The big picture: storylines for the nature of music

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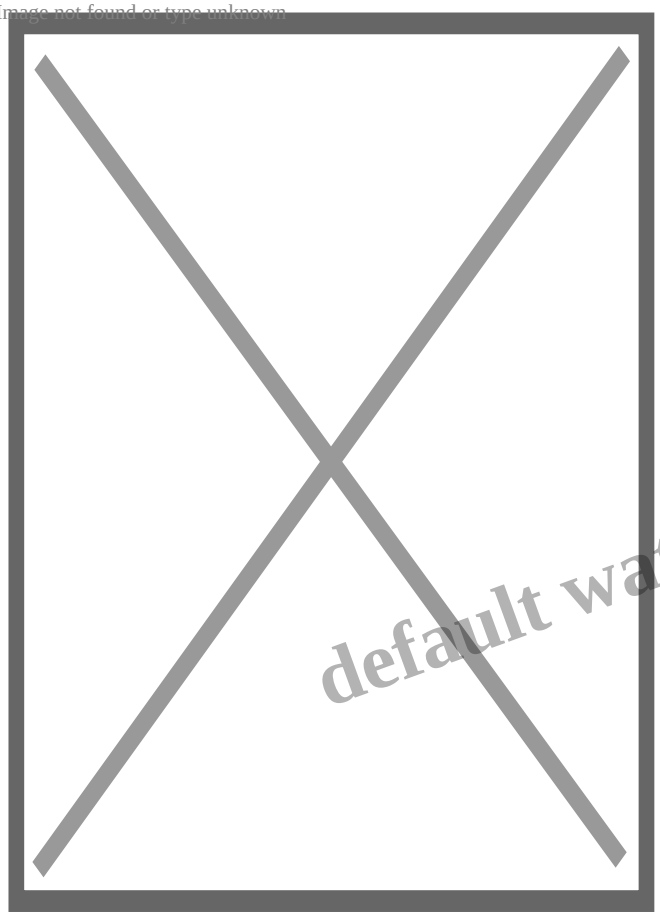

Civil War era CF Martin guitar made from Brazilian rosewood and 2015 Rainsong carbon fiber guitar

Traditional materials for making guitars have been getting scarcer and caught up in tangles with trade restrictions. How are guitar makers responding?

As mentioned in an earlier post, when I started this site, I indicated that the original plan had been to write a book.

That may still happen down the track. Regardless, as well as writing individual posts, I still want to develop a broader story-line that delivers a bigger picture of the topics I hope to cover. This post maps out the territory that will be covered in future posts – hopefully this will help position individual posts in that broader perspective. Broadly, we'll look at the problem of wood scarcity and trade limitations, how guitar makers are adapting to these, the range of wood types available, and whether all this matters to how guitars sound.

As a scientist, I like things to have a degree of order, even if, or maybe especially if, the world appears increasingly chaotic. My field of ecology investigates complex ecosystems and species with fluctuating

and unpredictable population trends and behaviours. Just when you think you are beginning to understand how your particular system or species works, it does something completely unexpected. But if you study things from enough different angles and for long enough, some things begin to make sense. At least they do until things change again – nowadays, we're dealing not only with the innate dynamics of ecosystems and species but also with how these are being altered by changing climates, pressures from human activities and the like.

This relates equally to the sources of most guitar materials, especially the trees that produce the woods needed to make a guitar. There are many different species of trees growing in different parts of the world, but until recently only a few were considered to have the right combination of attributes that are necessary to make a good guitar.

Wood scarcity and trade limitations

Unfortunately, many of the woods prized most for guitar building come from forests that have been heavily depleted by past (and in some cases ongoing) over-harvesting and destruction. That is a story to be explored more fully another time, but for now it's suffice to say that supplies of some of the prime timbers valued for guitar making are getting scarcer and the trees producing the timber are considered to be of conservation concern – i.e., they are threatened and vulnerable to extinction.

The International Union for the Conservation of Nature compiles and maintains a Red List of Threatened Species, summarizing the global conservation status of species. It uses a set of criteria to evaluate the extinction risk of thousands of species.

Policy and management responses to species declines look for ways to reduce the rate of decline and, hopefully, allow the species to recover sufficient numbers to allow it to persist into the future. In the case of species that have been over-exploited, this means protecting their habitat in situ and also attempting to reduce the pressures driving over-harvesting. One of the main tools for doing this are national and international regulations that limit trade in the materials derived from the threatened species- most notably the Convention on Trade in Endangered Species of Wild Fauna and Flora (CITES). This convention most prominantly deals with movement of animal species and products such as ivory, but also covers a surprising number of plants and plant products, including wood.

