

# Symphony for the native wood(s): Global reforestation as an opportunity to develop a culture of conservation

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## Abstract

1. The stewardship of forests across multiple human generations has potential to lead to cultural innovations fostering sustainable uses. Nevertheless, positive culture–nature interactions are often disrupted due to colonial exploitation and a lack of intrinsic value ascribed to nature in capitalist economies. There is global recognition that restoring degraded ecosystems is critical to promote the welfare of people and nature by reducing the negative impacts of global climate change and diminishing biodiversity. However, with a focus on technical remedies, restoration and reforestation efforts generally fail to address the root causes of ecosystem degradation.
2. In this perspective paper, we call for explicit incorporation of cultural values into global reforestation efforts. We focus on music as a cultural ecosystem service as music has been a prominent part of human history with clear sociological and psychological attributes that may invite mass interest and participation. We illustrate the value of musical linkages via three case studies from Europe, Africa and Hawaii focusing on native tree species, their wood, musical ecology and their interaction with culture.
3. We show that multi-generational stewardship of native ecosystems in Europe has allowed the refinement of the violin to its current form, one that is culturally significant for millions of people and has created a multi-million dollar industry. This development stems from a 500-year tradition of craftsmanship handed down across generations and illustrates that ecocultural interactions can be a strong dynamo for development of unique commodities.
4. In contrast, in regions where extirpation of native plant species was used as a deliberate colonization strategy, many ecocultural linkages face risk of extinction. Our case studies from Africa and Hawaii illustrate how native tree species of particular value for musical expression were nearly lost and along with loss of music, important cultural connections to nature.
5. In the context of restoration, there is also evidence that music-based linkages can revitalize nature–culture interactions and promote restoration of native ecosystems. Incorporating native trees in global reforestation efforts is critical

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for ensuring that reforestation efforts capture the synergies needed for developing new ideologies that promote the well-being of co-dependent humans and all life.

#### KEYWORDS

cluster concept, decolonization, ecocultural restoration, ecological imperialism, ecological restoration, music–ecology, reforestation

## 1 | INTRODUCTION

Forest trees are foundational for maintaining ecological-based ecosystem services in diverse ecosystems worldwide, but their value for promoting cultural ecosystem services is less acknowledged. Both ancient and current values that humans place on trees often forge strong ecocultural linkages between people and native plants resulting in diverse influences on cultures worldwide (Hall et al., 2011; Schweiger & Svenning, 2020). Many examples illustrate that strong interactions between culture and plants can promote sustainable ecosystem management. Both the Millennium ecosystem assessment report (Reid et al., 2005) and The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES, 2019) highlight cultural services of ecosystems as fundamentally important for environmental justice and sustainability. However, these positive culture–nature interactions are often disrupted due to lack of intrinsic value ascribed to nature in capitalist economies, colonial exploitation of natural resources and displacement of people from lands. The conversion of forest lands to plantation forestry and agricultural practices generally results in the displacement of native plant species as exotic ones may be more familiar and economically useful to imperialistic economies (Mastnak et al., 2014). With degradation and loss of native ecosystems, there is also a progressive loss of positive human–nature interactions, a decline in ecocultural diversity, and loss in perceived values of nature (Grant, 2012; Manne, 2003; Rapport & Maffi, 2010).

A vast majority of tree planting efforts in colonized regions have typically used a handful of exotic tree species (Chechina & Hamann, 2015; de Jong et al., 2021) that are unfamiliar to local communities and might support few, if any, ecocultural linkages. For example, despite native tropical forests supporting some of the highest levels of biocultural diversity in the world (Gorenflo et al., 2012; Grant, 2012), they are disproportionately revegetated with non-native species compared to temperate forests. For example, South American tropical planted forests are composed of about 98% non-native species and North American planted temperate forests are composed of 98% native species (de Jong et al., 2021). Plantation forestry in the tropics tends to focus on the use of industrial monocultures with a limited number of species from a small number of genera such as *Eucalyptus* and *Acacia* (Lamb et al., 2005; Liu et al., 2018). Although many of these plantations have been productive by generating goods such as pulpwood and providing

economic revenue (Liu et al., 2018), few provide the diverse array of goods and services that local people historically obtained from tree species in native forests (Boshier et al., 2009; Lamb et al., 2005). In fact, in many tropical regions, intentional extirpation of native plant species was often used as a deliberate colonization strategy (Mastnak et al., 2014) or occurred as a consequence of colonization (DeLoughrey et al., 2011). As biological diversity and cultural diversity are often positively correlated, it follows that degraded and biologically depauperate forests may threaten cultural diversity and cultural stability (Grant, 2012).

