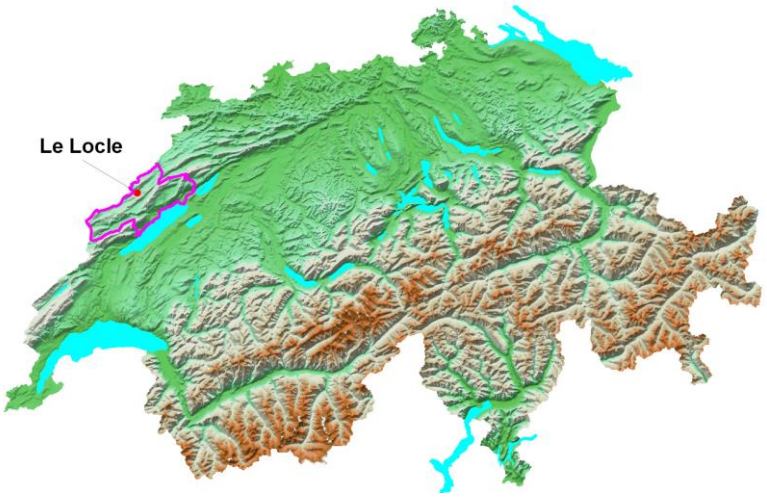
PRO SILVA HELVETICA

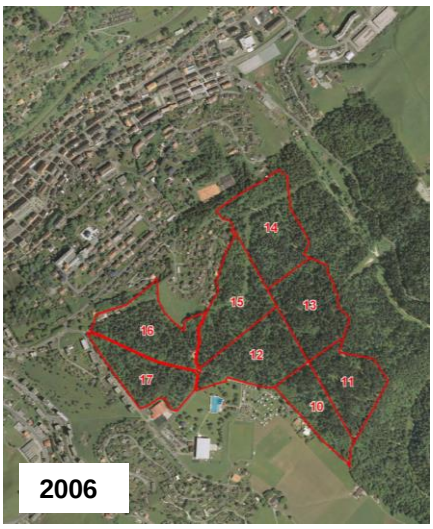
Portrait of the plenter forest “La Joux Pélichet”, Le Locle / NE

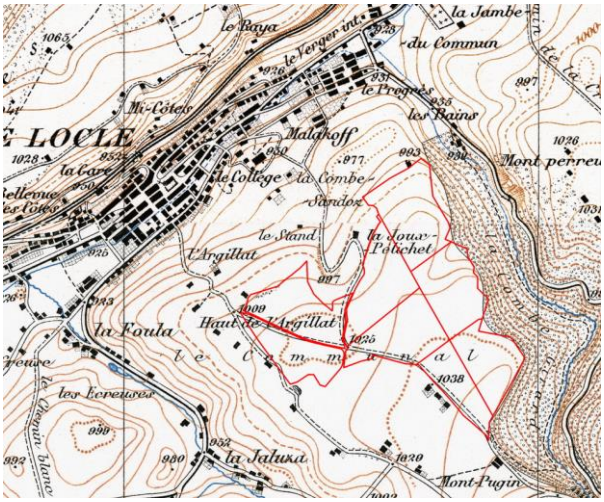
Forest road, which divides the forest of Joux Pélichet lengthwise. On the left, Division 12, on the right, Division 13, April 2011.

La Joux Pélichet is a **planted forest** created during the period **1899–1923** on a wooded pasture (in German: Wytweide), which was cleared five centuries ago. **Nature and forest management have, over the years created a plenter structure**. Natural factors and periodic silvicultural interventions will shape the further development of this special forest structure. This extraordinary forest has many advantages for society and represents a successful, stimulating and instructive example of well-applied silviculture.

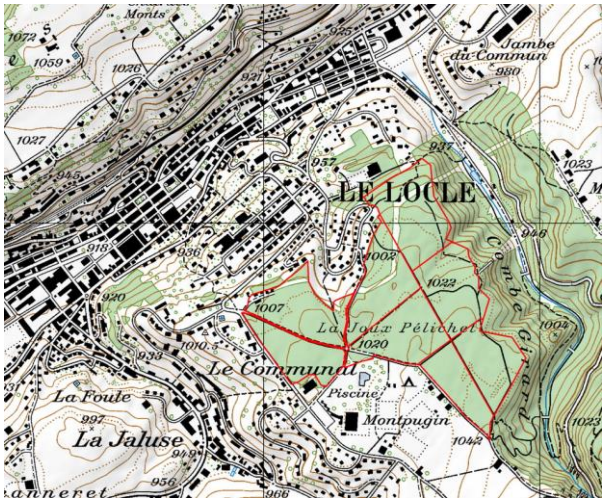
Situation







Siegfried map, 1871–1891. © swisstopo, Wabern.



Topographic map 1:25'000, **2005**. © swisstopo, Wabern.

Historical background

"Joux" means forest. "Pélichet" originates from the Old French word "Pelous" (= hairy). Thus the local name "Joux Pélichet" could mean something like **"forest with a short, dense lawn"**.

The name "Joux Pélichet" appeared for the first time in a document in **1382**: Jehan III of Aarberg, the Lord of Valangin, allowed the forest to be cleared to create commonly owned grazing land for the people of Le Locle. By the 16th century, the whole area had been completely cleared. In **1872** the council of Le Locle decided to build a shed for 60 cows. This construction was completed in 1873 and initially managed directly by the municipality, and then leased until 1 October 1898, when a fire completely destroyed the farm. It was decided not to reconstruct it but to pursue a far-sighted project, namely the afforestation of the whole of the 50-hectare area. The town of Le Locle was, however, flooded several times during this period. In addition, the springs in "Combe Girard" were sometimes contaminated by the manure spread in La Joux Pélichet.