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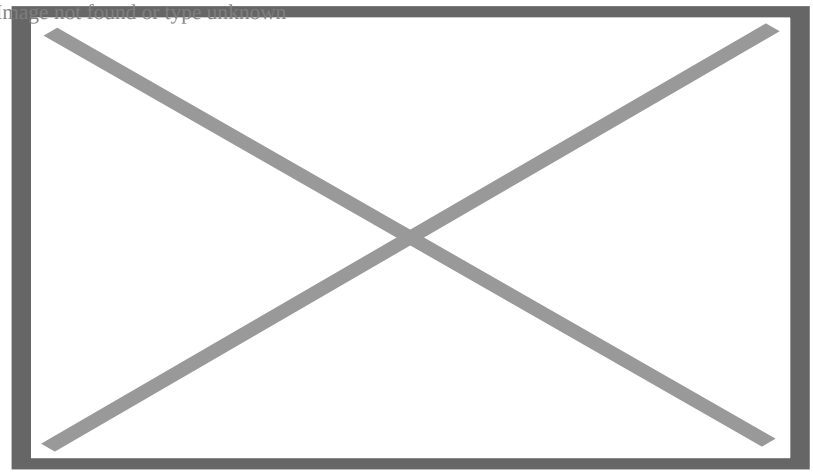

While guitars make up a tiny fraction of the total wood used in the world, they nevertheless get caught

up in the same trade restrictions, and some of the most well-known traditional guitar woods are on the CITES list of restricted species. The CITES list is revisited on a regular basis and species are added, or sometimes taken off, the list depending on how their conservation status is changing.

Over recent years, guitar makers, sellers and buyers have had to navigate a situation where guitars containing a wood from a listed species could not be shipped to another country without significant paperwork. And importing wood of a listed species was also heavily regulated. Things have recently freed up to some extent, following lobbying from the guitar industry, and finished instruments are now subject to fewer restrictions. The whole CITES thing will be explored more fully in a subsequent post.

All this is background to the issue facing guitar makers – that their traditional materials have been getting scarcer, harder to procure, and caught up in tangles with trade restrictions. And at the same time, these materials are tinged with environmental problems that run contrary to an ethos that focuses on sustainability and socially-responsible trade and business practices.

What to do about it?

Traditional woods

These issues have led guitar makers in a number of different directions. Some, especially smaller builders, have elected to keep doing what they have been doing and use their existing supplies of traditional woods, or source supplies that have been in storage since before the CITES regulations came into force. Others have sought to work towards more sustainable production and trade of traditional woods to ensure an ongoing supply that has some certainty around its origins. Minimizing wastage of wood at the various stages from harvesting to construction is another strategy. Using laminates (combining thin layers of wood) rather than solid wood can also reduce the use of scarce timbers.

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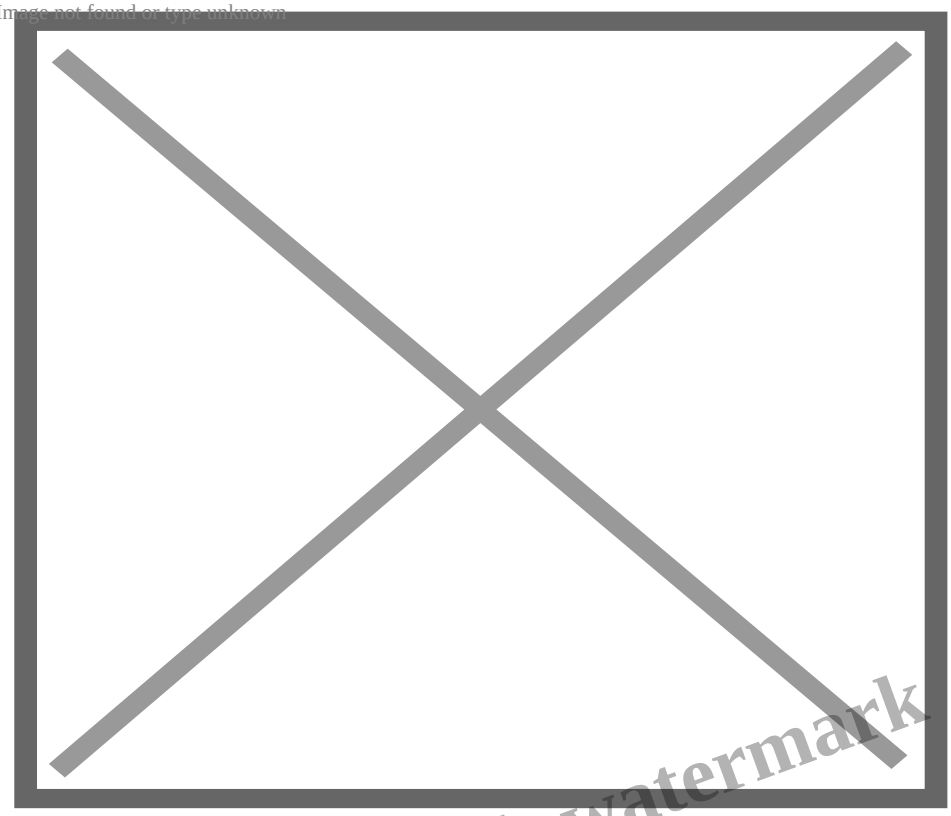