As a way forward to improve stewardship of nature, we argue for greater public participation in global reforestation efforts focusing on creating new and invoking historic cultural connections to nature. Promoting cultural ecosystem services via restoration could help in developing sustainable economies and lead to improved stewardship that generates benefits to a larger number of people (Reid et al., 2005). The United Nations Declaration of the Decade of Restoration (2021–2030) and related international environmental legislation calls for the restoration of 350 million hectares of degraded forests by 2030. This target of 350 million ha is more than double the forest area in the EU (158 million ha; EU, 2021). However, the amount of area being reforested lags well behind the amount of land being degraded annually which is highlighted by the recent COP26 agreement to halt and reverse forest loss and land degradation by 2030. We believe that greater public participation is needed to achieve such ambitious goals and that this participation can be increased from current levels by increasing the cultural relevancy of reforestation. Music, being a prominent part of human history (Peretz & Zatore, 2001) and with its many sociological and psychological links that help us interact with each other and our environment (Hargreaves et al., 2002; Malloch & Trevarthen, 2018; Schäfer et al., 2013) may act as an entry point for building cultural relevance. We highlight the connection between nature and music as one way to inspire action in forest stewardship, and suggest that bringing people to the forest to think about their interaction with music can be a catalyst. We also use music–ecology to demonstrate that connections between nature and culture (in this case, the unique music produced by a specific culture) can be lost through land degradation and colonialism, and that reforestation has the potential to help remedy these losses. In such cases, the act of reforestation can be an act of decolonialization towards environmental justice.

We illustrate this point via three thematic case studies from Europe, Africa and Hawaii, focusing on the connection between native tree species and music. In Europe, in the region of Cremona in Northern Italy, the maintenance of native ecosystems for multiple generations and the wood that those ecosystems provided allowed the development of the violin making industry, now a multi-million dollar industry. We emphasize that the violin industry evolved in a non-colonial manner where multiple generations maintained interactions with the same forests. This development was made possible by clear place-based circumstances that involved the natural environment and a close to 500-year tradition of craftsmanship and understanding of native plant uses being handed down across generations. This illustrates that ecocultural linkages and sustained human–nature interactions can be a strong dynamo for development of unique commodities that support cultural evolution and bio-based economies. In contrast, in regions where expiration of native species was used as a deliberate colonization strategy (Mastnak et al., 2014), or occurred as a consequence of colonization (DeLoughrey et al., 2011), ecocultural linkages dissolved. Case studies from Africa and Hawaii show how native trees highly valued as components of musical instruments have been nearly extirpated from these regions resulting in cultural loss. Nevertheless, there is also evidence that native tree species and music-based ecocultural linkages now inspire and promote restoration of native ecosystems. We argue that if done right, restoration offers an unprecedented opportunity, not only to restore degraded ecosystems and moderate climate change, but also to revitalize historic and synthesize new ecocultural linkages that connect people with their natural environment. This does not mean that societies should revert to an ancestral way of living but highlights that ecocultural linkages with native tree species carry a distinct value for current societies, a value that is fundamentally different from that provided by exotic tree species.

## 2 | 'IL BOSCO CHE SUONA'—THE MUSICAL WOODS

In a large part of Europe, the current majority of forests are composed of native tree species, that is, native tree species cover approximately 95% of the forest area. In Italy, exotic tree species cover only about 6% of forested land (Moreira et al., 2012). Reforestation efforts in Europe focus almost exclusively on native tree species and the use of exotic tree species has been black-listed or carefully controlled (Brundu & Richardson, 2016). The high esteem for native tree species has allowed long-term cultural traditions to flourish. When such traditions are allowed to develop over generations, they can play an important role in cultural evolution and in the development of refined products. One of the most striking examples must be the use of native tree species as source of tonewood, wood with particularly sonorous qualities for producing the unique sound of the violin.

The history of the contemporary violin stems from the region of Cremona in Northern Italy and dates back to the 16th century when Andrea Amatis, and later his protégés, Stradivari and Giuseppe

Guarneri del Gesu, headed the development of the basic form and function of the instrument (Frisoli, 1971; Gough, 2000; Heron-Allen, 1885). Under the influence of the key Renaissance cities of Milan, Florence and Venice, which by that time had already catalysed trade and culture in the region (Najemy, 2005), and with a close proximity to the Italian and Swiss alps (Figure 1), Cremona offered unique conditions for local violin makers. The development of the violin was made possible by the biogeographic place-based conditions that allowed local sourcing of natural resources, that is, native tree species providing wood for the many components of the violin (Bucur, 2016; Buksnowitz et al., 2007; Schumacher, 1988).