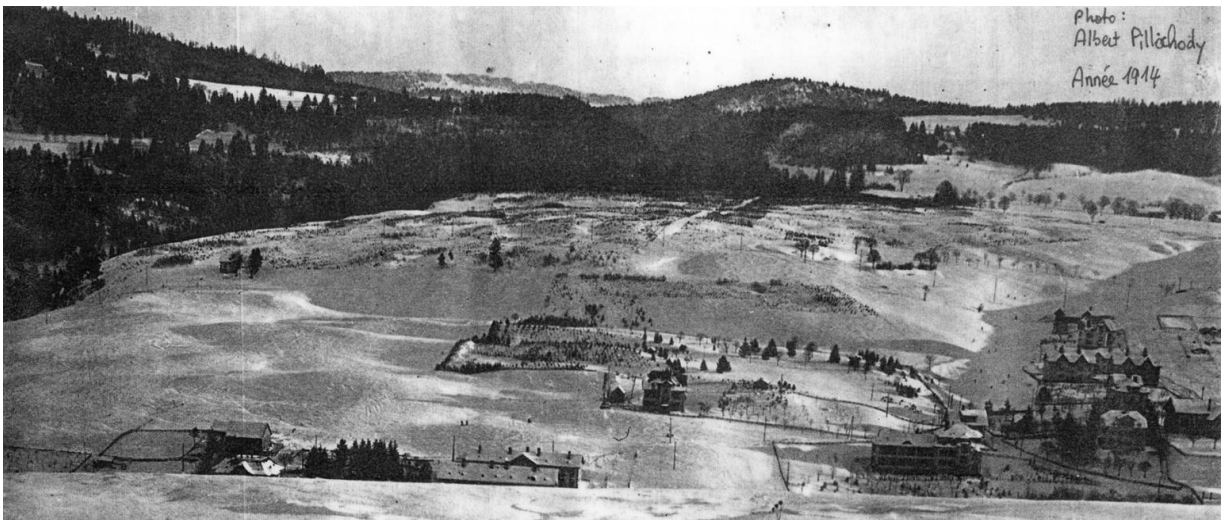
In 1899 the city authorities of Le Locle decided to reforest the whole of La Joux Pélichet with the help of the forestry expert Albert Pillichody and the financial assistance of the federal and cantonal authorities. Albert Pillichody specified the goal of this far-sighted project in his report to the authorities: *"The planned afforestation aims to create a new forest. The afforestation area today consists of meadows where there is no natural regeneration. Afforestation will help to protect the town of Le Locle from floods, clear the springs and regulate their discharge rate. The force of the cold winds that blow now freely over the treeless sides of the valley will be reduced by the new forest cover, which will benefit the local climate of the valley. Moreover, the afforestation will increase the currently insufficient forest cover of the region."* * The planting began in **1900** and continued until **1923.**

La Combe Girard and la Joux Pélichet in the year 1901. Photo Albert Pillichody.

Introduced plants -- still present		1900–1923	1989	2009
Norway spruce	Picea abies	141'340	5'203	3'511
Silver fir	Abies alba	24'070	644	938
Weymouth pine	Pinus strobus	43'485	90	31
Mountain pine	Pinus montana	41'975	45	11
Scots pine	Pinus sylvestris	1'900	64	23
Black pine (A)	Pinus nigra	1'300	-	-
European larch	Larix decidua	900	-	-
Stone pine	Pinus cembra	1'100	-	2
Douglas fir	Pseudotsuga menziesii	1'500	23	31
Sitka spruce	Picea sitchensis	2'300	-	-
	Total coniferous (58%)	**259'870**	**6'069**	**4'547**
Beech	Fagus silvatica	56'490	298	268
Sycamore	Acer pseudoplatanus	19'300	1'013	1'175
Ash	Fraxinus excelsior	23'954	1'151	1'146
White alder	Alnus incana	70'650	183	42
European white birch	Betula verrucosa	6'000	2	2
Hawthorn	Crataegus sp.	11'950	n.a.	Div blv:113
	Total broadleaves (42%)	**188'344**	**2'647**	**2'746**
	Total (100%)	**448'214**	**8'716**	**7'293**

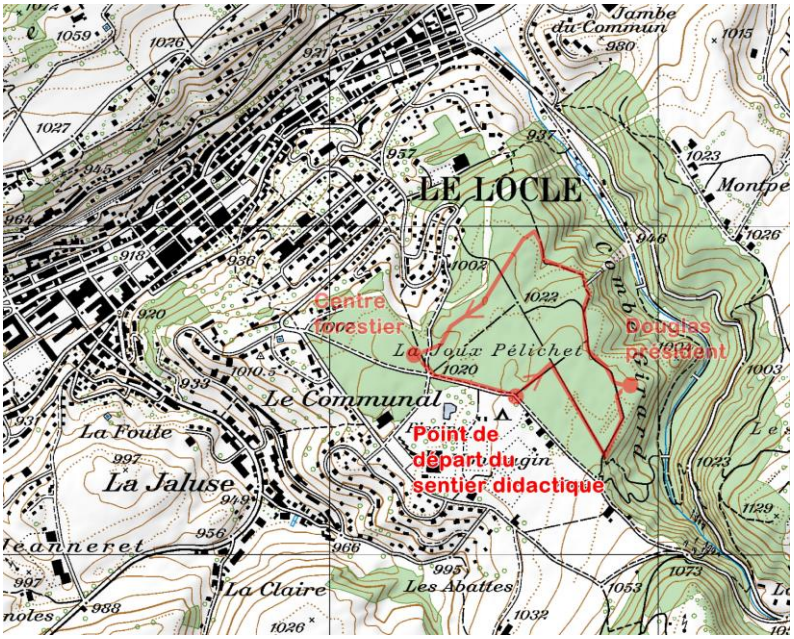
From Pillichody's report (1899) it is clear that *a **structured mixed forest was planned*** from the beginning:

*"The diversity of the tree species prevents an overly great uniformity and takes into account the site's characteristics (soil, aspect). The tree species mixture is adapted, containing many broadleaves, and should quickly transform today's meadows with their mats of grass into a permeable forest soil rich in humus." **



La Joux Pélichet in the year 1914. Photo: Albert Pillichody.