Tom Bedell of Bedell Guitars with Brazilian Rosewood that was stored in Spain for over 50 years before being acquired for guitar making. See the story here.

Alternative woods

As another approach, some builders have sought out alternative woods with similar characteristics to the traditional woods, but are not on the CITES list. Others have tried out completely alternative woods, including locally-sourced species and species that are abundant and readily available -including species that are problematic weeds.

Seeking out timber that has been grown and harvested to recognized standards that can be officially certified as “sustainable” is one way to ensure that whatever wood is being used is OK from an environmental perspective.

Re-used and “lost’ woods

These approaches still rely on a tree being felled somewhere in the world and transformed into timber that can be used in guitar making. An alternative to this is to re-use wood that was originally used for a different purpose – for instance, furniture, building materials or barrels – or re-using entire artefacts such as cigar boxes. Or to salvage wood that was harvested some time ago and then “lost” in some way – for instance in shipwrecks or sunken during flotation down rivers – or that fell in a storm or was buried in peat a long time ago.

Used cigar boxes were transformed into inexpensive instruments and played by many, including some of the blues greats.

Not wood at all

And then there is the option not to use wood at all. There is a long history of resonator guitars made mostly from metal. Various plastics have been tried, and more recently carbon fiber and mixtures of carbon or other fibers (e.g., flax) with resin materials are being used to produce guitars of all shapes, sizes and colours.

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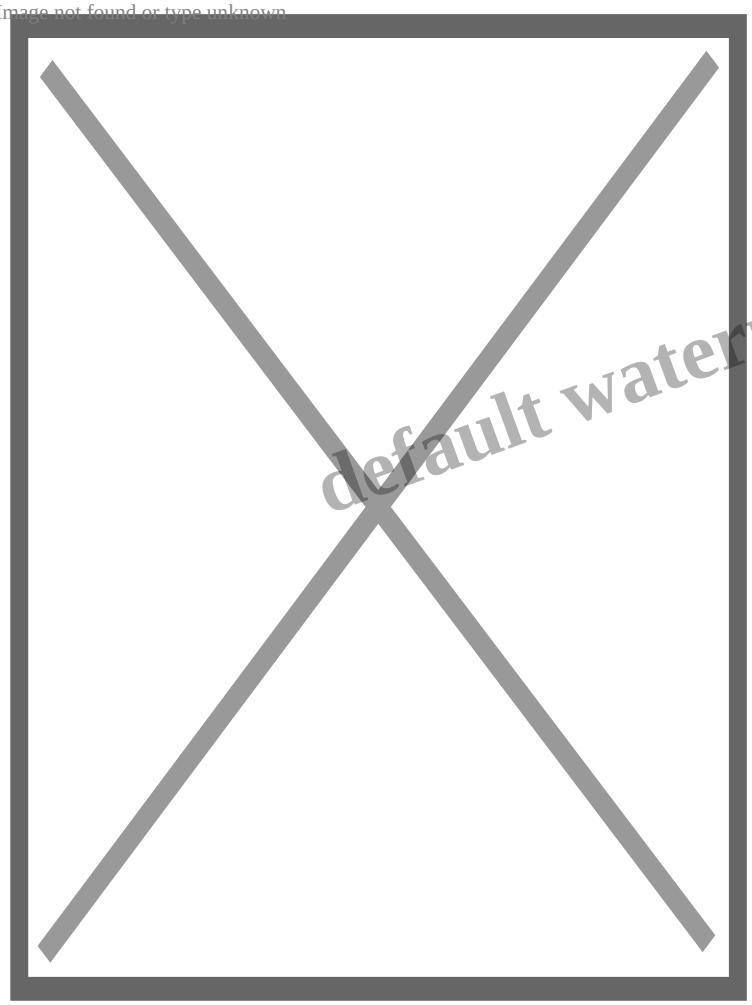

Carbon fiber guitars can sound and look great – here is an Emerald Guitars Artesan and a Composite Acoustics Cargo

Of course, the options are not all mutually exclusive, and many builders are using a mix of approaches and materials. All these approaches have both advocates and detractors – opinions abound in this area!