Diverse plant species are used to craft the 68 or 70 specific wooden pieces that compose a violin (Gough, 2000; Heron-Allen, 1885), each species with special characteristics that contribute to the overall musical resonance of the instrument (Bucur, 2016; Buksnowitz et al., 2007; Gough, 2000; Heron-Allen, 1885; Hill et al., 1965; Schumacher, 1988). Norway spruce *Picea abies*, a coniferous tree native to a large part of Europe, has earned a reputation as the prime wood for the resonance top that drives the sound of the violin (Buksnowitz et al., 2007). It has been shown that the preferred wood of violin makers in Cremona originates from specific locations in the European alps (Bernabei et al., 2010) where a unique combination of altitude and climate is known to produce extraordinary wood for violin making. This population preference suggests that traditional violin makers had a deep connection to the natural environment with an understanding of population differences in tonewood quality over a relatively long distance; Cremona is located some 200 km south of the European Alps (Figure 1). Some of these forests have also been sustained for over 500 years and still allow modern violin makers to source wood from the same forests as their Renaissance counterparts (Laurenson, 2013; Livesay, 2014). These forests have come to be called 'Il Bosco Che Suona'—The Musical Woods (Livesay, 2014).

The violin making traditions centralized around Cremona, where craftsmanship was handed down across generations and from master to apprentice (Gough, 2000), soon formed a 'cluster', that is, a geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities (Porter, 1998). The competitive advantage of such clusters includes social and cultural components, as well as natural capital (Fensterseifer & Rastoin, 2013; Martin & Mayer, 2008) and the sustainable use of natural resources (Martin & Mayer, 2008). Increased industry competitiveness from a regional industry cluster is due to acceleration in innovation from daily face-to-face information exchange allowing for rapid development and improvement of the violin (Okí, 2021). This regional cluster of craftspeople and markets contrasts with modern-day globalization and highlights the utility of proximity and tactile contact for artistic innovation. These skills are not limited to the craft of violin making but include many interconnected skills that are essential for the end product, that is, skills such as knowing when and where to source high-quality wood and sustainable use of native ecosystems—skills that are still practiced locally (Merlo, 1995; Scotti & Cadoni, 2007). Furthermore, throughout its 500-year history the violin has not only



**FIGURE 1** Map of northern Italy showing the location of Cremona, the birth place of the violin with a close proximity to Milan, Florence and Venice, three cities that contributed greatly to the development of the Renaissance. The evolution of the violin was stimulated by the Renaissance but was made possible by the biogeographical place-based conditions that allowed local sourcing of natural resources, that is, native tree species providing wood for the violin. Of particular importance are the Norway spruce forests of the Italian and Swiss Alps in which the unique combination of altitude and climate is known to produce extraordinary wood that allowed Renaissance luthiers (violin makers) such as Stradivari, Guarneri and Amati to hand-pick the trees that would be turned into some of the world's finest instruments. Some of these forests have been sustained for over 500 years and still allow modern violin makers to source wood from the same forests. These forests have come to be called 'Il Bosco Che Suona'—The Musical Woods

been a reoccurring feature in European culture, religious art and mythology, but has also played a key role in the cultural evolution of music (Box 1). In 2012, UNESCO declared the traditional violin craftsmanship in Cremona, an intangible cultural heritage (UNESCO, 2012).

Today, the city of Cremona is undisputedly one of the world's greatest violin making clusters with approximately 130 violin making studios officially registered, and the number of craftsmen are estimated at 700 people (Oki, 2010). There are examples of fine modern instruments collecting a price of up to £10,000 (Gough, 2000) and 40,000 USD (Marchese, 2008). The worldwide market for violins was estimated at 327 million USD in 2019 according to a new GIR report (Global Info Research, 2019). Furthermore, the 16th-century violins made by Stradivari and Guarneri are highly applauded as masterpieces, still played by top professional performers and are desired for collectors (Marchese, 2008; Oki, 2010). Lady Blunt, one of the best kept Stradivarius violins made in 1721, commissioned a value of 15.9 million USD on auction in 2011. There is also a significant tourism industry centralized around Cremona; the violin museum Museo del Violino in Cremona (Frisoli, 1971) attracts at least 100,000 visitors every year, and there are field visits arranged to 'Il Bosco Che Suona'—The Musical Woods (Livesay, 2014).