Site description



Coordinates	548'500 / 211'700
Town	Le Locle / NE
Area	42.20 ha (8 Divisions)
Altitude m a.s.l.	990 - 1040 m
Aspect	North – Northwest
Precipitation	1400 mm/year
Mean temperature	6,7°C
Vegetation period	approx. 5 months
Slope	Slightly inclined
Plant community	Beech-fir forest [Abieti-Fagetum]
Geology	**Divisions 10-13**: limestone from the cretaceous period + upper Jura, fairly fertile. Divisions **14-17**: Subsoil chalk, very permeable (dead stone) low site index
Soil	Cambisol, very varied layer thickness (70 cm to the south, 20 cm to the north)

"The Forest Welcomes You" is how the title of a booklet (in French only), published by the advertising and cultural office of the town of Le Locle, translates. (http://www.lelocle.ch/Promotion/Sentier_nature/Sentier_nature.asp). It is available free of charge in Le Locle's town hall. A nature trail leads through the forests of "Joux Pélichet" and "Combe Girard". Information boards have been set up by the Forest Service and draw particular attention to the valuable contributions of the forest's ecosystem. The tour outlined above on the "Joux Pélichet" plain is just one part of the nature trail. It invites you to take an easy stroll through the reforestation started last century, which has now become a plenter forest.

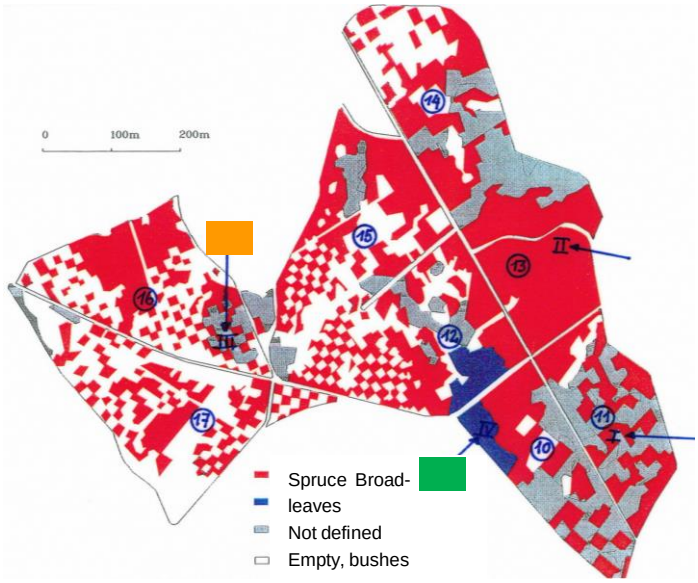
From planting to the plenter forest

The first plantings were carried out extensively in the years 1901 to 1907 (close plant spacing = 1.2 m x 1.2 m; medium plant spacing = 1.2 x 1.5 m; wider plant spacing = 1.5 x 1.5 m). They started in Division No. 10 then proceeded to the northwest in Divisions 11 and 13. Between 1908 and 1923, a further afforestation was carried out in a patchwork pattern: i.e. plots were staked out with edge lengths between 12.5 and 19 m. Every second field was planted with spruce. This structure can be clearly traced on the aerial photograph from 1934 (see next page). The remaining fields were left partially empty or planted with hardwoods or Weymouth pines.

Several tree species did not thrive, especially the Weymouth pine, which suffered from blister rust (*Cronartium ribicola*). The Swiss stone pine and the Scots pine also suffered due to snow pressure. Some spruce trees were affected by root and stem rot. This created holes where, with time, naturally regenerated broadleaves (ash and sycamore). This process has contributed to the diversity of the stand structure.

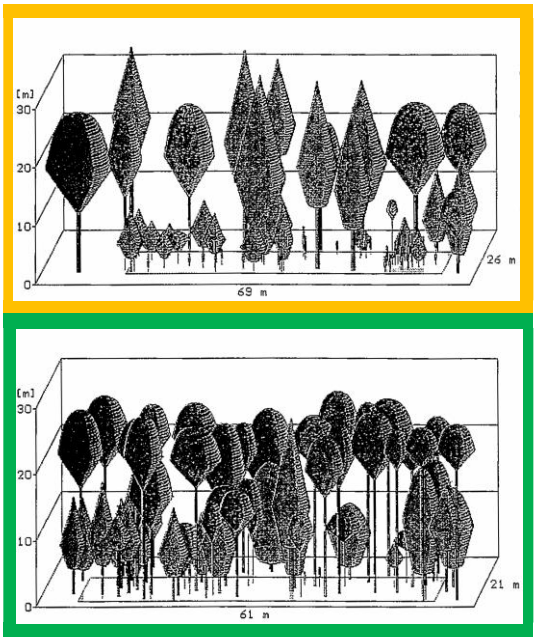
The diploma theses of Robert Jenni (ETHZ 1991) and Matthias Schmidt (University of Göttingen, 1995) revealed that having some broadleaves promotes the natural regeneration of spruce and fir in any case. In addition, such mixed stands have a greater tendency to diversify and to form a layered structure than closed coniferous stands. It follows from this work that spruce germinate better under a canopy of broadleaves, while fir does better under spruce. A relatively loose canopy promotes natural regeneration. Matthias Schmidt thinks that the critical threshold for successful regeneration can be reached with a standing volume of 550 m^3/ha.

Aerial photograph of Joux Pélichet in the year 1934.



Reconstruction of the original planting scheme in Joux Pélichet on the basis of the aerial photograph 1934.

Matthias Schmidt distinguished four structural types (see 2 figures on the right) and described them in his diploma thesis (1995).



