



Tāne's Tree Trust
NATIVE FORESTS FOR OUR FUTURE
Herehera te Wao-nui-a-Tāne

LESSONS FROM THERMOPYLAE

Written by Ian Brown, April 2022

Thermopylae 480 BCE

One of the first principles of warfare for an army facing superior forces is to select the field of battle. Henry V used this to advantage when confronting the French cavalry at Agincourt. But the most notable example in history occurred much earlier in 480 BCE, when 300 Spartans defended the pass at Thermopylae against a massive Persian army.

For armies approaching Attica along the Western flank of the Balkan Peninsula, Thermopylae has through history acted as a bottleneck. Defending Greek forces have taken a stand there on many occasions, against invaders including Roman and Gallic armies, and the Ottomans in the War of Independence; and most recently, in 1941, the New Zealand 2nd Infantry Division held off a German tank division for 24 hours at Thermopylae.

The Spartans took good advantage of the local geography. At that time, the pass was 20 metres wide, with steep cliffs on the left flank, and a rocky foreshore on the right. As we all know they held the Persians at bay for three days, before they were betrayed, surrounded, and killed.

If you visit Thermopylae today, and hope to re-imagine that great battle, you may be disappointed. The site is signposted, with a memorial to the Spartan leader, and the inevitable visitor facility, but there is no pass to be seen. It is still there, but it is now buried under 20 metres of silt. And where there was once an ocean, there is now an extensive plain, with the shoreline 9 km in the distance.



Above - Buried pass at Thermopylae



Above - Memorial to Leonidas

Thermopylae is located on the western border of the Malian Gulf, and it is clear that over two millennia, vast quantities of silt and gravel have been deposited into its waters.

The principal source of the silt is the Sperchios river, located a few kilometers from Thermopylae. The river winds back 80 km into the mountainous hinterland. The mountains were once heavily forested, but as a consequence of repeated episodes of deforestation have been stripped bare of most of their soils, and reduced to their limestone bedrock.

The process is still active. Old maps show there has been a significant advance in the shoreline over the last 200 years, as forests that were formerly inaccessible have come within reach. And a glance at Google Earth shows beds of silt in the upper reaches of the river, waiting delivery, and a fan of silt extending from the river mouth.

The process of deforestation, and its consequent loss of soils has stripped bare much of the mountainous landscapes of Greece, and beyond it much of the Mediterranean coasts. What makes Thermopylae distinctive is that the enclosed waters of the gulf have held the silt captive, so the evidence is clearly on show. Elsewhere, after filling the valleys and plains, the soils patiently assembled over vast periods of time under forest cover have been shunted off the coasts, to find their final resting place in the floor of the Mediterranean Sea.

Mycenae 1500 BCE

The forests of ancient Greece were first exploited for fuels among Neolithic farming communities 8000 years ago. Studies of sediment cores have shown a series of cyclical episodes in which deep sediment deposits are associated with a reduction of tree pollens, demonstrating a linkage between deforestation and catastrophic soil loss. Within the sediments are fragments of ceramics, revealing the use of forest timbers in pottery kilns.

Over subsequent millennia, the human populations of ancient Greece ebbed and flowed as their fuel sources were exploited and later replenished themselves.

When the late Bronze Age civilisation of Mycenae was established about 1500 BCE, the surrounding hills were densely forested. A wave of deforestation followed, to provide timber for construction and domestic fuels, make room for farms, and support a vibrant export industry in ceramics and bronze products.

The soils were now exposed to winter rains, and began an inevitable migration toward the sea. The first of the soils to depart was the rich brown terra fusca, which forms under forest cover. This exposed the impoverished red subsoils, which then peeled off the hills in massive floods.

Below the citadel of Mycenae, and reaching out to the sea, extends the fertile Plain of Argos. Silt-laden flood waters poured onto the plain, destroying crops and buildings. To protect them the Mycenaean engineers created a massive system of dykes and channels, diverting the floodwaters, but at the cost of siltation in the sea port.

The hills behind the ruins of the ancient citadel are now barren and rocky. Over time, deforestation has formed a triple alliance with the fires that are prevalent in the Mediterranean summers and the ubiquitous goats, which destroy any tree seedlings, and between them have reduced the hills to bedrock.

The Bronze Age cultures went into decline at about 1000BCE. The causes are complex and much disputed by the historians, but the loss of fuel sources through deforestation may have played a part. Later, as the human populations went into retreat, the forests slowly re-established themselves.



Above - Hillside at Mycenae

Athens 5th Century BCE

With the re-emergence of Athens in the 5th century the forests of Attica came under renewed assault. Fuels were needed for construction and domestic use, industries including metal refineries and pottery kilns, and the construction of the Athenian fleets.

The forests also fell victim to war. After breaking through at Thermopylae, Xerxes' armies laid waste to Athens, and as they withdrew they set fire to the forests on their route. And in the Peloponnesian Wars that followed, a series of ritual conflicts conducted like a blood-drenched annual summer festival of war between the Spartans and the Athenians, the Athenians sheltered behind their city walls, while the invading Spartans attacked their fuel supplies by laying waste to the forests of Attica. The resultant erosion was severe, and left behind a legacy of siltation and malaria-infested swamps.