### 3 | THE ECHO OF MBILAMUTONDO MUSIC FAINTING INTO HISTORY

In stark contrast to the story of the violin industry, many tropical regions and particularly the African continent have been significantly

affected by its colonial and post-colonial history (Bennett, 2010; Campbell, 1996; Strauch et al., 2016; Tropp, 2006). In many parts of Africa, traditional land management systems were often based on cultural practices emerging from social and religious traditions, and developed over hundreds of years, generally with a strong appreciation and value of nature (Campbell, 1996). These systems were aggressively displaced by colonial and post-colonial land tenure systems and capitalist economies (Strauch et al., 2016). Forced labour and mass displacement of human populations further disintegrated traditional land tenure systems and weakened cultural connections to nature. Colonial settlers, and later post-colonial governments, also displaced native plants. Native plants were harvested and replaced with fast-growing, non-native tree plantations that encouraged and reinforced divergent patterns of economic, social and ecological development (Bennett, 2010; Bennett & Kruger, 2013). With both native people and plants being displaced, and diverse forests being replaced with mono-cultural plantations, the ecocultural linkages between humans and nature were also largely disrupted.

One threatened forest ecosystem of great local importance in South-eastern Africa is the dry tropical forests known as the Miombo woodlands. The Miombo woodlands cover some 2.7–3.6 million km<sup>2</sup> across 11 African countries (Sawe et al., 2014), and support the livelihood of approximately 100 million people (Campbell et al., 2007). Miombo woodlands are increasingly threatened by anthropogenic activity (Campbell, 1996; Chidumayo, 1987; Mojeremane & Lumbile, 2016) and in southern Africa, the management practices introduced by colonial and post-colonial governments have not been



## BOX 1 Cultural significance of the violin

Throughout its 500-year history, the violin has not only been a reoccurring feature in European culture, religious art and mythology, but has also had a distinct role in driving cultural evolution. In the early days, Amanti made violins for the European royal courts and customers such as Charles the IX, King of France (Heron-Allen, 1885). With time, the violin spreads from Italy to other regions in Europe; France, England, Germany and Scandinavia (Schoenbau, 2012). With a growing popularity, the violin soon filtered down to the rural population, becoming established as the primary instrument for folklore and dance music of the common person (Ling, 1997). With this development, the violin was slightly remodelled, that is, whereas the sound of the early violins was light and sweet, fitted for small ensembles in the palace halls, later violins had a stronger and more powerful sound suitable for a bigger audience (Marchese, 2008). The violin is also a reoccurring feature in other non-musical art forms. The violin and related string instruments are reoccurringly depicted in religious art such as An Angel in green with a Vielle from c. 1490, most likely painted by Francesco Napoletano (c. 1470–c. 1501), an associate of Leonardo da Vinci, as part of the altarpiece of San Francesco Grande, Milan. The artwork Violin Player Seated in the Inn (1685) by Cornelis Dusart (1660–1704), Dutch genre painter and print maker illustrates the inclusion of the violin into the everyday life of common people. Furthermore, the violin is a reoccurring feature in the myths and legends of many Germanic peoples in Europe. In Scandinavian folklore mythology, Näcken (or näkki or nøkk) are male water spirits that represent the unknown nature, the mysteries and people's fears, and his enchanted songs played on the violin represent the 'hypnotizing' power of current water. These folklore myths also inspired artists from a range of fields such as the painter Ernst Abraham Josephson (1851–1906).

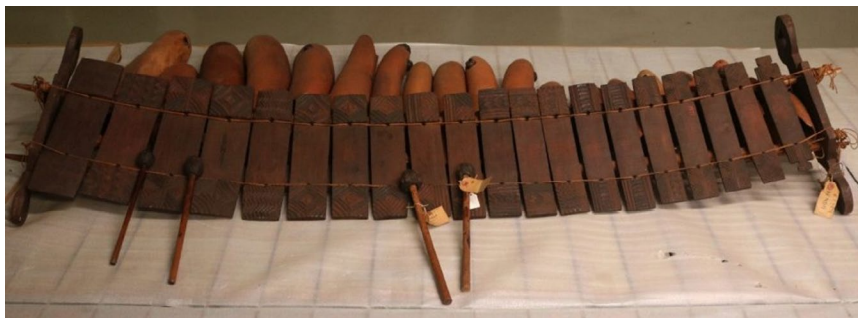


suitable to satisfy the needs of those most dependent on Miombo woodlands (Deweese, 1996). One of the culturally important tree species associated with Miombo woodlands *Pterocarpus angolensis* has a declining population trend and was recently introduced in the IUCN Red list as near threatened (Mojeremane & Lumbile, 2016). Alongside the threats to *P. angolensis* populations, the cultural traditions linked to this tree are also facing risk of extinction (Mugovhani, 2009).