Recycle an old guitar!

Finally, a piece of advice that often pops up on discussion threads is that one way to be truly

sustainable when buying a guitar is to buy a secondhand one. Buying a used guitar is the ultimate in recycling, does not involve the use of any more resources, and can sometimes get you a very fine guitar indeed. In fact, the world of vintage guitars revolves around the perception that old guitars can be valuable and, in some cases, sound a whole lot better than new guitars.

A brief introduction to wood

There are many species of tree in the world, and hence many different types of wood, with a wide array of properties in terms of colour, density, hardness and the like. The structural properties of wood determine how useful it will be for a range of applications – wood has long been used as fuel and in construction of everything from ships to cathedrals to furniture to chopsticks.

Huge amounts of information on a large number of wood types have been gathered together in various places, such as:

The Wood Database

Wood Handbook (US Forest Service)

Tropical Timbers (US Forest Service)

Different types of wood are not equally suited to making musical instruments, and over time, a select number of woods have been recognized as the main ingredients that make a good guitar. Lists of these can be found on quite a few of the guitar builder websites listed later. What makes a good "tonewood" is an ongoing topic for discussion, especially as more woods are included in the mix. Most discussions focus on a handful of key species, but then also include a selection of others, depending on the perceptions and preferences of the writer. See for instance:

A Tonewood Primer: How to Pick the Right Materials for Your Optimal Sound

The standard palette of woods usually contains Brazilian Rosewood, Indian and other types of Rosewood, Mahogany, Ebony, Koa and Spruce. For some people, the top pick for a guitar would always be Brazilian Rosewood for the back and sides and spruce – Adirondack, European or Sitka – for the top. Again, however, there is lots of discussion around the choice of wood species – for instance is Mahogany or Rosewood better?

We'll explore these discussions further another time, but the bottom line is that the answer depends on how you define and measure "better" – and "better" is largely a subjective assessment based on individual preferences and perceptions. It is generally agreed that different woods vary in their tonal characteristics and can be distinguished based on these characteristics – and they also vary greatly in how they look too. Visual appeal can also be an important element in choice of woods, and this can vary greatly even within individual tree species.

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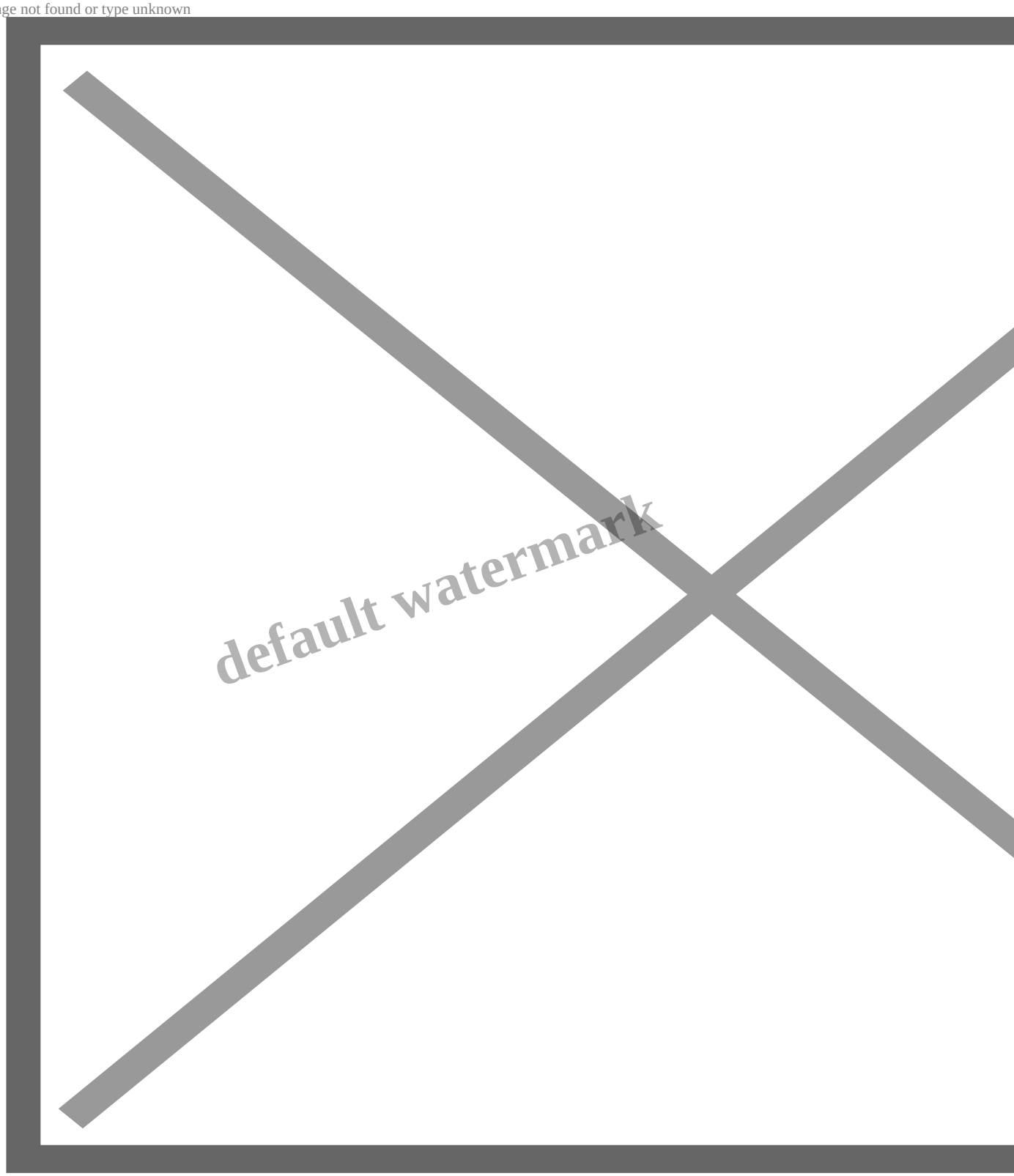

