

Distant Affinities



Coast Redwoods, California, USA



Giant eucalypts, Styx valley, Tasmania, Australia

The challenges facing temperate forests in World Heritage Areas (USA, Slovakia and Japan)

Report to the Winston Churchill Memorial Trust of Australia, December 2011

Geoff Law, 2010 Churchill Fellow

The Winston Churchill Memorial Trust of Australia

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Geoff Law
12 December 2011

Cover photographs: A Californian Coast Redwood juxtaposed with a giant *Eucalyptus regnans* in Tasmania's Styx valley.

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Glossary

Buffer Zone	An area surrounding the World Heritage property which has complementary legal and/or customary restrictions placed on its use and development to give an added layer of protection to the property.
Climax forest	Vegetation that has reached equilibrium with its environment and does not require disturbance to regenerate. It is the culmination of a series of successional changes in the development of plant-communities over time.
Coast Redwood	<i>Sequoia sempervirens</i> , the world's tallest tree-species. Occurs along the coast of California and southern Oregon.
Core Area	The primary part of a World Heritage property, occurring within the buffer zone.
Giant Sequoia	<i>Sequoiadendron giganteum</i> , the most massive tree-species in the world. Occurs on the western slopes of California's Sierra Range.
GSMNP	Great Smoky Mountains National Park (USA).
Integrity	Integrity is a measure of the wholeness and intactness of the cultural or natural heritage within a World heritage site.
IUCN	The World Conservation Union.
Karst	A type of topography that results from dissolution and collapse of carbonate rocks such as limestone and dolomite and characterised by closed depressions or sinkholes, caves, and underground drainage.
NGO	Non-Government Organisation.
NPS	USA National Parks Service.
Oldgrowth forest	Ecologically mature forest where the effects of human-caused disturbance are negligible.
Primary forest	Original forest prior to disturbance by logging.
RNSP WHA	Redwood National and State Parks World Heritage Area (USA)
SKCNP	Sequoia and Kings Canyon National Parks (USA)
TPWS	Tasmanian Parks and Wildlife Service.
TWWHA	Tasmanian Wilderness World Heritage Area.
WHA	World Heritage Area – an area inscribed on the World Heritage List for its outstanding universal values by the World Heritage Committee under the rules and guidelines of the World Heritage Convention.
World Heritage Convention	An international treaty whose objective is protection of the world's natural and cultural heritage. In 2011, the treaty had 188 signatories, including Australia.

Executive Summary

Project: The challenges facing temperate forests in World Heritage Areas
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The objective of the study tour was to gain insights into the protection and management of forests in World Heritage Areas in the northern hemisphere for application back in Australia and, in particular, in Tasmania. The forests in the Redwood, Yosemite, Sequoia and Great Smoky Mountains national parks of the USA; the Carpathian Beech Forests of Slovakia; and Japan's Shirakami-Sanchi all displayed striking affinities with their Tasmanian counterparts.

Critical conclusions are as follows:

- The ecological importance of protecting large tracts of undisturbed forest in World Heritage Areas was affirmed. The Tasmanian Wilderness World Heritage Area should therefore be extended to embrace adjacent oldgrowth forests in areas such as the upper Derwent, Styx, Florentine, Weld, Huon and Tarkine. A Styx Valley of the Giants National Park should be established as a southern counterpart to the Redwood National Park;
- Restoring forests that have been damaged by logging is a crucial part of World Heritage management in the USA and Slovakia and should be carried out in key habitats in Australia, including in tall-eucalypt forests such as those of Tasmania's Styx valley;
- Keeping substantial areas of forest free from the impacts of human access and exotic biological invaders is crucial for maintaining the ecological integrity of protected areas;
- Restoring natural processes such as fire to protected areas has been a crucial part of management in many USA national parks. It should be done in appropriate parts of Australia's protected landscapes, but subject to a super-precautionary approach, given recent and well-documented misadventures with 'controlled' burns;
- Tourism opportunities are best developed on the fringes of large tracts of forest that remain undeveloped at their core;
- External support for national parks in the form of fundraising and management assistance by volunteers and NGOs helps moderate the ebb and flow in government funding for parks, and is crucial at times of severe budgetary pressure;
- Protecting substantial areas of unmodified forest is necessary to sequester carbon from the atmosphere and to reduce the ecological impacts of climate change on those forests;
- Tasmania's giant trees could contribute more to the state's tourism industry if reserves in places such as the Styx valley were managed by the Tasmanian Parks and Wildlife Service rather than by Forestry Tasmania; if half-day walking tracks were developed; and if signs and brochures conveyed the same awe, reverence and pride displayed by managers in the USA, Slovakia and Japan.