The VhaVenda people in the Limpopo Province in the northern part of South Africa exclusively used wood from *P. angolensis* in the construction of a resonated xylophone instrument called the mbilamutondo (Figure 2). The mbilamutondo is comprised of 10—or up to 22—wooden blocks that are called mbila, similar in length but different in thickness according to the desired key. The instrument is played using two beaters in each hand and each key is also associated with a gourd as resonator to amplify the sound (Figure 2). The name Mbilamutondo is a compound name derived from two terms: mutondo, which is the common name of the tree *P. angolensis* that provides the wood for the instrument, and mbila—referring to the

wooden keys. Mbila also refers to the rock dassie *Procavia capensis*, a small mammal known for making a characteristic calling sound from within its cave, where the echo from the cave increases the intensity of the sound (Mugovhani, 2009). There are also local varieties of the instrument. The Tshopi people have a similar instrument which is constructed on the same principle but the two types are made from different materials, and the Venda and Tshopi each have their own manner of performance (Kirby, 2013). The mbilamutondo also carries some similarities to the world famous marimba (Mugovhani, 2009; Straže et al., 2015), but the marimba is constructed from yet another type of wood (Straže et al., 2015).

With deforestation occurring on a large scale in many parts of the former Venda territory, there is now a great scarcity of mbilamutondo building-material and a co-occurring decline in the performance of mbilamutondo music (Mugovhani, 2009). While local varieties of this music are still performed in Zimbabwe, Mugovhani (2009) reported that in 2003 there was only one musician, Vho-Ravele, practicing the traditional mbilamutondo music in the area



**FIGURE 2** A 20 key Mbilamutondo and four beaters with the Mbilamutondo resonators showing on top. The xylophone pictured is part of the Anthropology Collection of the DITSONG: National Museum of Cultural History and was archived in the 1920s in Sibasa, Venda (Seabela, 2021). With permission of the photographer Motsane Getrude Seabela

around Venda. At that time, Vho-Ravele was more than 100 years old and had difficulties remembering and explaining all the different nuances of the music; its meaning, its performance, and songs and varieties. Vho-Ravele passed away in 2005, and with him one of the last first person accounts of the religious rituals and spiritual practices associated with mbilamutondo music. For example, ‘Mulovhidzhana’, is a Shona song, inherited by Vho-Ravele from his father Vho-Vele, that may never be performed again (Mugovhani, 2009). Apart from promoting interest in the traditional music performance among the next generation of people (Evans, 2018; Mugovhani, 2009), there is also a need for conservation intervention, restoration and planting to protect the tree to be able to save this cultural heritage for the future (Mojeremane & Lumbile, 2016; Mugovhani, 2009).

#### 4 | THE REBIRTH OF THE LONG-LIVED TREE TO THE SOUND OF THE UKULELE

The ecology of many Pacific islands was also irrevocably changed by colonialism (DeLoughrey et al., 2011). Conversion of Hawaiian forests to non-forest use began when the islands were first colonized by Polynesians, and accelerated with the arrival of Europeans c. 1800 (Cuddihy et al., 1990). The result was an overwhelming change in social structure and lifestyle. Subsistence agriculture based on communal lands was replaced with a western style land tenure/ownership and capitalist economies based on sugar cane, plantation forestry and ranching (Cuddihy et al., 1990; Levin, 1968). Perhaps the most serious and persistent early impact of western culture was the introduction of exotic plants and large grazing and browsing mammals that quickly established large feral populations and began to open up and destroy upland forests and high-elevation systems (Cuddihy et al., 1990). In combination, these drastic changes to the ecosystems of Hawaii (Czech et al., 2000) have reduced native forests to a fraction of the area they once occupied (Baker et al., 2009; Gagné, 1988). Over 30 years ago, Gagné (1988) estimated that <10% of the land on the Hawaiian island are composed of pristine native forest—it is likely lower now.

Of particular concern are the montane Hawaiian rainforests characterized by a dominance of the Koa tree *Acacia koa* (Baker

et al., 2009). As an endemic, the Koa tree is an important ecological component of montane Hawaiian rainforests (Baker et al., 2009; Friday et al., 2015; Scott et al., 1986; Scowcroft & Jeffrey, 1999; Stein, 1983; Swezey, 1925). It is a nitrogen-fixing species (Cole et al., 1996; Pearson & Vitousek, 2001; Rose et al., 2020) and is considered an important ‘nurse’ tree for other native plant species (Friday et al., 2015; Scowcroft & Jeffrey, 1999). About 30% of the threatened and endangered plant species in Hawaii can be found in Koa forests and loss of such forests have been a major cause of plant extinction and endangerment in Hawaii (Baker et al., 2009). The Koa tree is also known to support a wide diversity of animal life including several endemic insects (Stein, 1983; Swezey, 1925) and birds (Baker et al., 2009). Of Hawaii’s 35 remaining native forest bird species, 30 species, 17 of which are endangered, can be found in Koa forests (Baker et al., 2009). Hence, the Koa tree is important for the ecology of Hawaii and many species may become threatened, endangered or extinct when Koa forests are lost (Baker et al., 2009; Scott et al., 1986).