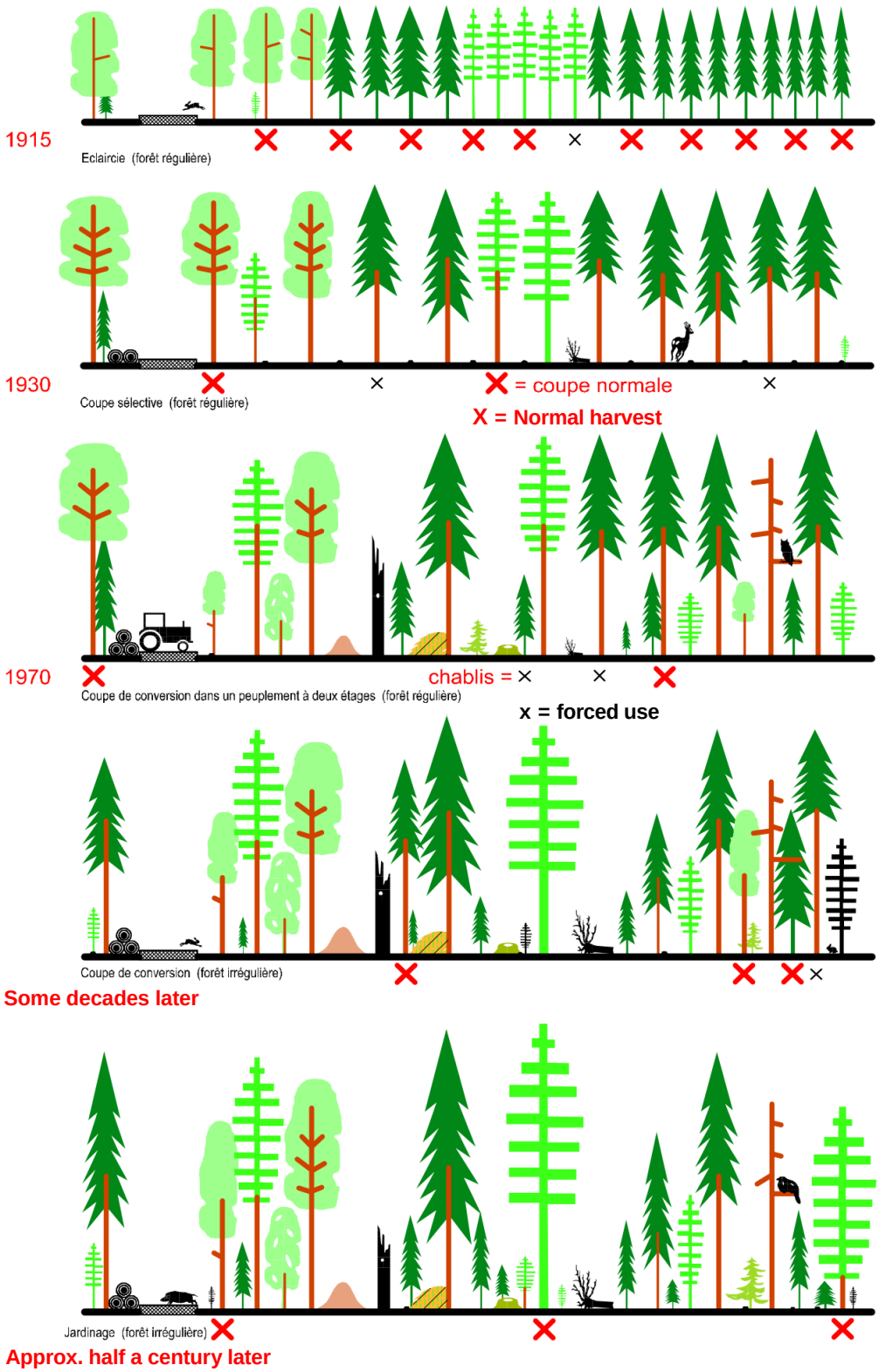
Top: structural type III (uneven-sized with a predominance of conifers).

Bottom: structural type IV (uneven-sized with a predominance of broadleaves).

La Joux Pélichet, a classic example

A transformation thinning (plenter thinning) tends to convert a single-layered stand into a richly textured and diverse mixed forest. These interventions are needed to repeatedly break the existing regularity of the stand. The procedure is illustrated in the schematic diagram below, which is based on the Joux Pélichet.

An example of plenter thinning in La Joux Pélichet



"Principes sylviculturaux" du canton de Neuchâtel, 2001. Translated excerpt from Addendum 5 (French)

What is a plenter forest?

To describe a plenter forest, you should first check that it is still alive and developing, which is what distinguishes it from uniform age-class forests. It is structured heterogeneously and is mixed. Its growing stock does not change noticeably in either space or time. The whole above-ground level space is filled with leaves (chlorophyll). The regeneration process is permanent and all development stages are unified in time and space. You can find all ages, or rather all sizes, of trees within a small area, from the tiniest seedling to giant trees. The age does not really matter anymore.