Writing in *Critias*, the great Athenian philosopher Plato described how Attica had been heavily forested not long before his time, but was laid bare by the cutting of timber and grazing; and how subsequent erosion washed away the rich deep soil.

Plato was also aware of the role of forests in recharging water storage systems, a concept that we may regard as modern, but 24 centuries ago Plato had observed the drying up of springs in the wake of deforestation, and wrote: in the forests "the soil they had was deep, and it received the water, storing it in the retentive loamy soil ... and providing abundant springs to feed streams and rivers".

Before the end of the 5th century the environs of Athens were mostly bare. In an elegiac commentary, Plato wrote: "what now remains compared with what then existed is like the skeleton of a sick man, all the fat and soft soil having wasted away, and only the bare framework of the land being left".

The mines of Laurion

In the 5th century the economic and military power of Athens hinged on silver. As life resumed in the ruined city during the half time interval in the Persian Wars, the Athenians struck lucky. A rich lode of silver was discovered at Laurion, south of Athens.

The revenue derived from the mines supported the reconstruction of the city. It paid for the building of the Parthenon, and the construction of the Athenian fleet which defeated the Persian navy at Salamis, and made Athens the dominant naval power in the Eastern Mediterranean. And it supported an explosion of creative activity that gave Athens its Golden Age.

However for all of this there was a terrible human and environmental cost.

A series of wars had provided Athens with a bountiful harvest of slaves. Thousands of slaves, men, women, and children laboured and died in appalling conditions in the mines of Laurion.

The smelters for the mines were hungry for fuels, and the local forests were soon depleted. Timber was then sought offshore. As one historian described it, "the ripple of deforestation that began at Laurion spread like a tsunami to the Mediterranean coasts".

The effect of deforestation can be seen today on the Turkish coast. The ancient city of Ephesus, formerly a coastal trading centre dealing among its products in timber exports, fell victim to the industry that it had created, as it became isolated by siltation from the exposed soils. The city ruins are now located 7Km from the coast.

Mt. Hymettus, Athens

Rising to 1000 metres, Hymettus is a mountain range located on the outskirts of modern Athens. Its proximity to the city has ensured its repeated exploitation for timber, with inevitable consequences. Plato would have had Hymettus in mind when he wrote: "There are some mountains that have nothing but food for bees, but they had trees no long time ago".

In the late 19th century the city authorities decided to restore the mountain for recreational use, giving it the optimistic designation of "Aesthetic Forest". Their good intentions were sabotaged during WW2, when the occupying German forces removed most of the trees, and in the aftermath of the war, the desperate local population, more concerned with survival than aesthetics, removed much of what was left.

The lower slopes are now secure, but above 500 metres the mountain has been reduced to bedrock. In an exercise in futility the authorities blasted holes in the bare rock with dynamite, filled them with soil, and planted pines, producing a crop of bonsai pines, which grew to less than 3 metres before most of them died.

Viewed from the Acropolis in Athens, the bare summit of Hymettus defines the eastern skyline. Like the bare mountains of much of Greece, it is often admired by tourists and poets for its stark beauty. But It might be viewed from an alternative perspective, as a reminder of what once existed, and has now been lost.

Resilience

In an often quoted passage, George Santayana wrote in 1905: "Those who cannot remember the past are condemned to repeat it".

This may be true, but it is not so simple. Historians are notoriously better at explaining past events than predicting future ones. And history, like the sacred books, lends itself to selective readings. We tend to withdraw from the deep well of history those stories that we wish to hear, not those that we need to hear.

The message from Thermopylae, where the Spartans made their stand and died on that narrow pass, is a powerful story of heroism and sacrifice. However there is another message, in the now buried pass, and in the ravaged hills behind it. There is a price to be paid for a sustained assault on the natural world, and for neglect of the intimate relationship that exists between the forests, and the soils that they have created and that sustain them.

The forests will fight back, but there is a limit to their resilience. When that is reached the forests will be gone forever, and as the bare summit of Hymettus has shown, not even the power of dynamite will bring them back.

Tutira 1921

In 1880, aged 19, and fresh from school in England, Herbert Guthrie-Smith arrived in New Zealand. Two years later, with all the confidence of youth, and a vision of pastoral England, he and a former school mate leased a 20,000 acre property at Tutira, in the Northern Hawkes Bay, and set about transforming it into a sheep farm. The property was a sea of bracken, had low fertility, and access was difficult, and for years they lived on credit.

Over the following decades, while struggling with his tasks, Guthrie-Smith found time to make meticulous observations of the land, its history and biota, and the impact on it of a transplanted culture and its alien species. And 40 years later he documented it all in one of the great classics of environmental literature.

Tutira: The story of a New Zealand sheep station, is unique. Written in a highly idiosyncratic prose style and enlivened with flashes of humour, it is encyclopaedic in scope and almost obsessional in detail. But its message is more than local. It shows how a lens tightly focussed over time on a small patch of land can illuminate those broad principles that underlie our colonial experience over the rest of it.