To advance these recommendations, this report will be widely circulated amongst conservation NGOs, government agencies, government ministers and other decision makers. These insights have already formed a part of my continuing work for the future of Tasmania's wilderness.

Some requests are respectfully made to the governments of places visited. The USA government is requested to consider placing the Great Smoky Mountains on the World Heritage in Danger list because of the threats from biological invaders and lack of funding. Designation under the Wilderness Act is recommended. The USA government is also requested to nominate the Sequoia National Park for World Heritage. The Slovakian government is requested to consider re-nominating the Primeval Beech Forests of the Carpathians in larger, better defined areas with full protection from logging, and with rehabilitation of areas damaged by logging. The Japanese government is requested to consider providing further support and encouragement to volunteers and volunteer organisations in the management of Shirakami-Sanchi, particularly in the Fujisato area.

Program

Table 1.

Date (2011)	Place	Activity, person, organisation, subject matter
18 May	Hobart - Sydney - San Francisco	
19 May	San Francisco	Emily Limm (Director of Science), 'Save the Redwoods League' – two-and-a-half-hour discussion about current conservation issues with Redwood forests, including facts and figures, budgetary pressures, climate-change impacts, and significance of Redwoods for storing carbon
22 May	Humboldt Redwoods State Park, California	<ul style="list-style-type: none"> • Avenue of the Giants drive, South Fork Eel River; • Rockefeller Loop Trail – giant trees, Bull Creek and education signs
23 May	Crescent City, California, Redwood National and State Parks Headquarters	National Park Service and California State Parks, Steve Chaney (Superintendent NPS) and Jeff Bomke (Sector Superintendent) – two-and-a-half-hour discussion of management of Redwood National and State Parks, including restoration of previously logged areas, visitation, budgetary pressures and fire management.
24 May	Hiouchi Visitors Centre, Jedediah Smith Redwoods State Park	<ul style="list-style-type: none"> • Nature trail and a ranger mistaken for a bear. • Interpretation training for trainee rangers. • Brief discussion and inspection of visitors centre. • Hiouchi Trail – giant trees and their ecology; banana slugs
25 May	Prairie Creek State Park Prairie Creek Redwoods State Park Visitors Centre	<ul style="list-style-type: none"> • Lucille Vinyard, Diane Beck and Sue, Sierra Club (North Coast Redwoods Chapter): two-and-a-half-hour discussion of conservation history of Redwoods circa 1970s. • Inspection of Visitors Centre, Revelation Nature Trail and educational signs.
26 May	NPS Headquarters, Orick	Mike Sanders (RNP Watershed Restoration Geologist) – discussion of rehabilitation of logging roads and regrowth forests in logged areas within World Heritage Area
26, 27 May	Lady Bird Johnson Nature Trail, Elk Prairie Trail, Cathedral Trees Trail, Prairie Creek Trail, Revelation Trail	<ul style="list-style-type: none"> • Inspection of education trails, brochures and signage. • Viewing DVD about restoration of forests. • Discussion with volunteer ranger.
5, 6 June	Mariposa Grove, Yosemite National Park; General Grant Grove, Kings Canyon National Park	<ul style="list-style-type: none"> • Inspection of education trails, brochures, fire management and signage; writing; logistical organisation; • Discussion with volunteer ranger.
8 June	Giant Forest, Sequoia National Park	<ul style="list-style-type: none"> • NPS meeting: Deb Schweizer (Fire Education Specialist) and Tony Caprio (fire-management officer) – two-and-a-half-hour discussion and field trip regarding fire history and fire management in the Giant Forest. • Field trip: Giant Forest, rehabilitated tourist sites, six bears.
9 June	Giant Forest, Sequoia National Park	Field trip: rocky view point, national-park trails, giant trees, educational signs, meadows and bears.

