

Didactic trail of the Risoud tonewood

In this forest hides a coveted treasure for centuries: resonance spruce. It is also called the green gold of the Risoud. Used to make many musical instruments, this wood has exceptional qualities. We even say that one in 10,000 trees is perfect enough to be part of the treasure...

Once upon a time there was the Risoud

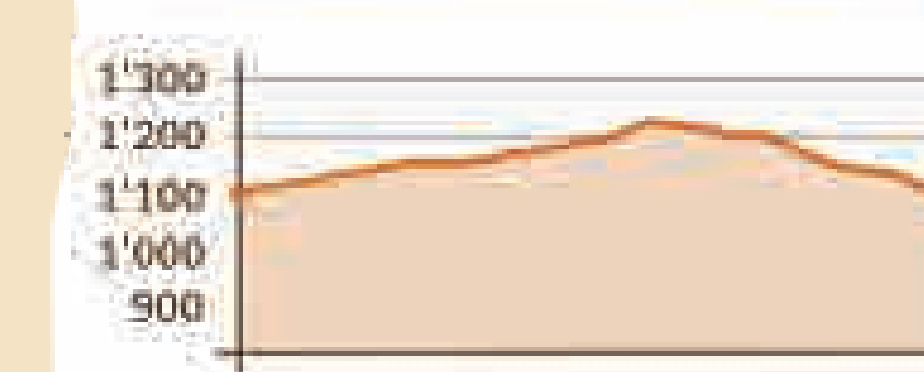
Covering more than 2,200 hectares, this forest culminates between 1,200 and 1,350 meters above sea level. The history of the Risoud is long and very rich. The trees that make it up have thus seen the Bernese occupants, the Bourbakis soldiers in disarray or even the famous smugglers during the Second World War... Its long military vocation has allowed the spruce to prosper. Their strong presence indeed made it possible to slow down the advancing enemy cavalry.

Managed according to the principles of the gardened forest, the Risoud has been essential for the survival of the inhabitants of the Vallée de Joux, called the Combiers. Very generous, he provides wood for construction and heating, filters the water, cleans the air, allows us to revitalize and above all... amaze us! The Risoud is therefore a little Sherwood in the Vallée de Joux.

“Tonewood is the heart of a tree that speaks to the heart of a man.”

Jeanmichel Capt – luthier

Path



Total distance: 6.4 km

Ascent: 125 m

1 to 10 didactic pannels

Other nearby trails :

- A.** Mas des Grandes Roches forest trail
- B.** Apollo refuge forest trail
- C.** Grand Risoud forest Trail

We thank you in advance for :

- Using the car parks provided for this purpose
- Taking your waste back with you
- Respecting the instructions given by the forest services
- Using the trail only on cross-country skis in case of snow

For the youngest: on each panel, animals are hidden somewhere. Yours to find them...

Look for the 3 boars!

A very demanding ecosystem

The climate of the Risoud is very harsh. The average annual temperature does not exceed 6 degrees. Sometimes strong winds blow for many months of the year. The period during which trees can grow is limited to 4 or 5 months per year. Also, the soil is karst type. That means that it is composed of limestone that has been eroded for thousands of years by rain runoff. The water seeps in very quickly in the ground. In addition, some trees, such as spruces, have superficial roots which do not allow them going to draw water from deep.

Trees therefore grow very slowly. This can be observed when you observe the fineness of the growth rings of a Risoud spruce. As we will see later, it is there that lies the great value of tone-wood...

Lapiaz created by runoff

Alpine pastures use wells for storing rainwater because there are no lakes or rivers around.

Limestone

Waterproof base layer

Water seeps through faults and cracks.

Underground lake

Resurgence

The roots of the spruce propagate horizontally. The layer of soil is very thin in the Jura.

30 cm

Annual growth circles

Low elevation spruce

Spruce from the Risoud

For an equivalent diameter, Risoud spruce is a lot older.

Trees are heavily impacted by winter conditions.