The lost forest

Guthrie-Smith soon became aware that the "illimitable sea of bracken" that dominated Tutira had been "within a very recent period wholly under forest". In the bogs he found tree stumps, predominantly totara, some up to 5 metres in diameter. And on the surface there were hollows and hummocks derived from burnt out roots. The agent of change was clearly fire, and recent studies have dated this to 500 BP, close to his estimated date.

Core samples from Lake Tutira have shown a heavily forested landscape in pre-human times, dominated by totara, rimu and matai, and with a wide range of hardwood trees, shrubs, climbers and ferns. Subsequent fires have supported the dominance of bracken.

The bracken was a head-high thicket, multi-layered, and barely penetrable. The method chosen for control involved "fern crushing". After firing, and as the young fronds, barely palatable, were unfolding, grass seeds were spread and the property then mob-stocked with unhappy, but hungry sheep. Mortality was high. Grassing was "accomplished by brute force", in which "the surface had to be stamped, jammed, hauled and murdered into grass".

The imported grasses mostly died, but there was some replacement with native grasses and clover. However the next stage of transition took an unexpected turn. Manuka, previously confined to patches on high slopes and ridges, entered the game. "The reign of bracken- a sovereignty of centuries- was in truth passing away; the day of manuka had dawned".

With hard slog, time, fires, better grasses and sheep breeds, the manuka was eventually controlled, and what emerged was now a property ready for serious farming. However there was an unintended consequence: with the replacement of native species by shallow-rooted grasses, it was also prepared for some serious erosion.

Erosion

The soils of Tutira are of marine origin. based on sandstones and siltstones. Overlying these are 14 tephra of volcanic ash, the most recent from the Taupo eruption of 1850 BP, and covered by a thin layer of humus.

Tutira, like much of our coastline, is located in a zone of coastal uplift, which averages 2 mm per year. With the ebb and flow of sea levels linked to ice age sequences, expanses of elevated seafloor are periodically exposed, ready to be invaded, held in captivity, and stabilised by native forests.

This is a fragile relationship between trees and soil, but studies have shown that in pre-human times the forests prevailed, and erosion was confined to occasional landslides and some channel erosion. (Lake Tutira was formed about 7200 BP. by a massive landslide, probably caused by an earthquake).

With the advent of bracken, bearing a matted network of rhizomatous roots, erosion remained moderate. However as bracken gave way to pasture, there was a dramatic increase in erosion.

Erosion took several forms, well documented in *Tutira*. Most conspicuous were the slips, in which "sometimes a whole hillside will wrinkle and slide like snow melting off a roof". Tutira is subject to exceptional storms, in which "under 3 to 4 days of uninterrupted torrential rain I have counted on a 2 mile stretch of hillside over 200 slips great and small in which huge masses of solid hill have slid onto the larger flats".

As he warms to his theme he describes a type of gully erosion, resembling " a remarkable process of subcutaneous erosion, akin to the dissolution of a dead beast when first the flesh decays, and then the skin shrinks and shrivels, whilst only at the last do the bones protrude". Finally, a pervasive but insidious form of sheet erosion in which "the land creeps" and flows downhill.

What is described here is a slow but relentless migration, in which the soils of Aotearoa, released from natural protection, are returning to the sea from which they arose.

"Everywhere the ocean robs the upland farmer, but nowhere more brazenly than on Tutira"

Restoration

As a product of Rugby School in the U K in the Victorian era, Herbert as a young man was inevitably brought up in the school tradition of "muscular Christianity", and with it a conviction of the moral destiny of the British Empire. However as he set about to reconstruct his chosen place in the image of rural Britain, he found in himself an increasing affection for his strange new homeland, its landscapes, its natural forests and birdlife, and with it a growing awareness of what had been lost. With that he turned his mind to the possibility of restoration.

In the third edition of *Tutira*, Guthrie-Smith considered a practical strategy that might be adopted. Over several decades he had seen, in patches of gully protected from fire and livestock, evidence of the natural resilience of native forests. In the transition from bracken to manuka and as light entered the understory there had been "an insurrection of green leaved tree species". However the natives were now jostling for space with alien invaders, and these soon became dominant.

His proposal, as a method of selectively favouring native plants, was to manipulate the light environment. We might "call up the Powers of Darkness", which would "take shape as some tall exotic species such as *Cupressus macrocarpa*". Once established, and the understory deeply shaded, the trees would be ring-barked, allowing light to slowly filter through, and favouring the native species. It is interesting that the concept of transitioning from exotic to native species, currently receiving much attention, was articulated by the author of *Tutira* more than 80 years ago.

In the third edition of his great book, Herbert Guthrie-Smith reflected on his life's work, and on the loss of the native forests, and linked to that "my contribution towards more quickly melting New Zealand through erosion into the Pacific", and he allowed himself some subversive thoughts.

Finally he wondered, "should he be content to leave alone? Admire, conserve, let well alone...Have I then for 60 years desecrated God's earth and dubbed it improvement?".