Date (2011)	Place	Activity, person, organisation, subject matter
13-14 June	San Francisco to Nashville to Great Smoky Mountains (Tennessee)	
15 June	Great Smoky Mountains NP (GSMNP): Clingmans Dome, Appalachian Trail, Sugarlands Visitors Centre.	Ray Payne, Sierra Club (Harvey Broome Chapter). All-day field trip and discussion about conservation issues in GSMNP: biological threats, need for Wilderness Act to apply, lookouts, Appalachian Trail shelter, and one coyote.
16 June (morning)	GSMNP Headquarters	NPS meetings: <ul style="list-style-type: none"> • Kevin Fitzgerald (assistant superintendent) and Bob Miller (management assistant): Discussion of general management issues GSMNP, including high visitation, budgetary issues, lack of entry fees, external support. • David Loveland, Mark Taylor and Rob: Discussion of fire management in GSMNP.
16 June (afternoon)	Twin Creeks Science and Education Centre, Gatlinburg	NPS meetings: <ul style="list-style-type: none"> • Kris Johnson (forester) – biological threats to GSMNP and remedial actions. • Keith Langdon (biologist) – ‘All Taxa Biological Inventory’ and community involvement in this project.
17 June (morning)	GSMNP Headquarters	NPS meeting: <ul style="list-style-type: none"> • Karen Ballentine (education) and Liz – education and outreach; development of custodianship; • Field trip to Laurel Falls: crowds, volunteer rangers, butterflies, flowering trees, views and a trail-side snake.
17 June (afternoon)	Cades Cove, GSMNP	<ul style="list-style-type: none"> • Drive Cades Cove Loop – traffic jams and a bear; • NPS meeting: Mike Maslona (interpretation). Discussion of broad national-park issues, including visitation, traffic, park history and the future of national parks in a period of budgetary pressure.
18 June	GSMNP	Writing and logistical organisation
19-22 June	GSMNP	Field trip: oldgrowth forests, regenerating catchments, numerous trails, Appalachian Trail, one AT shelter, three campsites, a salamander, snails, butterflies, and an overly close encounter with a mother bear and her cub.
23, 24 June	Gatlinburg-Nashville	Transit, logistical organisation, writing and resting
25-26 June	USA-Germany	
2 July (all day)	Banska Bystrica (Slovakia)	Juraj Vysoky, Forest Stewardship Council Slovakia – forest field trip (including an encounter with a young bear), lunch, office meeting and discussions about Slovakian oldgrowth forests, World Heritage boundaries, and management.
4 July (all day)	Nova Sedlica (Slovakia and, briefly, Poland and the Ukraine)	Field trips to Stuzica forest, Carpathian Beech Forests WHA: visitors centre, educational signs, walking tracks, oldgrowth forests, mountain tops, and an encounter with a Polish border guard after stepping one metre inside the Ukraine without passport.
5 July (all day)	Vihorlat forest (Slovakia)	Forest conservationist and journalist Peter Sabo – field trip and discussion of oldgrowth forests, World Heritage boundaries, and integrity.

Date (2011)	Place	Activity, person, organisation, subject matter
6 July	Kosice (Slovakia)	Writing and logistical organisation
7 July (afternoon)	Osadne (Slovakia)	Dáša Lukáčová, LZ VLK ('Wolf' – a conservation NGO) – discussion of Slovakian forest conservation.
8 July	Udava forest, Solinka International Forest Trail and Balnica cottage (Slovakia and Poland)	Udava forest field trip: logged areas, World Heritage oldgrowth forests, education signs, forestry railway converted to tourist train, beaver dam but no beaver, and unseen large fleeing mammals in the undergrowth.
9 July	Osadne (Slovakia)	Juraj Lukáč, Director, LZ VLK ('Wolf' – a conservation NGO) – discussion of forest conservation in Slovakia, efforts of NGOs to protect 10% of forested land in Slovakia
18 July 9 am – 4 pm	WWF Carpathian Program Headquarters, Vienna (Austria)	Michael Zika (Natur- und Umweltschutzabteilung program) WWF – discussion of wilderness protection and restoration programs in Europe, including Natura 2000 parks, PAN Parks, and Re-Wilding Europe program
20-21 August	Germany-Japan	
1-3 September	Shirakami-Sanchi World Heritage Centre, Nishimeya, northern Honshu, (Japan)	Ms Mari Yamazaki (Ranger), Japanese Ministry of the Environment - meetings and field trip into Shirakami with volunteer scientists and students including members of the monitoring team, Professor Nakashizuka from Tohoku University; Professor Makita from Akita Prefecture University, and Professor Munekatsu Saitoh from Morioka University Places visited: Shirakami-Sanchi World Heritage Visitors Centre; World Heritage Conservation Centre; monitoring trip base camp; monitoring trip field plots; Akaishiohashi Bridge; Mother Tree; and Tarkine-like rainforests in headwaters of major rivers.
1 and 4 September (morning)	Shirakami-Sanchi World Heritage Visitors Centre, Nishimeya (Japan)	Inspection of superb educational materials, signs, brochures and IMAX film.
4 September (afternoon)	Anmon Falls, Shirakami-Sanchi WHA (Japan)	Field trip (substitute for last day of monitoring trip, cut short due to circumstances beyond the organisers' control) – waterfalls, boardwalks, rainforested gorge and discussion of democracy with visiting Chinese law student and Party member.
5, 6 September (all-day meetings and field trips)	Fujisato Nature School (Bunakko Kyoshitsu), Akita Prefecture, Northern Honshu (Japan)	Meetings and field trips with local conservationists: <ul style="list-style-type: none"> • Koichi Kamata (Director-General) Conservation Society Virgin Beech Forest in Shirakami Mountain Area; • Zenkichi Ichikawa, mountain guide and author; • Kazuko Sao, editor, writer and board member of Fujisato Nature School; • Naoto Sato, translator. Visits to Dokedai Forest Reserve; Tsurube Pass; Fujisato World Heritage Visitors Centre; Mt Kodake: rainforests, mountains, big trees, logged areas, educational signs, forest haiku, tree calligraphy, mushrooms.
7 September	Fujisato-Tokyo	Travel, logistics, writing and preparation of presentations