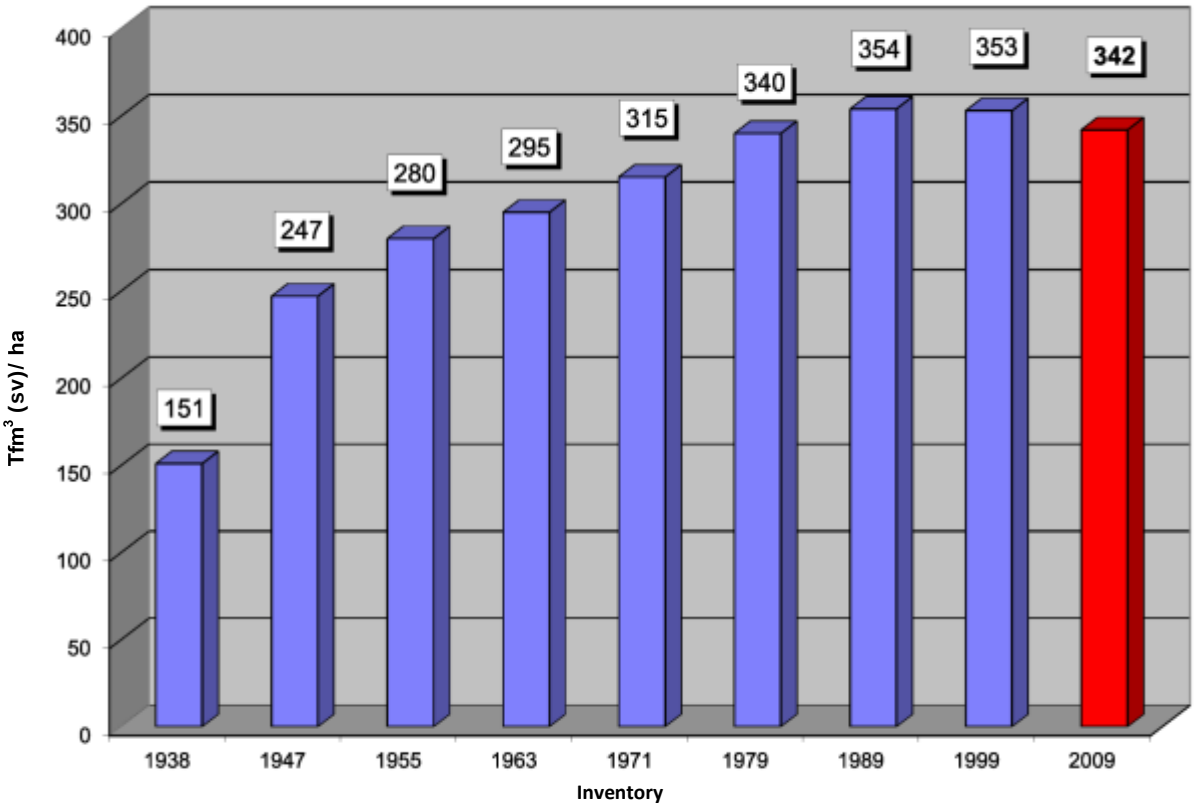
Definition based on the work of Henry Biolley and Walter Ammon.

Characteristic cross section (top) through a plenter forest and view from above (bottom)
(based on Jean-Philippe Schütz, 1997).

A plenter forest is the result of moderate management interventions in the forest ecosystem. It represents a **dynamic equilibrium,** where small areas are constantly performing to **a maximum**. This applies to economic as well as other aspects, such as conservation, biodiversity, recreation and landscape.

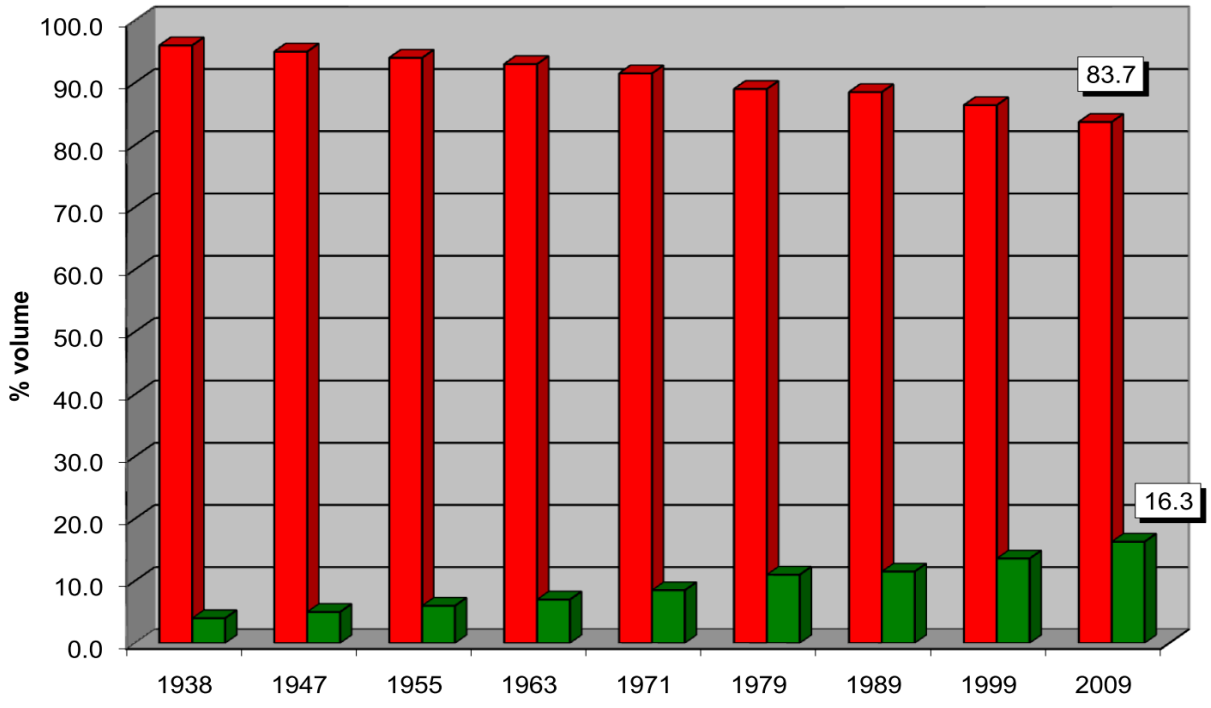
- The forest is made up of a welcoming mixture of native tree species.
- It is like a kind of family, where the individual members have all shapes and sizes, and live close to each other.
- It naturally regenerates constantly in a spatially widely dispersed way.
- It performs various protection functions efficiently such as conserving the soil, regulating the water, improving air quality and conserving biodiversity.
- It continuously produces an optimum volume of quality wood for harvesting. Investments in tending are low as the emphasis is on promoting automatic biological processes.