Beyond its ecological importance, the Koa tree and its wood is an important part of Hawaiian culture. The wood was long associated with Hawaiian royalty and used to build the traditional Hawaiian outrigger canoes for fishing, racing and voyaging (Baker et al., 2009). Koa wood was used in constructing houses (hale), spears, tools, paddles (hoe), kahili handles, calabashes (‘umeke lā’au), ceremonial poles (hulumanu) and short surfboards (Krauss, 1993). The wood was traditionally also used in religious ceremonies (Krauss, 1993). The Koa tree also has language tangents, that is, in the Hawaiian language koa means brave, bold, fearless or warrior. A Hawaiian saying goes; E ola Koa, ‘Live like a Koa tree’, which refers to wishing someone a long life, like a Koa tree in the forest (Pukui & Varez, 1983). Koa is also a tonewood and traditionally used in construction of the taro patch fiddle, the instrument better known as the ukulele. Developed in the 1880s, the ukulele is based on several small, guitar-like instruments of Portuguese origin, the machete, cavaquinho, timple and rajão, introduced to the Hawaiian Islands by Portuguese immigrants. The ukulele hence represents a product of remarkable synthesis between Western and Pacific cultures. The history of the ukulele is nevertheless tightly linked to Hawaii and with wood from the endemic and culturally important Koa tree (Figure 3). The ukulele is also known as the ‘the national instrument of Hawaii’.



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HAWAII

The Genuine  
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Hawaiian  
Hand-Made  
**UKULELES**  
Iaro-Patch Fiddles & Steel-Guitars  
**ARE BEST**

**Because** Each instrument is made under the personal supervision of Manuel Nunes, the inventor of the Ukulele, who has been making them since 1879. For many years Mr. M. Nunes made instruments almost exclusively for the Hawaiian Royalty.

**Because** The Koa wood used in the manufacture of these instruments is wood naturally seasoned in Hawaii for years—not kiln dried.

**Because** They are strictly hand-made by Mr. Nunes and his sons in Honolulu, who have been taught the art of making them by their father, the inventor.

**Because** In making these instruments, QUALITY, is their sole aim, not quantity. Each instrument is constructed by hand and hand polished and before leaving the shop must pass the personal inspection of Mr. Manuel Nunes.

The above reasons are why the M. Nunes & Sons' instruments are far superior to all other makes in TONE, artistic workmanship and durability. They cost no more than the many inferior imitations, based on getting the genuine with the Royal Hawaiian coat-of-arms on headpiece, as above illustrated.

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FIGURE 3 A historic advertisement for hand-made Hawaiian Ukuleles by M. Nunes and sons illustrating the characteristic patterns of the wood from the Koa tree on the soundboard. Although representing a remarkable synthesis between Pacific and Western cultures, the history of the ukulele is tightly linked to Hawaiian culture, highlighted by the ukulele being the 'the national instrument of Hawaii'

Due to the importance of the Koa tree for Hawaiian culture and ecology, Koa forest ecosystems are a prime target for conservation and restoration (Baker et al., 2009; Jacobs et al., 2020). Today,

planting Koa trees is a common way to restore native forests (Jacobs et al., 2020) as they facilitate dozens of other native species (Friday et al., 2015; Scowcroft & Jeffrey, 1999). Furthermore, in severely degraded sites, nitrogen fixation by *A. koa* can help restore favourable soil conditions (Pearson & Vitousek, 2001). Planted Koa may thus provide means to restore dominant native forest cover and recreate habitat for native flora and fauna. Management and restoration of Koa forest is suggested as the ideal solution to restore native habitats on Hawaii and meet multiple objectives, including ecosystem and socioeconomic goals (Baker et al., 2009; Pejchar & Press, 2006).

There are also examples of employing the cultural connection between the Koa tree and its use in making musical instruments and musical expression to generate interest, incentives and revenue for conservation and restoration. One example is The Ukulele Restoration Project at Haleakala Ranch (2017) aimed at honouring heritage and culture through preserving native forests and planting native trees. One other example is Saving Hawaii's Forests (2021) with a goal to restore native forests by replanting Koa trees and other native and endemic tree species in part through different programmes that utilize the musical connection to generate revenue. One such programme is the Willie K. sponsorship programme honouring William Awihilima Kahaialii (1960–2020) who was a world famous Hawaiian musician, singer-songwriter and ukulele player, which sponsors support for Koa tree planting, and restoration and conservation of Koa forest ecosystems. Saving Hawaii's Forests (2021) also offers an Ola Ka 'Aina album which is a compilation of original compositions by Willie K. and other artists. The compositions are inspired by the composers' personal experience with reforestation and sustainability and revenue from sales goes directly into reforestation and conservation.