A gigantic forest

The Risoud forest extends from 2 sides of the Franco-Swiss border. In Switzerland, it belongs to :

- the Canton de Vaud
- the 3 municipalities of the Vallée de Joux
- a few private owners

Risoud forest

SWITZERLAND

Look for the great horned owl!

A gardened forest

Main trees from the Risoud:

A. Red spruce: 70%
Picea abies

B. White fir: 15%
Abies alba

C. Beech: 10%
Fagus sylvatica

D. Sycamore maple: 3%
Acer pseudoplatanus

E. Mountain ash and others species: 2%
Sorbus aucuparia

7

A

1

2

D

C

E

B

3

6

5

4

Forests have several functions:

- Wood production
- Preservation of the biodiversity and the landscape
- Protection against natural hazards
- Water filtering and storage
- Public recreation

Forest managers should always allow the forest to assume these different functions. To do this, a fundamental principle has been adopted to manage the Risoud: forest gardening.

This principle aims to ensure, on the smallest possible surface, the presence of trees at all stages of their development (from the youngest to the oldest) and of diversified species. Looking around you will find that the forest is not uniform. The role of the forester is to ensure that the irregularity of this forest structure is preserved. To ensure sustainability, one only harvest the volume of annual forest growth. In financial terms, it's like to collect the interest but to not touch the capital. Although it looks very natural, the Risoud forest is relatively artificial. Indeed, spruce has been favored for several centuries, to the detriment of beech. Spruces have a much higher market value. If the forest had been left to itself, one would therefore observe a lot more deciduous trees than at present.

A rich and fragile biodiversity

The forest is an important habitat for 40% of the species living in Switzerland. Forest gardening takes this into account and contributes maintaining biodiversity and protecting species.

Emblematic animal species of the Risoud:

1. European owl
2. Tengmalm's owl
3. Hazel Grouse
4. Capercaillie
5. Wolf
6. Lynx
7. Three-toed woodpecker

Look for the 2 squirrels and the garden dormouse!

The Risoud forest is managed according to sustainability principles and certified.



A tree in wedding dress

For thousands of years, the Risoud spruces have adapted to their environment. They are also called columnar spruce (columnar-shaped). The branches tend to not be horizontal, as with the white fir, but to fall along the trunk. This allows the trees to reduce the weight of the snow by letting it fall more easily to the ground and being less sensitive to the wind. It also allows them to have more needles in contact with light for better photosynthesis. They thus expend less energy which can then be used to produce wood in order to continue their ascent to the sky. This specific shape makes some foresters say that the Risoud spruces are wearing a wedding dress...

Most spruces tend grow by spinning a little bit. This give them the possibility to balance their crown because the light allows the development of the branches. A spinning spruce is unsuitable for use in musical instruments making. His fibers are indeed not perfectly parallel. That's the reason why foresters “hug” the trees to observe if they are straight enough.

Properties of a spruce that can potentially provide tonewood

The spruce makes it possible to produce many musical instrument.

Having generally grown in a combe protected from the wind by its congeners

Straight trunk

Spinning trunk

The drooping branches of the Risoud spruce allow him to drag the snow to the ground.

Usable part of the trunk for musical instruments making: between 5 and 8m.

Diameter at 1.3 m from the ground: at least 80cm

At the service of music

To produce sound, a musical instrument needs to put air in movement. For hundreds of years, luthiers used spruce to generate this sound wave. This material indeed combines exceptional qualities: lightness, resistance and responsiveness. By putting this wood in vibration, the sound becomes music.

The forester observes if the trunk is spinning.

Look for the 6 tits!

The acoustic Graal

The influence of the moon

The fluids present in the trees being attracted by the moon like the waters of the oceans (which causes the tides), it is imperative to cut trees when it is farthest from Earth. This ensures much better drying of the wood and prevents it from cracking.