Development of the forest La Joux Pélichet

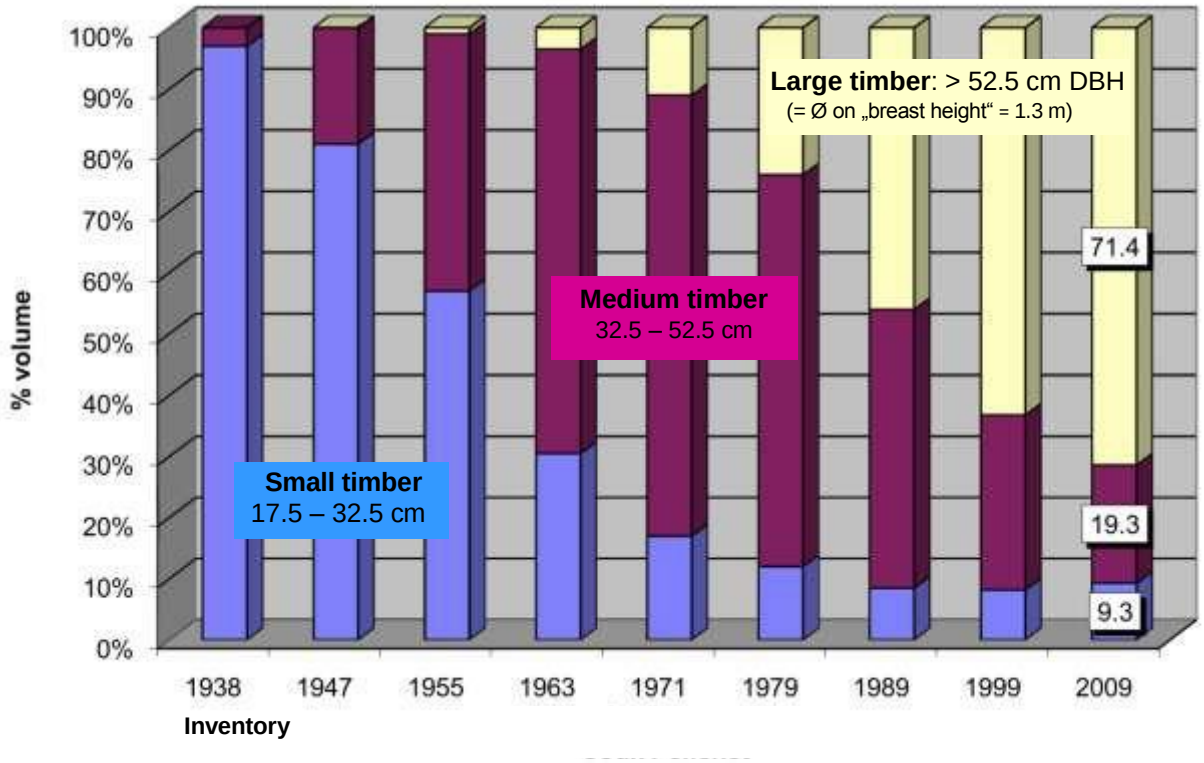


Development 1938 – 2009 of the growing stock in m^3/ha [2].

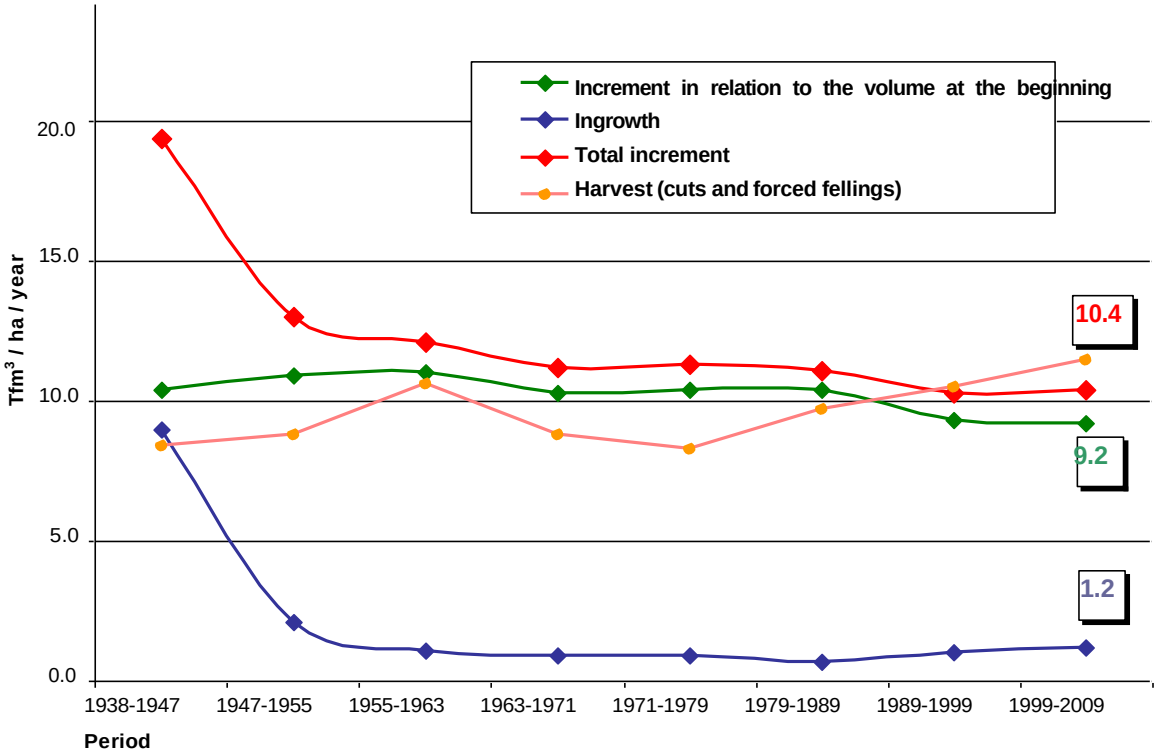
1938 the first inventory was carried out in Joux Pélichet using a tried and tested control method [3]. Further inventories followed in the years 1947, 1955, 1963, 1971, 1979, 1989, 1999 and 2009. All these data reflect the impressive development of this forest.