Date (2011)	Place	Activity, person, organisation, subject matter
8 September	Sophia University (Tokyo)	Professor Kuninori Otsubo (Graduate School of Global Environmental Studies), Sophia University: <ul style="list-style-type: none"> • Presentation and discussion.
9 September 10.15 am - 2 pm	University of Tsukuba (outside Tokyo)	Associate Professor Masahito Yoshida (World Heritage Study Program, Graduate School of Comprehensive Human Science), University of Tsukuba: <ul style="list-style-type: none"> • Presentation and discussion with graduate students; • Discussion about Shirakami-Sanchi boundaries, management, forestry agency issues, and climate change.
10-11 Sept	Tokyo-Seoul-Sydney-Hobart	

Introduction

For nearly 30 years, the state of Tasmania has seen an intense but necessary debate between the logging industry and conservationists over the future of the island's forests. At the heart of the dispute are the giant eucalypts, rainforests and pristine valleys of Tasmania's western wilderness.

Recently, the Tasmanian forests debate has appeared close to resolution. In 2010, conservationists and representatives of the forestry industry began negotiations following the collapse of major parts of the industry's market. In September 2010, the state's biggest logging company, Gunns Limited, announced that logging of native forests would no longer be a part of its future. In August 2011, the Tasmanian and Australian governments agreed to protect up to 572,000 hectares of forest (subject to 'verification') and to re-structure the logging industry using \$276 million of taxpayers' funds. If this occurs it will set a precedent across the country, with similar debates over logging in Victoria, NSW and Western Australia facing similar resolution.

Yet this situation presents brand new challenges for both the community and the forests themselves. In particular, the following questions are raised:

- How do we determine the boundaries of new national parks and World Heritage Areas to ensure the long-term viability of those places?
- What about forests that occur within valleys crucial for conservation but which have been damaged by intense logging operations?
- How can we best appreciate these spectacular landscapes without 'loving them to death'?
- How can we ensure these places receive the care they deserve at a time when budgets for land management are under pressure?
- How do we protect these landscapes from fire while maintaining their relationship with fire?
- How do we respond to climate change and the stresses this will bring to particular environments?

The objective of this Churchill project was to learn from managers and conservationists in places where the logging debate is over – in forests where a relationship with magnificent temperate forest environments has been developed outside of a battlefield situation. World Heritage Areas were selected as the places to learn from because of the higher standards of management, scrutiny, reporting and international discussion that apply by virtue of the World Heritage Convention.



Forest trail, Redwood National and State Parks, California, USA.

Many overseas World Heritage forests share affinities with Tasmania. Those with characteristics such as giant trees, ancient rainforests and glacial refugia were sought for study, including:

- The Californian Coast Redwoods (USA)

California's 'coast redwoods' are the tallest trees on Earth. Tasmania's eucalypts are the tallest hardwood trees and flowering plants on Earth and are only 12 metres less tall than the Coast Redwoods. Tasmania's forests occur at the same latitude south as the redwoods' northern latitude (about forty degrees). The 'forest wars' over the future of the Redwoods were similar to those in Tasmania but have been largely won or lost.

- The Giant Sequoias (USA)

These are the most massive trees on Earth. They are a major tourism attraction in famous national parks such as Yosemite. They occur in a much drier environment than the Coast Redwoods and have a very defined relationship with fire.