How different woods compare in terms of tone – courtesy of Breedlove Guitars

Old growth or new growth?

The picture is, however, even more complicated than just considering the species of tree that the wood

came from. How old the tree was when it was cut, how fast it grew, where it was situated and an array of other factors will affect the properties of the wood it produces. A key distinction these days is whether the wood came from “old growth” natural forests or from secondary or planted forests.

Old growth means exactly what it says – the trees have been around for a long time, sometimes thousands of years, and have generally grown pretty slowly for much of that time. That means that the annual growth rings are more tightly packed and the wood is generally denser and stronger. And of course, wider trunks mean that larger pieces of wood are possible. Wood from the same species of younger tree from a secondary forest or plantation is likely to have grown faster and hence have more widely spaced annual rings and less dense wood.

Old growth forest is increasingly scarce these days because of historical and ongoing exploitation. The small scraps that are left are now protected in some way and viewed as incredibly valuable for reasons other than their timber content. In many areas it’s now illegal to cut down old growth trees, and hence the only (legal) sources of old-growth wood are from recycled, stored or salvaged sources.

The photos below show a good contrast between old growth and plantation grown timber – in this case, California redwood used for the tops of two guitars. On the left is old growth timber salvaged from a disused railway tunnel in northern California – the Tunnel 13 story is for another time – used on a Santa Cruz guitar. On the right is redwood from a plantation in Australia, used on a Cole Clarke guitar (again, another story).