Development of the proportional volumes of conifers (red) and broadleaves (green).



Development of the diameter classes: (sBigmall – medium – large timber).



Development of the increment and the harvests (planned harvest and forced felling [4]).

In the period 1938–2008 (71 years), the average increment was at 11.9 Tfm³/ha/year.

In La Joux Pélichet over the years 1938–2008, the 29,376 Tfm³ harvested were not really noticeable. It corresponds to **twice the growing stock of 2009,** (14,422 Tfm³), **but the soil was never exposed to direct sunlight** and the forest's appearance and climate did not change.

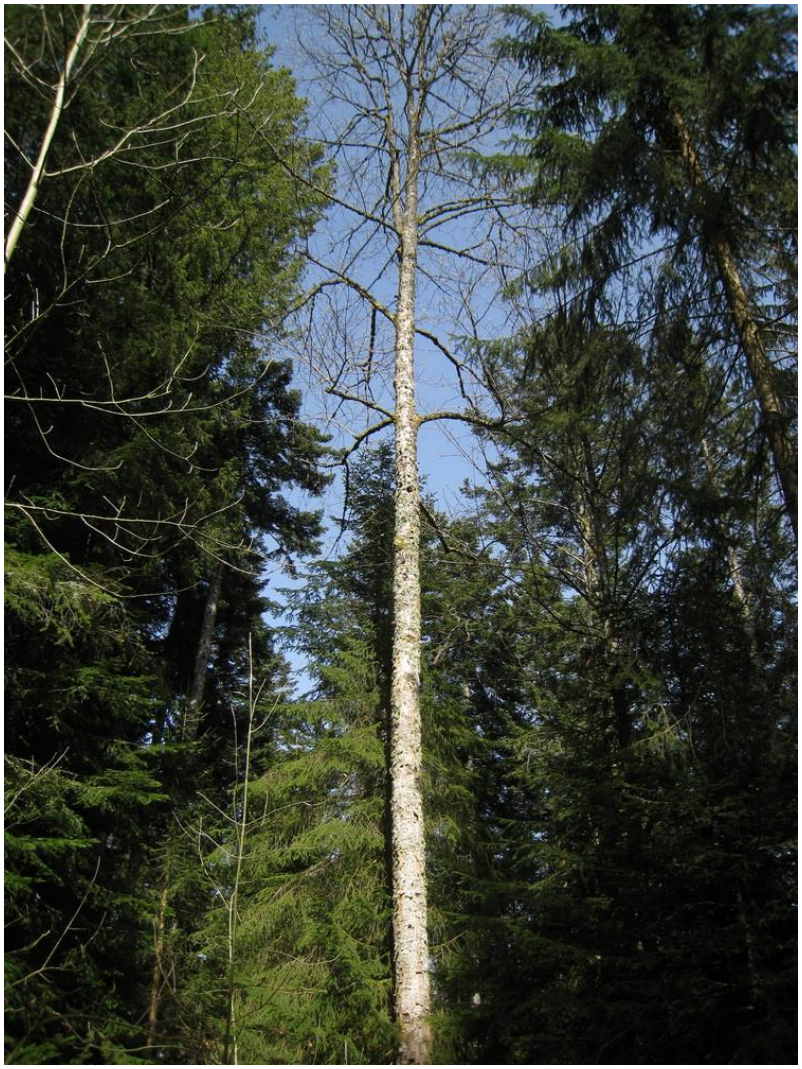
Silvicultural aim

"Forests generally have a multifunctional role. This also applies to the forests of the town of Le Locle, which are managed in such a way that they can fulfill their protection, production and recreation functions sustainably, and at the same time maintain the biodiversity." * This statement, from the operational plan 2002 of the community forests of Le Locle, shows the plan's main focus, with more detailed operational objectives specified as:

*Planted stands and those in the process of conversion will be thinned, partly with the aim to promote diversity. Particular attention will be paid to a finely adjusted mixture of tree species. In the regeneration stage, qualitatively less numerous conifers should now be promoted over the broadleaves by creating moderate light with small but numerous light wells in the crown area. If necessary, the ingrowth dynamic can be increased through more drastic interventions and the production of more light. **

Today, no plants are artificially introduced into Joux Pélichet on principle. Natural regeneration stems from the seeds of surrounding trees or from seeds spread by birds or other animals.

Generally, the owner of a plenter forest pursues the goal of producing a multi-layered mixed forest with conifers and broadleaved trees, where the public have access to the best possible recreation and a high level of protection is provided. Plentering also increases the quality and yield of the drinking water springs in the area. Managing the forest in this way also contributes to the local economy.



A varied, pleasant and attractive forest full of life …

…and good quality timber.

An outstanding sycamore: with increasing volume, it will become much more economically valuable.

Joux Pélichet, Division 11, April 2011.

Tree marking is important

Trees selected for felling by the forest workers are marked. This is not done just for timber harvesting, but also takes into account the functions of the forest as a whole, with its soil, flora, fauna and climate, as a biological production system and as the keeper of many ideal values. The silvicultural decision to remove a tree is based on various criteria: Harvesting, forest structure, mixture regulation and health. In a plenter forest, it is important to regulate the light on the ground sensitively so that regeneration can take place, even if it is only occasional, and the whole forest system can be maintained. Allowing in more light means an addition of energy. It can be controlled by varying the level of shading or changing the leaf volume in the forest structure. While it is clearly easy to let more light reach the ground, shading is a completely different matter...

By restricting the intervention to only what is the necessary and always taking into account the development of each stem and the balance of the whole forest ecosystem, a kind of symbiosis with the forest can be reached that benefits both society and the environment.

Marked spruce, 2011 in Division 15.

We are harvesting trees that we have looked after for more than a century. The young trees we promote today in tending the young forest will form the future forest, and the timber will be used by our great-great-grandchildren.