Slaughtering and quartersawing

Matured at around 350 years (although it can live up to sometimes 800 years), the tree is felled with respect and debarked. It is then divided into quarters. In order to ensure a high solidity to the soundboard and an optimal propagation of the soundwave, it is essential to avoid cutting the wood rings. The wood will thus react less to hygrometric changes and will not absorb the varnish too much. The sawing is done according to the quartersawn principle. The wood is then dried for 6 months before being sliced into planks to serve as guitar soundboards, for example.

During its cycle, the moon moves away and closer to Earth.

Perigee 356'410 km 405'500 km Apogee

The resonance tree should be cut at the apogee.

Look for the raven and the fox!

Very slow growing in rough conditions

Absence of defects on at least 5m

80cm diameter at least at 1.3 m from the ground

Quartersawn principles

Drying in a controlled environment

Plainsawn: growth rings are cut

Quartersawn: growth rings are not cut

The transverse fibers also allow to make the soundboard more resistant.

Violin top blank

An exceptional material

Resonance spruce can generate a soundwave circulating at more than 6,000 meters per second, while having a very thin thickness (about 2 to 3 mm for a guitar soundboard). This piece of wood will also be able to withstand the traction of about 80 kg exerted by the strings of the instrument and this for decades. Resonance spruce is therefore a very high-tech material offered by nature...

Specificities of a resonance spruce

- Has grown very slowly in harsh conditions
- Has a minimum diameter of 80 cm to 1.3 m from the ground
- Comes from a trunk that has not been spinning and is as cylindrical as possible
- Has been cut according to the right moon phase
- Has been quartersawn respecting the fibers of the wood
- Does not show resin pockets, discolorations, attacks of insects and branch knots on at least 5 m
- Has been dried for several years in an environment with monitored humidity and temperature.

Timbers from here and there

On many musical instruments, the sound generated by the top is amplified by a soundbox, as on a drum for example. The latter must be made of wood much denser than spruce in order to allow the soundwave to bounce against the back and sides before exiting through the gills in “f” of a violin or the rounded mouth of a guitar.

Luthiers have always used flamed maple for their quartet instruments (violin, cello, viola and double bass), except for the ebony fingerboard and tailpiece and the table in spruce. Other woods, such as rosewood and mahogany are used for other instruments since the beginning of the 20th century. However, for several decades we have witnessed a very problematic overexploitation of these exotic species. That has extremely harmful consequences on biodiversity, local people and climate. An international convention called CITES allows partially to avoid a deterioration of the situation.

Alternatives to tropical woods are currently being tested by innovative luthiers. They use walnut or even cherry, in particular. Some luthiers also use timbers such as laburnum or olive tree to make the guitar fingerboards traditionally made out of ebony.

Walnut
Trees of the
Juglandaceae family

Switzerland

Cherry tree
Trees of the
Prunus genus

Switzerland

Europe and
North
America

Switzerland

Flamed sycamore maple
Acer Pseudoplatanus

Red spruce
Picea Abies

Rosewood
Trees of the
Dalbergia gender

Ebony
Trees of the
Ebenaceae family

Mahogany
Trees of the
Maliaceae family

South America,
Africa and Asia

Africa and
Asia

South America,
Africa and
Asia

Red spruce

Ebony

Maple

Ebony

Ebony

Ebony

Flamed maple

Rosewood

Red spruce

Mahogany

Flamed maple

Flamed maple, the second treasure of the Risoud

If resonance spruce is the king of the Risoud, flamed sycamore maple is the prince. Just as rare, this wood is well known for being used on the back and sides of quartet instruments. A genetic peculiarity in a tiny number of these trees creates an oscillation of the growth rings. Once planed and varnished, flamed maple shows off gorgeous curves that look like pleated satin. Invisible when the tree is standing, this specificity can only be seen following slaughter. Luthiers, however, prefer flamed maples that have grown at lower elevations. The slow growth of the Risoud maples has a tendency to make them heavier.

Typical texture
of the flamed maple

Look for the elephant
and the sloth!