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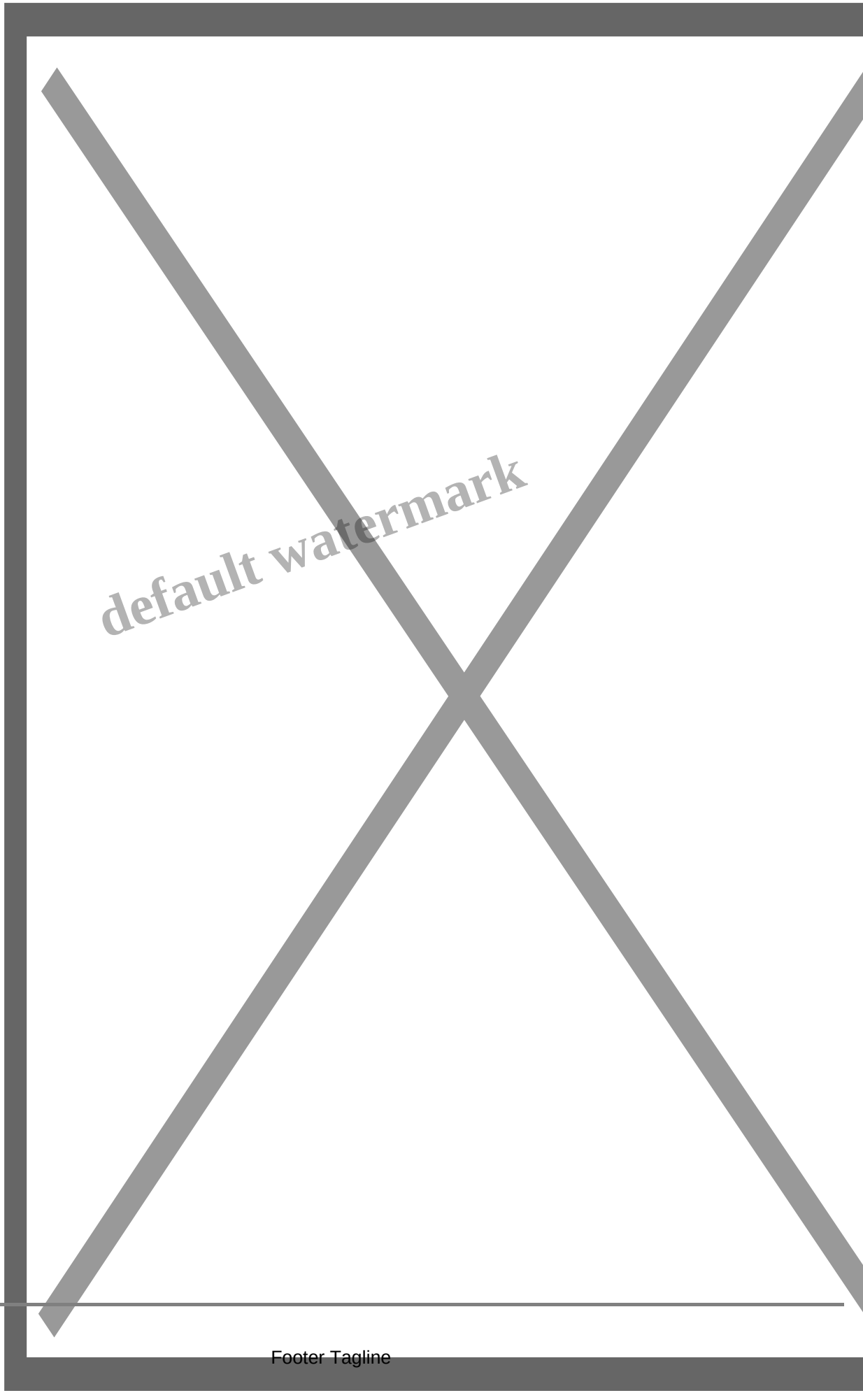

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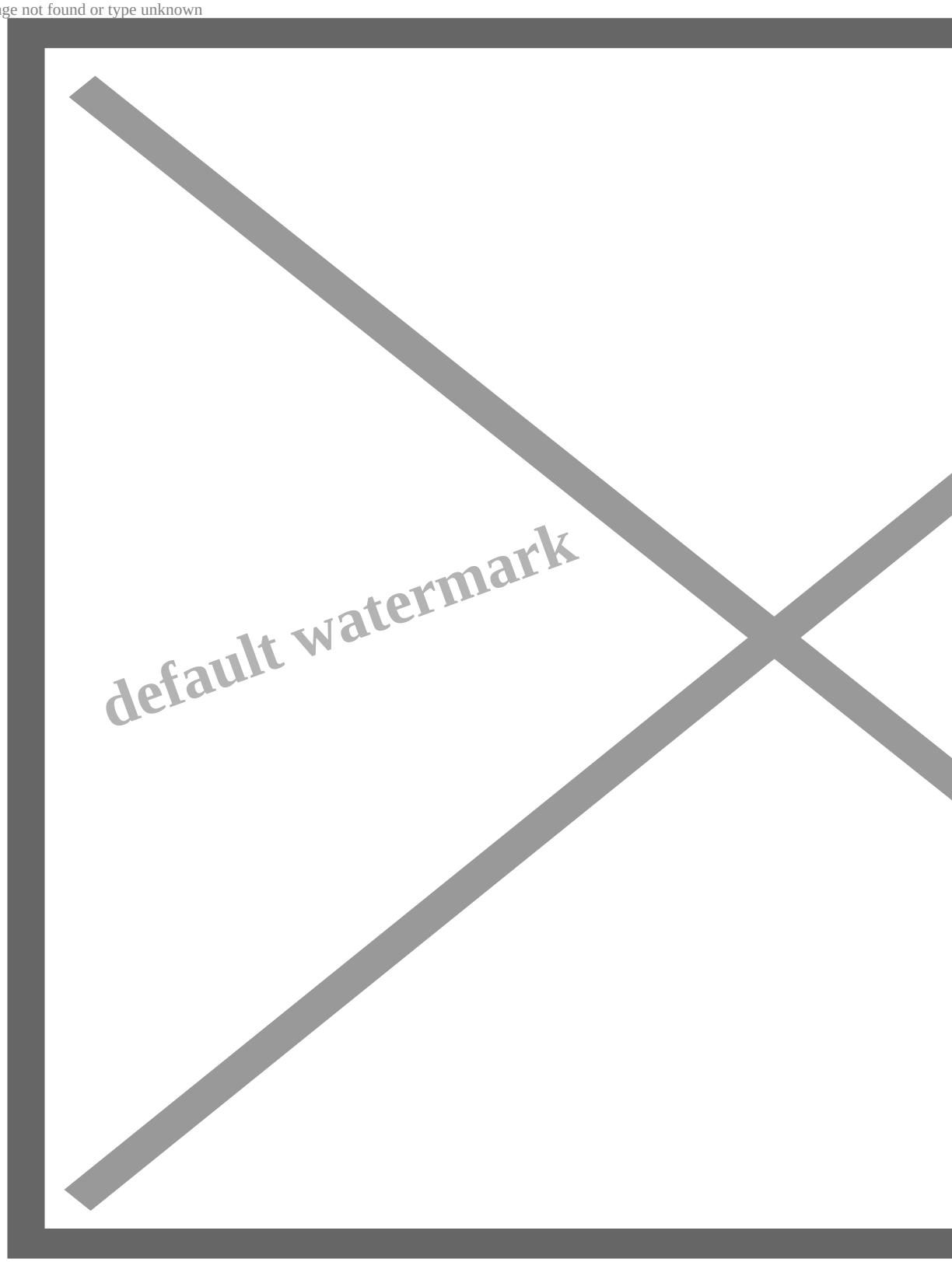