"The value of tree marking is the way it links harvesting with tending." *

Henry Biolley, 1937

"An ecosystem is like a symphony of life where the score assigns a voice for each species. People have to find out what their part is to bring the work to fruition without dissonance." *

Bernard Boisson, La Forêt primordiale, 2008

The whole forest is regenerated, with sustainably distributed, spontaneously regenerating groups of trees everywhere.

Joux Pélichet, Division 16 September 2011, after harvesting.

Where trees have been felled, more light, warmth and rainfall reach the soil. The seeds germinate and the regeneration already present receives the necessary energy to grow further.

Joux Pélichet, Division 16, April 2011, immediately after harvesting.

Financial aspects

Total economic value of the performance of the plenter forest La Joux Pélichet (42 ha). Based on P. Alfter, 1998 and W. Ott & M. Baur, 2005.

			Value per year [Thousand CHF]		per hectare [CHF]	per inhabitant [CHF]
Goods	Timber		**29**	1)	700	3
	Non-timber		**3**	1)	70	0
Services	For the environment	Protecting soils	**133**	2)	3'160	13
		Saving CO_2	**38**	2)	900	4
		Cleaning air	**15**	2)	350	1
		Protecting water	**8**	2)	190	1
		Biodiversity	**2**	2)	40	0
	For society	recreation	**20**	2)	470	2
	Yield per year		**247**		5'880	25

1) real value
2) theoretical value of performing substitutions

The plenter forest combines respect for nature with an optimal production... even without considering the **considerable immaterial benefits** for society.

Harvesting single trees requires not only highly skilled loggers, who love the forest, but also a dense network of permanent roads and skid trails.

Joux Pélichet, September 2011. Photo: Hubert Jenni

The forest giant: a Douglas fir

The biggest tree in Joux Pélichet shows an astonishing vitality.

Joux Pélichet, Division 11, May 2011. Photo: Daniel Wyder

*" … we can only guess… how much long-lasting and continuous growth is involved in producing a tree: Here patience contends with the unfavourable conditions …" **

Henry Biolley, 1901

Pictures of the forest

Favorite spot for recreation and sports.

Joux Pélichet, Division 15, May 2011. Photo: Daniel Wyder

An invitation to relax … Joux Pélichet, Division 12, April 2011.

*"The more a society develops, the more important becomes the social component of the forest". ** Lucien Boppe, 1889

The greatest possible production of high quality wood, forest services and wellbeing... with a minimum of maintenance.

Joux Pélichet, Division 13, April 2011.

A colorful mixture of tree species of different ages... can you spot the Scots pine?

Joux Pélichet, Division 12, April 2011.

A very vital ash with good quality wood that grew from natural regeneration in the plenter forest, demonstrating plentering's ability to obtain the largest income with minimal effort.

Joux Pélichet, Division 10, July 2010.

Photo: Hubert Jenni

A small pond, especially appreciated by wildlife…

Joux Pélichet, Division 16, May 2011.

Photo: Daniel Wyder

A sublime heritage, created 110 years ago. A century of interaction between nature and humans!

Joux Pélichet, Division 12, September 2011.

Le Locle and La Chaux-de-Fonds' new building for forestry maintenance, constructed with wood, a noble and ecological building material.

Joux Pélichet, Division 16, May 2011. *Photo: Bernard Vaucher*

For further reading …

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www.ne.ch/fne.
www.prosilvaeurope.org

PRO SILVA HELVETICA **Who are we?**

PRO SILVA HELVETICA is a Swiss foundation established in 1945 to promote plentering or a *multifunctional silviculture* [6], while respecting the rhythms and laws of nature.

Founded by Walter Ammon, chief forester of the forest district of Wimmis (1906–1912) and Thun (1912–1944), *PRO SILVA HELVETICA* has not stopped investing its modest resources in promoting the ideas and benefits of this form of silviculture, with its great respect for nature.

We have published several portraits of plenter forests from all over Switzerland on the Internet to give students of forestry and the general public an opportunity to find out more about this fantastic approach to forest management and feel inspired by it. Plentering is a sound and modern approach, which respects the whole ecosystem and guarantees sustainability... combining economics harmoniously with ecology.

PRO SILVA HELVETICA's bank account number is
UBS Privatkonto CHF
CH54 0024 2242 5000 3040 L
Pro Silva Helvetica

We are very grateful for any support in developing the plenter idea.

A big thank you to all those who contributed to producing this portrait.

Cortaillod, 23 September 2011 P. Junod, for the foundation *PRO SILVA HELVETICA*

Translation (French–German): Jean-Philippe Mayland and Peter Ammann
Translation (in English): Silvia Dingwall

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[1] *Division:* In Canton Neuchâtel's forests, the Division is the unit of land to which all data collection refers (Inventory, increment calculation and timber harvesting).

[2] Tariff m^3 [Tfm] or Silve [sv]: unit of measurement for the standing volume of a tree or a stand, calculated with a tariff.

[3] In Canton Neuchâtel, forest management is based on the "Control Method", developed by Henri Biolley (Biolley, 1920). This method requires a periodic full inventory in public forests of all trees larger than 17.5 cm diameter at breast height and the ongoing annual recording of all trees used, including the damaged and cut wood.

[4] *Chablis*: Fallen tree, broken, uprooted, struck by lightning, attacked by disease or dead.

[5] *Plentering*: Please note! This term has nothing to do with the German word "Plünderung" (plundering), but comes from the terminology used by foresters. It means harvesting trees individually or in groups so that the forest floor is exposed as little as possible and differently aged trees, mostly spruce and fir, can coexist side by side. Plentering refers to interventions as described above. Specifically, plentering in a plenter forest aims to ensure regeneration, regulate the mixture of tree species, improve the structure, promote the best trees, while education, harvesting and eradicating diseased wood using the same procedure.

[6] *Multifunctional forestry*: here the aim is to use all tangible and intangible forest services as efficiently as possible.

***** All citations marked with an asterisk are originally in French