Sound alchemy

Depending on their density, rigidity and speed of growth in particular, tonewoods produce specific sounds. We are entering a very subjective world here. It is indeed particularly difficult for human beings to describe with unambiguous terms a sound feeling. Every tree and even each part of the same tree being unique, wood is a non-standard material. It is also this feature that makes all the magic of musical instruments making.

By choosing the woods for the sound-board, the back and the sides, the luthier works like a winemaker making an assembly of different grape varieties to create a grand wine.

Carving of a violin top by using a small plane called “hazelnut”

Look for the 7 mouses!

Bracing, the luthier’s know-how

The luthier glues and carves a thin structure on the internal face of the soundboard in order to reinforce it and balance the frequencies. This system is called the bracing. It is particularly in the mastering the bracing, not too thin, nor too thick, that partly lies the know-how of a luthier. The bracing of a guitar also reflects his personality.

Different bracing for different types of guitar

Acoustic guitar

Classical guitar

Gypsy jazz guitar

Jazz guitar

Bracing in red spruce

Multiplayers

In order to produce quality resonance wood, a whole industry is necessary. All the skills and know-how of these partners is essential for the luthier and, ultimately, for the musician.

The cantonal forest inspector and the forest ranger ensure compliance with legislation and implement forest management plans. They collaborate with the various owners, stakeholders and interest groups.

A forest with an Italian accent

It's not just the trees that suffer from the harsh climate of the Vallée de Joux. The foresters too. Let's pay tribute to the Italian immigrants who have come in particular from the Bergamo region from the 1870s. It was up to these men, voluntary and resistant, that we owe in large part the quality of the Risoud forest. In collaboration with local foresters, they took care of the forest, erected a vast network of skid trails or even built forest refuges. Among these foresters, one is particularly famous: Lorenzo Pellegrini. Several documentaries and a photographs book were dedicated to him.

The forest ranger manages a forest yard on behalf of owners who may be the Canton de Vaud, municipalities or privates. He provides planning, execution and control forestry work. He also identifies potential resonance trees.

The forester carry out the felling and skidding of the trees in order to route them close to forest roads. He is also in charge of caring for young stands and plantations. His tasks also include forest engineering such as the construction of structures (avalanche barriers, stabilization of embankments and river banks, etc.) or the paths maintenance.

The carrier transports the logs from the forest road to the sawmill. Part of the wood, mainly beech and spruce of lesser quality, is also sent to the heating facilities developed by the municipalities of the Vallée de Joux.

The sawyer cuts the logs in quarters. The luthier can then contact the sawmill or the wood dealer to choose his resonance spruce.

After drying the wood for several years, **the luthier** builds his musical instruments. You have to play a guitar between 3 and 5 years before it expresses its full potential sound.

The musician, inspired by the acoustic and subtle qualities of the instrument, composes and interprets songs capable of covering the entire spectrum of human emotions.

Look for the 3
hazel grouses!

A great traveler in danger

Picea abies is not only present in the Risoud! It is widely distributed in Europe. For it to be potentially of resonance, it must have, as we have seen, grown into very specific conditions. Several regions in Europe fulfill these conditions.



Among these are:

- 1. The Val di Fiemme region in Italy, prized in its time by the famous Antonio Stradivari.
- 2. The Carpathian region in Central and Eastern Europe.
- 3. The Alps and the Pre-Alps. Tonewood is found in the Rougemont region in Pays-d’Enhaut or in Graubünden, notably.
- 4. The Jura and the Vosges. The village of Mirecourt is officially the French capital of lutherie.

The Risoud spruces also have cousins on other continents, including in North America. Widely used in modern lutherie, these trees grow on the east **(5)** and west **(6)** coasts of Canada and the United States.

Endangered forests

If in our country a forest management said to be close to nature is often practiced, this is by far not the case under other latitudes. The exploitation of forests (and therefore tonewood) causes often considerable problems. The global forest area is shrinking an average of 4.7 million hectares per year, especially in South America and in Africa.