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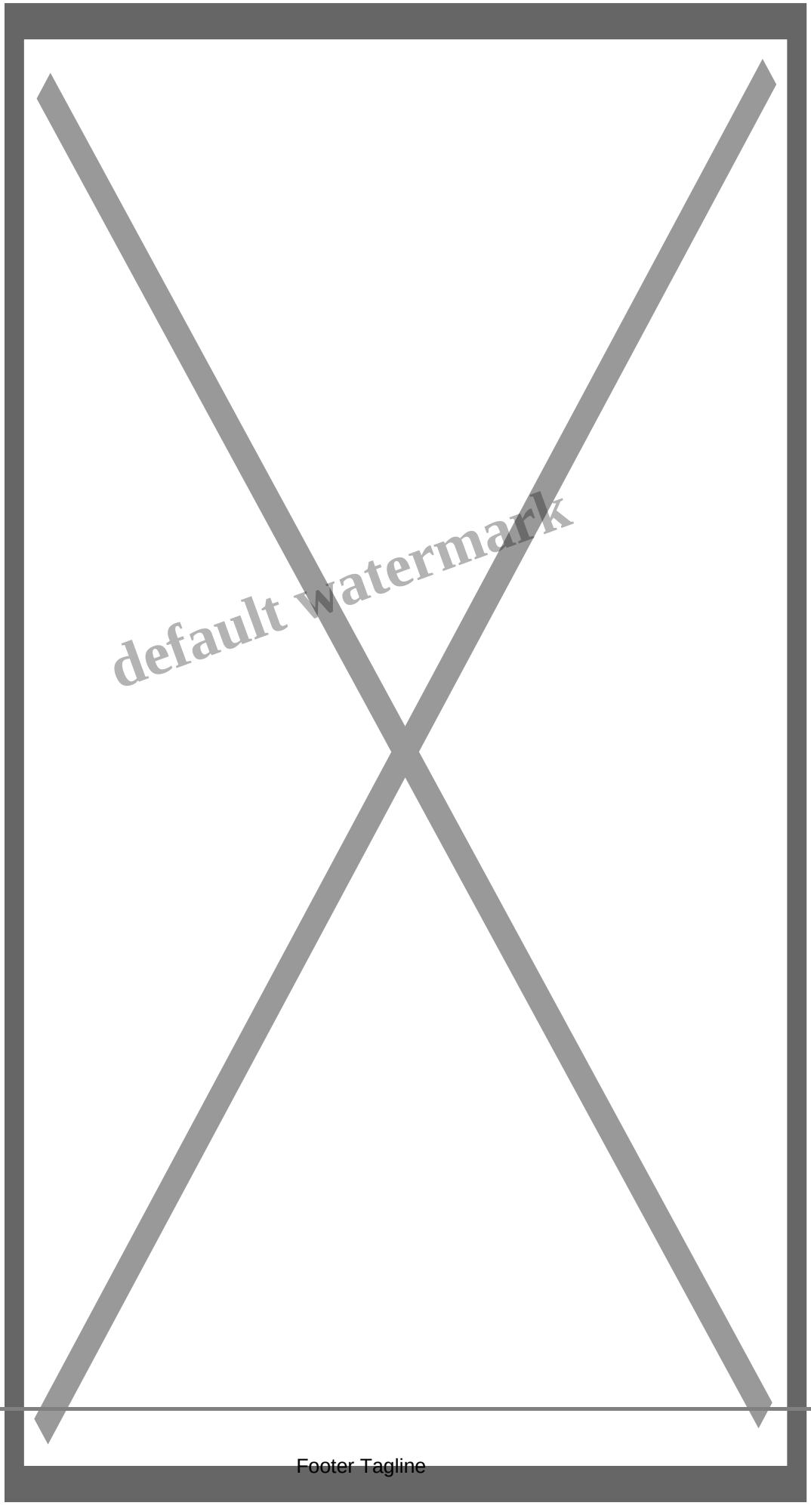

