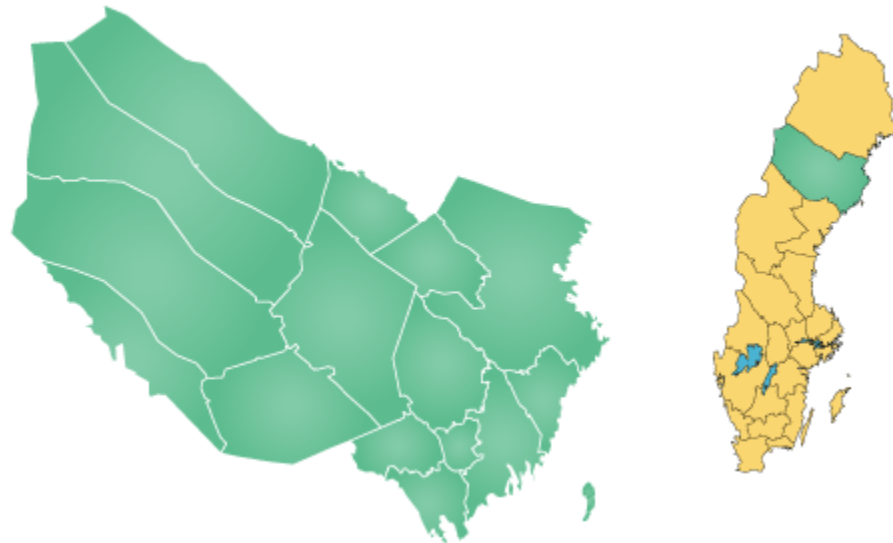




Use of simulator in EFORWOOD

A case study “Scandinavian regional case” within the EFORWOOD framework. This case is forest defined and aims to describe the network of Forestry-Wood Chains (FWC) in Västerbotten, Sweden.

FWC – Fibre , Solid Wood and Bioenergy flow



Use of simulator

- Scenarios that have an influence on Forest Management Alternatives
- Indicators for year 2015, 2025
- Indicators on forest resource, biodiversity, greenhouse gas emission and carbon stock, etc





FWC – Sawn timber

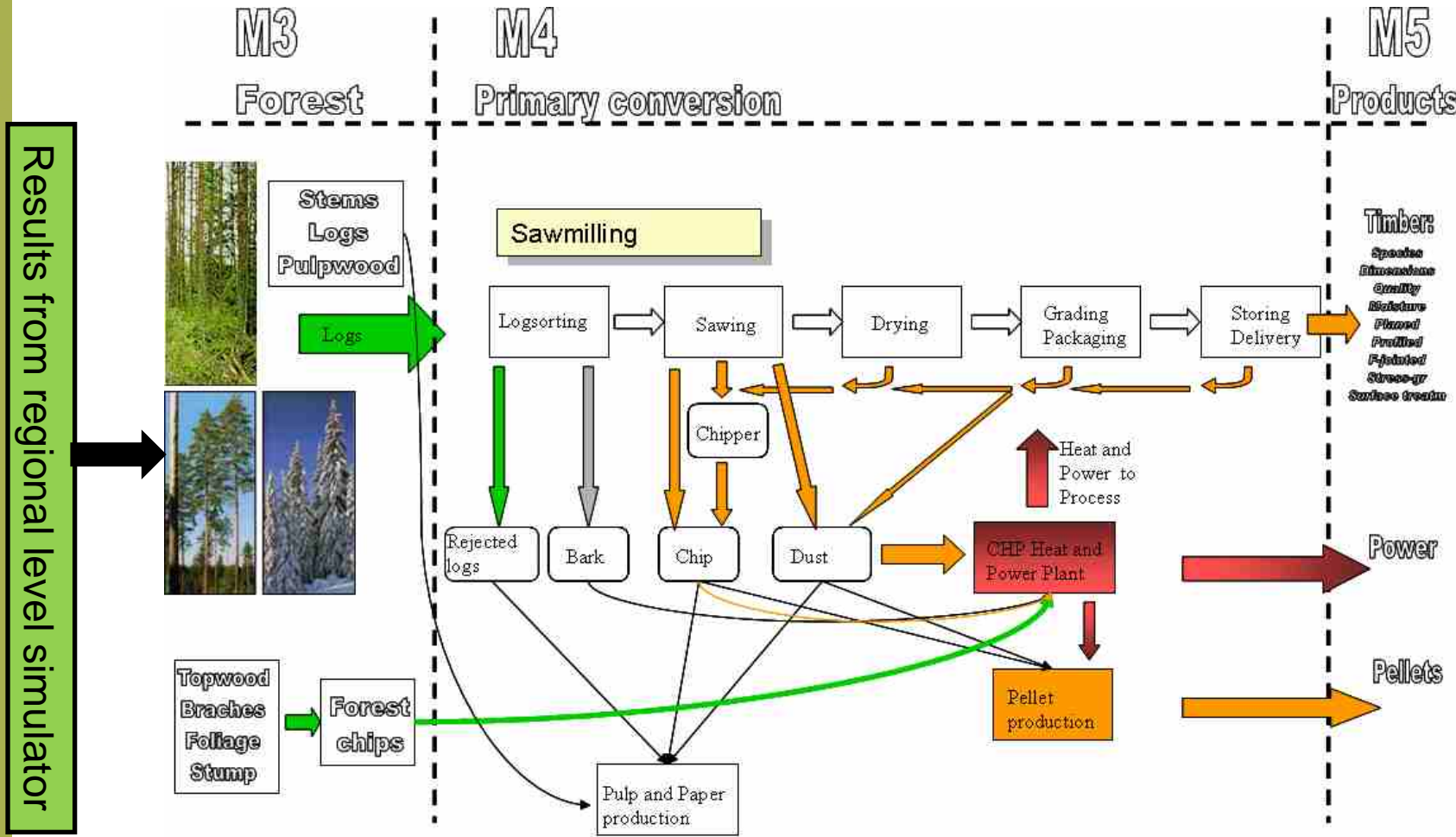
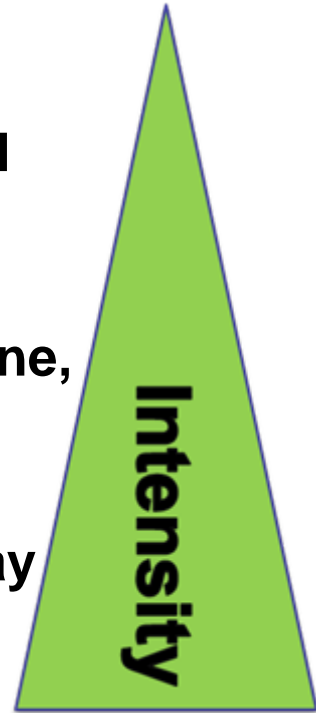


Figure 7.4 Phases in the sawmill converting stems to sawn timber.



Forest Management Alternatives (FMA)

1. Unmanaged forest reserves
2. Close-to-nature forestry managing Scots pine and Norway spruce
3. Combined objective forests managing of Scots pine, Norway spruce, birch and mixed species forests
4. Intensive even-aged forestry of Scots pine, Norway spruce and mixed stands



Conclusions

- It can support analyses of FMA changes and its impact on goods and services
- Projections of the tree-layer make up a core part of the regional level forest simulator



Thank you for
your attention!