Author Geoff Law at the base of a Giant Sequoia, Sequoia National Park (USA)

- The Great Smoky Mountains (USA)

The 'Smokies' affinities with the Tasmanian Wilderness include a similar altitudinal range and mixture of habitats, from forest to natural grassy clearings. There is very high biodiversity. However, the Smokies suffer from massive over-use at 9-10 million visitors per annum, air pollution from adjacent industrialised areas, inadequate management budgets, and biological invasion from exotic pests and diseases.

- The Primeval Beech Forests of the Carpathians (Slovakia)

The Carpathian forests in Slovakia, Ukraine and Poland have affinities with the Tasmanian beech forests of the Tarkine and West Coast. They are both 'recolonisers' after the last Ice Age. The Carpathians boast the 'tallest and largest beech species in world at 50 metres tall' – a height similar to that of the tallest Tasmanian beech trees.



The author next to an oldgrowth tree in the Carpathian beech forests, Slovakia, July 2011.

- Shirakami-Sanchi (Japan)

This World Heritage Area in northern Honshu protects Japan's largest remaining pristine stand of beech forest. Shirakami's latitude is 40.5 degrees north, so is as far north of the equator as Tasmania is south, and has similar topography and altitudinal range to the rainforests of Tasmania's Tarkine and west coast. Protection for Shirakami-Sanchi was won only after a decade-long battle against a new logging road.

The respective institutions have much to offer by way of knowledge and experience. The USA has conservation organisations of long standing such as the Sierra Club and Save the Redwood League. The USA National Parks Service is well resourced by international standards with well-developed and transparent thinking on management. The Carpathians are part of an area of strong international focus by NGOs such as WWF as well as the institutions of the European Commission. The Shirakami forests of Japan are managed by the Department of Environment and Forestry Agency and were defended in the 1980s by local groups and the Nature Conservation Association of Japan.



The rugged rainforested topography of Shirakami-Sanchi, Japan.

Most of the insights gained will be applied to advocating protection of Tasmania's forests and to the management of an extended Tasmanian Wilderness World Heritage Area (TWWHA). This world-renowned tract of wilderness contains a wealth of landscapes, habitats and values. Ancient endemic pines grow along the wild western rivers and in the cold, wet highlands. Thousand of glacial lakes adorn an extensive plateau. Great speleothems ornament capacious caves that are habitat to rare, strange invertebrate creatures. Artefacts and the detritus of thousands of years of campfires are hidden in remote caves once inhabited by the most southerly people on the face of the planet during the last ice age. Dramatic mountains whose serrated skylines were fashioned by glaciers tower over deep valleys of rainforest. And in close association with those rainforests and wild rivers are Tasmania's oldgrowth tall-eucalypt forests – increasingly rare, precious and threatened.



The author in front of a giant eucalypt (threatened until 2004) in Tasmania's Styx Valley, the world's greatest concentration of giant hardwood trees.

Redwoods National and State Parks World Heritage Area (USA)



Area: 56,883 ha

Year of World Heritage listing: 1980

Parks: Redwood National Park and Del Norte, Prairie Ck and Jedediah Smith Redwoods state parks.

Management agency: National Park Service

General description

The famous Redwood forests of the USA's Pacific coast contain the world's tallest trees – giants reaching 115 metres tall and up to seven metres wide at the base. They tower over a verdant understorey and a forest-floor carpeted in ferns, flowering plants and deep leaf-litter. The Redwoods' scientific name is *Sequoia sempervirens*, the latter word meaning 'ever-living'. Some Redwood trees are more than 2000 years old. Yet even this period is but a fraction of the history of the Redwoods' ancestors. Their fossil record extends back over 160 million years in many other parts of the Earth, including Asia and Europe. Today, the Redwoods' closest relatives are the Giant Sequoia (*Sequoiadendron giganteum*) of the Sierras and the Dawn Redwood (*Metasequoia glyptostroboides*) of China.

Forests of *Sequoia sempervirens* occur only in a narrow, broken strip from Monterey Bay, south of San Francisco, up the coast of California to southern Oregon – hence their common appellation as 'Coast Redwoods'. Here, the mild, moist climate, with frequent summer fogs, approximates the conditions that prevailed over much larger parts of the Earth in aeons past when the Sequoias' ancestors were widespread.