Old growth California redwood (left), salvaged from a railway tunnel, and plantation-grown redwood from Australia (right) – a close up of the two tops shows the much smaller annual rings in the old growth wood.

Does it matter?

An important question relating to all this is how much difference the choice of materials actually make a difference to the quality of a guitar. This question involves both quantitative science of acoustics and the physics of the materials and how they behave. But it also involves a broader consideration of the process of building the guitar and the playing and appreciation of the final product. This, in turn, leads into considerations of how sound is perceived and molded by the builder and then how it is perceived by the player and their audience.

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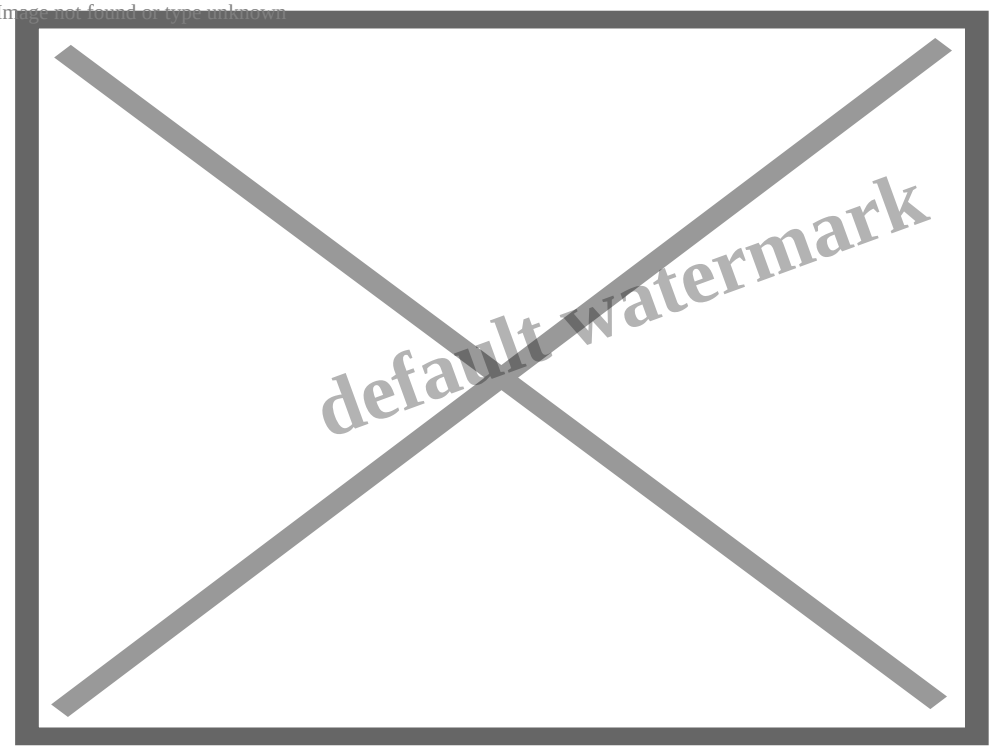

Many ingredients go into how a guitar sounds

Future posts will consider each of these parts of the puzzle that make up how a guitar sounds and plays.

I got into this topic partially as a way of doing something different from my normal science job. I wanted to escape the many controversies and arguments in my field and in how science is used in policy and management. Little did I know that there would be so many differences of opinion about anything and everything to do with guitars! As mentioned briefly earlier, lots of folk have very strong opinions about which particular brands of guitar are good or bad, which size of guitar is best, which combination of woods is best, whether different woods actually affect the sound or not, and much, much more.

Some of these discussions have been scrutinized objectively using scientific methods in physics and acoustics, and others have been examined in terms of human perception and how our brains process sound and other inputs. These investigations are shedding light on many aspects of how sounds are

produced and perceived – but they are not necessarily reducing the level of debate!

So, this mixture of topics is likely to keep me busy for quite some time! I hope you'll come along for the ride – feel free to sign up below for automatic notifications of new posts.

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Category

1. Uncategorized

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