## 5 | DISCUSSION

Although the inclusion of native tree species in reforestation and restoration has been convincingly argued before (Boshier et al., 2009; Brancalion & Chazdon, 2017; Lamb et al., 2005), we feel that it is well worth highlighting the great value that native tree species may bring in terms of revitalizing ecocultural linkages. Reforestation that includes consideration of cultural ecosystem services and acknowledge native ecosystems as central for environmental justice (IPBES, 2019; Reid et al., 2005) may increase social interest and scale of reforestation efforts by increasing the cultural relevancy of such efforts. Our case study of the violin industry in Cremona with a history dating back to the 16th century illustrates how ecocultural linkages being maintained and allowed to evolve through time can promote the development of nature-based products with a distinct value other than the sheer production of biomass. These can, of course, include economic values, such as in the case of the violin making industry stemming from Cremona that has developed into a multi-million dollar industry with a global market, but also intrinsic values ascribed to nature. For example, just as long-lived trees can carry a legacy that stretches across generations, the violin also

represents a vector of culture–nature and human–nature interactions that connects people and societies with nature across time and space. Such strong interactions provide opportunities for diverse industries and creative development and are likely to create positive feedback loops that result in greater human value of nature and better stewardship of forest resources—and to a much greater number of people.

Our review illustrates that this development benefited from the maintenance and refinement of craftsmanship through time but also by the ecocultural linkages that connect humans and nature. This includes legal acknowledgement of native ecosystems as valuable natural resources with a planned and sustained management tradition; in essence, the natural and cultural capital (Pretty, 2011) that even today allows native forests to provide top quality wood for violin making (Laurenson, 2013; Livesay, 2014). During the Renaissance, management of these forests was largely community based (Merlo, 1995). Although modern development has changed how these forests are managed, that is, progressively reduced the extent of community forestry in Italy (Merlo, 1995; Scotti & Cadoni, 2007) in favour of government and corporate forestry, the forest industry is still predominantly based on native tree species (Brundu & Richardson, 2016; Moreira et al., 2012). We argue that conservation of native ecosystems can lead to the evolution of ecocultural linkages and result in a value of nature to society that is far beyond its economic value.

In contrast, in many tropical regions where extirpation of native species was used as a deliberate colonization strategy, ecocultural linkages are at risk of extinction (Mastnak et al., 2014). Our South African case study is a striking example of this, illustrating how cultural traditions in connection to mbilamutondo music, musical performance, storytelling and crafting of the musical instrument, may already have been lost from the local culture of the VhaVenda people and to the world. Part of this loss is linked to the decline in availability of building material (Mugovhani, 2009), demonstrated from declining populations of the tree species (*Pterocarpus angolensis*) providing wood for the musical instrument (Mojeremane & Lumbile, 2016). If done right, current undertakings to reforest large areas in tropical regions could potentially have a profound impact on revitalizing ecocultural connections with benefits to both humans and nature. Diversifying restoration with larger proportion of native tree species would at least provide the physical setting that is a fundamental necessity for allowing the development and refinement of traditional cultural uses. We suggest that reforestation efforts could be popularized to modern culture through the Renaissance of traditional music. As with the case of the ukulele, the mbilamutondo music could play a central role in garnering support for the conservation and reforestation of the Miombo woodlands and at the same time increasing cultural value towards nature. Similar efforts could be conducted wherever music and ecology can be linked. For example, loss of native tree species (e.g. the rosewoods) for production of tonewood for electric and acoustic guitars and marimbas throughout central and South America is being used to rally support for reforestation.

Despite the extraordinary potential of tropical forests to support biological and cultural diversity (Gorenflo et al., 2012; Grant, 2012), most reforestation efforts in the tropics have been dominated by monoculture plantations and exotic tree species (Chechina & Hamann, 2015). This practice is being promoted by a growing global carbon market in which maximizing production is the prime objective. Trade-offs associated with a streamlined focus on carbon capture using a few fast-growing exotic tree species clearly include a decreased possibility to develop cultural traditions linked to native trees species into tradable commodities such as in the violin case. From this perspective, it seems like much of current reforestation efforts represent yet another colonial and exploitative step in the negative trajectory of severe remodelling of the landscape and reduction of land tenure by local communities that are adding to previous declines in natural and cultural capital (Manne, 2003; Pretty, 2011; Rapport & Maffi, 2010). Remodelling of native ecosystems in this may also be judged a clear act of environmental injustice as it may be undermining indigenous collective continuance (Whyte, 2018) and may be robbing the global poor of their natural cultural heritage. Diversifying restoration activities and appropriate inclusion of indigenous peoples and local communities is central to environmental justice and sustainable protection of nature (IPBES, 2019).