The effects of global warming

The forest may seem static, but it is actually in perpetual evolution. The Risoud, like all of our ecosystems, is not immune to the effects of climate change. This translates in particular by a lack of water very unfavorable to the spruces. These latter tend to dry out and thus be more vulnerable to attacks by insects such as typograph bostrich. The forest managers take these threats into account in the framework of their activities. If global warming were to continue at such a speed, there is strong reason to fear that the spruces will not adapt quickly enough and would be replaced especially by oak trees.

Dead spruces due to typographer bostrish attacks

Typographer bostrish and it’s larva

Bark eaten away by typograph bostrich

Discoveries and innovations

Amazing discoveries

Our understanding of forest ecosystems is still very limited. Humans must be humble. Recent works by Francis Hallé and Ernst Zurcher, for example, demonstrate that trees are able to communicate with each other. They adapt their DNA continuously and very quickly. They give off inegatives ions allowing us to fight against stress. They react in a scientifically demonstrable way to the presence of beings humans near them, etc.

Promising innovations

Far from being set in stone, lutherie is constantly evolving and modernizing. New uses for tonewood appear: supports for minute repeater watches, loudspeakers, smartphone docking stations, etc.

We are also witnessing the appearance of torrefied woods (just like for coffee producing) on some guitars. This roasting technique makes it possible to modify the cellular structure of the wood in order to make a soundboard behave like if it had been vibrating for decades. The future promises to be full of surprises for enthusiasts of lutherie and music lovers!

It is very likely that in the future we will be prescribed prescriptions forest walks! These few discoveries and so many others marvel while inviting us to reconsider our relationship to domination of nature. The forest is the origin of everything: from the soil necessary for agriculture, including heating, construction, culture, crafts, music and spirituality.

Everything is connected.

Resonance wood speaker

Bluetooth wood speaker

Watch resonance support

What if nature was using the golden number?

The golden number has been used for centuries to give ideal aesthetic proportions. It was used by painters, architects, musicians, etc. Some luthiers have also referred to it to ensure perfect proportions to their instruments.

It seems that nature also uses this number...

Golden number: $\Phi = \frac{1 + \sqrt{5}}{2} \approx 1.618033$

Fibonaci sequence:

0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, 233, ...

In the Fibonacci sequence, each number is the sum of the two previous ones. If we divide a number by its previous one, the result gradually gets closer and closer to the golden number.

13

8

Pine cone: with the number of spirals in opposite directions, we find elements of the Fibonacci sequence.

34

21

5

8 1 3
2

13

Approximation of the “logarithmic spiral” thanks to the Fibonacci sequence...

...which is often found in the environment.

Nautilus

Look for the boar and the 2 foxes!

Galaxy

To know some more

By using this QR code, you can have access to many documents about the Risoud and the lutherie: educational videos, reference studies, books, movies, etc. You can also find offers by Vallée de Joux Tourism and the Jura vaudois Regional Nature Park: culinary specialties, know-how, fauna, flora, landscapes, sports activities, etc.



www.sentierboisderesonance.ch

Tavillonnage

Observe the small roof protecting this didactic panel! It is made out of tavillons. This ancestral technique allows to create roofs and facades with a local resource. The wood used is spruce of very good quality. In fact, it is necessary that the growth rings are very regular. The wood is also quartersawn and seasoned properly. It is therefore very similar to the the resonance wood...

Quartersawn wood

Production of
cheese



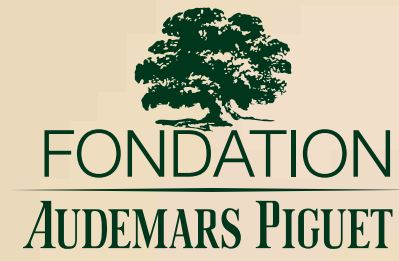
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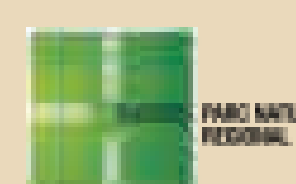
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Thanks

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This didactical trail is dedicated to Mr. Jacques Vuichard
Le Brassus, June 2023

Look for the ermine
and the dahu!