The biggest of the Coast Redwoods occur in the valleys of northern California. Between the towns of Eureka and Crescent City are the Redwood National Park and State Parks (RNSP), a 57,000-ha tract of wild country that holds approximately 40,000 ha of Coast Redwood forest. The forests and prairies combine with great rivers, lagoons, estuaries and a wild Pacific shore to create habitats for an array of species, from the small and endangered marbled murrelet to large mammals such as the black bear and Roosevelt elk. The protected area extends one quarter of a mile (approximately 400 metres) offshore, into the habitat of whales, dolphins, sea lions and sea birds.

The parks are managed by the National Park Service (NPS) and the California Department of Parks and Recreation in accordance with the 2000 Management Plan and a 2007 'cooperative management agreement' between the two organisations. Their efforts are bolstered by volunteers (13,685 hours' worth in 2007) and funds from the Redwood National Park Association, which contributes up to \$500,000 per annum.

Conservation history

Battles over the future of California's Coast Redwoods began in the 19th century as the logging industry expanded to service a booming population. Between 1902 and 1930, several state parks were declared to protect stands of well-known giants. The Save the Redwoods League, established in 1918, played a major role in advocating protection for giant Redwoods. Many of the newly reserved lands were acquired by the League through purchase from logging companies and ranchers. In 1968, Congress declared the Redwood National Park and a ceremony attended by then President Richard Nixon, then Governor Ronald Reagan, and former First Lady Lady Bird Johnson was held in the forests to mark the occasion.



Rockefeller Grove, Humboldt State Park, California, dedicated in September 1931 thanks to a donation of over one million dollars by John D. Rockefeller, Junior, to the *Save the Redwoods League*.

Unfortunately, the vast majority of the Coast Redwood forests remained under the control of logging companies. The boundaries of the new national park were contorted in a strange tadpole shape, its tail protecting only 400 metres of forest on either side of Redwood Creek. Similarly, many of the state parks acquired through purchase had irregular boundaries not conducive to the long-term viability of the forests contained within them.

To rectify this problem, the Sierra Club pushed for the protection of entire catchments. But the logging industry redoubled its efforts. The companies worked 'twenty-four seven', with night-time logging operations occurring under floodlights, to extract as much timber as possible before the conservation movement prevailed. Aggressive bumper stickers (such as KISS MY AXE) appeared

and attempts at intimidation of the conservation movement occurred. The local newspaper – the *Eureka Times Standard* – was hostile to conservation. Lucille Vinyard, a founding member of the Sierra Club’s local campaign group, now in her nineties, describes the resulting campaign as ‘a real battle’, with ‘a tenseness about the whole affair’.



Redwoods conservationist, Lucille Vinyard, May 2011

Loggers surrounded a venue for Congressional hearings in their trucks, creating pandemonium. ‘I was scared’, Lucille said. But by dint of perseverance, the campaign made progress. Students from the Humboldt University were active in the cause. A relentless program of flights and field trips for journalists, politicians and other opinion leaders bore fruit and in 1978, Redwood National Park was extended to include major sections of the catchment of Redwood Creek. Congress authorised the National Park Service to rehabilitate large logged areas within the park’s extensions. The efforts of major figures in the conservation movement, including Lucille Vinyard, were recognised by the conferring of special awards by the Sierra Club and the Government. Further extensions to national parks subsequently occurred.



Map 1. Extent of Californian Coast Redwood forest, with oldgrowth shown in red.

Despite the gains, immense damage to the Coast Redwoods has been done. Logging has reduced the area of ancient forest to only 6% of its original extent. Of the approximately 800,000 ha of Coast Redwoods 200 years ago, 609,000 ha remain (most degraded by logging), with over 50% of that being owned by logging companies. Only about 47,000 ha of Coast Redwoods remain as oldgrowth, and only three quarters of that is protected in conservation reserves.

The parks' facilities are very well managed. If the NPS could start from scratch, however, it would not place campsites in sensitive areas, such as groves of giant trees. In future, such developments will occur outside the boundaries of the parks.

According to park managers, the carrying capacity of the Redwoods World Heritage Area has not been exceeded, with the exception of a few particularly popular sites such as the Lady Bird Johnson Grove and the Tall Trees Grove. But even here, the problem is not the numbers of people but the numbers – and sheer size – of motor vehicles. While parking and camping facilities are routinely filled to capacity during summer holidays, the walking trails themselves are, if anything, under-utilised. Restrictions on their use apply largely due to the seasonal requirements of endangered species such as the marbled murrelet or spotted owl.