Promoting a switch to including more native tree species in reforestation offers the opportunity to revitalize or build new ecocultural linkages between people and nature. On this topic, Pretty (2011) suggested that incorporation of local and traditional knowledge systems in management can be used to revitalize ecocultural connections and hence produce optimal outcomes for both nature and culture. In an earlier perspectives paper in *People and Nature*, Freitas et al. (2020) outline the possibility for co-management of culturally important species as a way to promote both biodiversity conservation and human well-being. Incorporation of local and traditional knowledge systems, in opposition to global trends, may increase regional dependence in terms of food production and artisanal products. Our case studies on music provide positive examples where a cultural connection, such as that stemming from the Koa tree of Hawaii and the use of its wood in musical instruments, is used to generate interest and incentives for conservation and restoration of native ecosystems. Furthermore, in Africa, the African blackwood *Dalbergia melanoxylon*, which is known for its exceptionally hard wood used in the construction of woodwind instruments such as clarinets and bagpipes, is used as a flagship species to promote conservation (Ball, 2004). Examples of such projects can be found in The African Blackwood Conservation Project (2019) and the Mpingo Conservation and Development Initiative (2013), for more information see Kweka (2014) and Nakai et al. (2019).

With such high levels of biodiversity, tropical forests have immense ecological value—but this high diversity also presents a challenge in terms of conservation and restoration (Lamb et al., 2005; Löf et al., 2019; Lu et al., 2017). Clearly, hyperdiverse tropical forests represent a huge resource for development of alternative commodities other than timber (i.e. non-timber forest products, NTFP). Examples of such alternatives include alternative sources of food and medicine



(Balick & Mendelsohn, 1992; Shanley et al., 2016) but also opportunities to develop artisanal and specialized products (Sedik et al., 2010; Ulrike, 2006). Research conducted over the last three decades has demonstrated that the value of NTFPs provided by forests may be far greater than that captured by monetary valuations (Alicia et al., 1994; Laird et al., 2011; Pierce, 2014; Shanley et al., 2016). However, to really make use of this diversity in restoration, there is a need for strategic investment in knowledge development throughout tropical regions. Large parts of the tropical forests are located in developing countries, where research capacity is focused on non-native species and rarely supports the use of native tree species (de Jong et al., 2021; Lamb et al., 2005; Lu et al., 2017). Such research development will likely need to include several different aspects; documenting cultural uses of different tree species, conducting research on basic ecology and development of propagation practices suitable for different tree species and assess the different trade-offs associated with the use of native and exotic tree species. There is work being done to improve knowledge of native tropical tree species (Aguilos et al., 2020; Gustafsson et al., 2016; Hooper et al., 2002; Schneider et al., 2014) including research on functional genetic variation (Axelsson et al., 2020). There are also good examples showing that it is possible to incorporate a diverse set of native species in operational restoration (Brancalion et al., 2018; Gustafsson et al., 2016; Schneider et al., 2014). Furthermore, research on the basic ecology of culturally important native tree species could increase the value of reforestation for maintaining biocultural diversity during global climate change (Axelsson et al., 2021).

In this perspective paper, we highlight the potential importance of including ecocultural connections during global reforestation efforts. We argue that restoring native trees will help maintain traditions and knowledge that are critical for development of unique products and that support sustainability and reduce global dependencies. We believe that the benefits of diversifying restoration using native tree species goes deeper than rebuilding ecosystem integrity and providing increased options for alternative income. We want to be clear that we do not claim that cultures and societies necessarily need to be conserved in some historic state to be sustainable. Instead, we suggest that the cultural connections between human societies and native trees, connections that extend through time and that evolve with culture offer opportunities for current societies—and that these opportunities in many cases are fundamentally different from those provided by exotic trees. Furthermore, social participation in reforestation efforts has potential to reach hundreds of millions of people, with an ability to stimulate new modes of consciousness that promote global sustainability. For people to value nature enough to take care of nature requires ecocultural approaches as much as technological approaches. Stimulating interest in stewardship of nature through exposing connections between nature and mainstream popular art or music may invite broader cultural participation in ecological and ecocultural restoration.

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## CONFLICT OF INTEREST

The authors declare no conflict of interest.

## AUTHORS' CONTRIBUTIONS

Authors contributed equally in the development of this paper.

## DATA AVAILABILITY STATEMENT

No data were used in this paper.

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