Major issues facing the Coast Redwood forests

Boundaries, integrity and restoration

The USA's remaining ancient Coast Redwood forests have been seriously fragmented by logging and over 7000 kilometres of logging roads. RNSP is no exception. Only the lower 40% of the catchment of Redwood Creek was incorporated into the Park and large parts of this had already been logged. The park contains over 660 kilometres of failing roads. Over half of the park's forests had been seriously damaged by logging prior to their inclusion with the Park. Upstream of the park, the majority of Redwood Creek's catchment remains subject to logging operations that have continued to this day. The impacts of these past, present and future logging operations have created serious problems for the integrity of RNSP.

Heavy rain on the steep, damaged soils has caused severe erosion. Many of the loggers' roads, bridges and culverts were constructed according to standards inadequate to deal with high sediment loads. As a result, giant Redwoods downstream have been smothered by silt; aquatic environments have been degraded; and native fish such as salmon are endangered. According to the NPS, the impacts of past roads and logging remain the biggest issue facing the Parks today.



1978 U2 photo showing clearcuts and a web of forestry roads in an area incorporated into Redwood National Park and subject to rehabilitation. Photo courtesy NPS.

Within the RNSP itself, oldgrowth Coast Redwood forests cover about 31 percent of Redwood National Park, while post-logging regrowth covers about 55 percent. Many of the oldgrowth stands that occur within this fragmented landscape suffer ‘edge effects’ such as diseases and wind-throw, and are not big enough to support fauna that requires large areas of old trees.

When the Park was expanded in 1978, Congress instructed the NPS to restore the forests. According to a NPS documentary ‘this unprecedented move changed the concept that national-park lands, when acquired, had to be in pristine condition.’ The NPS devoted serious efforts to removing roads. Early attempts at using non-invasive means of restoration were inadequate to cope with the onslaught of silt, landslides and collapsing roads in this unstable environment. The NPS realized that the same methods used by the loggers to construct the roads would be required to restore the natural contours of the land. Heavy earth-moving machinery was deployed. Since 1978, the NPS has removed over 400 km of roads at a cost of \$21 million. Another 240 km of roads are slated for removal at an estimated cost of \$45 million.

According to the NPS, some 40% of the regenerating trees in cut areas within the Parks are impaired. In these areas, the NPS has attempted to restore the natural character of a Coast Redwood forest by cutting and removing ecologically undesirable trees. Sometimes the logs obtained from these thinning operations have been sold to help recoup costs. A further 4000 ha of such forests will require treatment at a cost of approximately \$5 million.

To help protect the Park’s integrity, Congress established a 12,000-hectare Park Protection Zone (PPZ) upstream of the Park boundaries. Within this area, it is mandatory for companies to consult with the NPS about the conduct of their logging operations. Formal agreements have been formed with landowners in the PPZ to control erosion. This has included removal of some logging roads.

Budget cuts

Costs of restoration of forests and roads are increasing with time. Many of the funds spent until now have come from non-renewable, one-off grants. Recovery of the ecosystem within the RNSP depends on long-term, secure funding at a time when the USA as a whole is suffering significant budgetary pressures.

Coast Redwood forests face these issues not just in the RNSP but throughout their entire range. In California and southern Oregon, governments, logging companies and the public are having to come to grips with ecologically impaired forests, failing logging roads, the impacts of erosion and sedimentation, and drastic cuts to government budgets. In California, such pressures have bitten deeply into the local Parks network, with over 70 State parks – including Del Norte, part of RSNP – slated for closure in 2011 due to lack of funds.

On top of this comes climate change.

Climate change

According to the Save the Redwoods League, the Coast Redwoods ‘stand at a new crossroads of environmental change where urbanization, habitat fragmentation, pollution, invasive species and climatic changes threaten them in ways they have not yet experienced in their long history on Earth.’ The Coast Redwoods are experiencing ‘temperature increases, less coastal fog, reductions in snowpack and earlier snowmelt. Climate change will interact with many other stressors... The current and projected interactions of these stressors jeopardise more than 90 years of League conservation work.’ The League goes on to warn that ‘under a pessimistic outcome, in which we continue emitting greenhouse gases at the current rate, much of the current habitat for coast

redwoods is no longer suitable.’ The recent 30% reduction in coastal fogs, in particular, could cause dramatic permanent loss of Coast Redwood habitat.



Banana slug, Prairie Creek State Park. The Coast Redwoods and the creatures dependent on them require an environment that remains moist.

To address this potential impending ecological collapse, the League has initiated the Redwoods and Climate Change Initiative, a long-term scientific study of Redwoods and their characteristics – from the canopy, to the rings in the tree trunks, and the tiny creatures in the forest soils. Using the results, conservationists hope to plot a way forward for their future work in purchasing, managing and advocating for the Coast Redwoods.

Already, the League is refocussing some its efforts. Having spent its entire existence acquiring blocks of Redwood forest, the League now strives to be more holistic – for example, by purchasing forests that may not contain Redwoods at all in order to achieve greater ecological integrity across larger areas.

Indeed, the magnitude and number of problems facing the Redwoods, combined with the League’s approaching centenary, have stimulated a period of deep reflection on the organisation’s role. The League may now have to carry out a form of environmental ‘triage’, in which Redwood forests that can’t be saved may have to be let go in order to focus resources on those stands with the best chance of survival (a measure that, according to the League’s Director of Science ‘will break our hearts’). The League has customarily passed the Redwood forests it has purchased over to the Government for incorporation into state parks. But if the Government says it can’t afford to manage those parks, what then? Does the League become a park-management body? And if so, how much will that cost?

But with the threats come opportunities. Coast Redwood forests store prodigious amounts of carbon. Recent research shows the oldgrowth Coast Redwoods are still growing – in the volumes of the trunks and in the size of the canopies if not in the height – and therefore still removing carbon from the atmosphere. This potentially allows forests to be protected under a measure recently approved by Californian voters, AB32, to reduce the state’s net carbon emissions. Despite recent setbacks in the carbon market there is still potential for protecting additional Redwood forests under such schemes.

Tourism and Education

The Redwoods World Heritage Area is a highly popular tourism attraction, attracting 477,000 visitors in 2008-09 and 444,000 in 2009-10. The area's attractions are not advertised by government. Park managers say that the area receives plenty of unprompted promotion in mainstream media such as the *National Geographic* cover-page article of October 2009 and one of the *Jurassic Park* movies of the 1990s.

The NPS places a heavy emphasis on interpreting the characteristics of the Coast Redwood forests to visitors to the Parks. There are five major visitors centres; several excellent nature trails; informative, well-presented brochures and signs; and excellent free newsletters, with up-to-date information about attractions, scientific discoveries and conservation.



On popular trails, it's not uncommon to encounter a Park volunteer providing information and help to curious visitors.

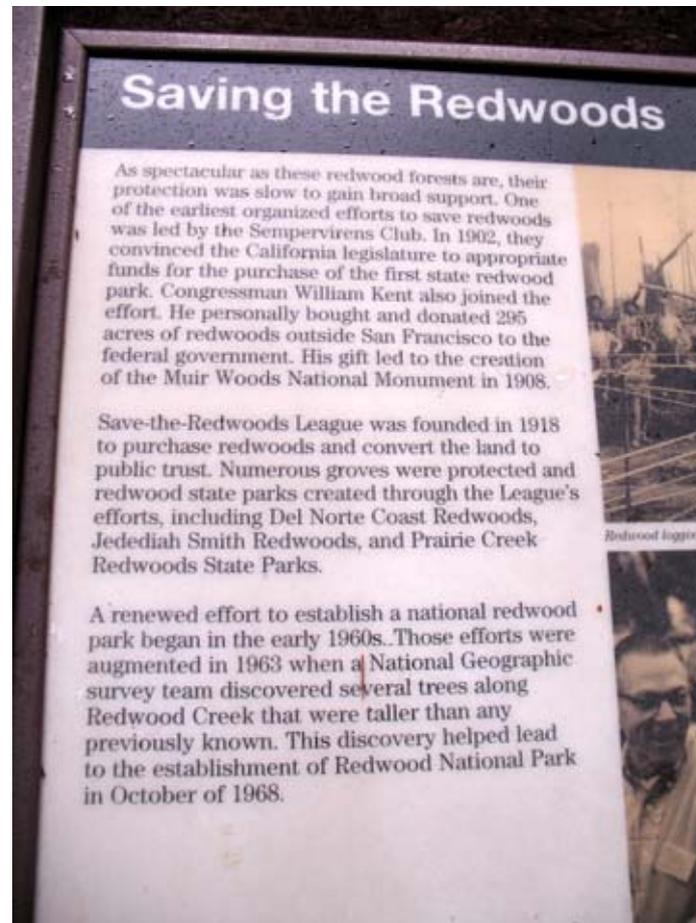
These materials don't just give facts and figures about the Redwoods. They also tell the story of Redwood conservation. The almost complete elimination of oldgrowth by relentless logging is fearlessly stated. The trees' relationship with carbon in the atmosphere is explained. Park literature celebrates the contributions of conservationists who helped protect the Redwoods. And a sense of awe, reverence and pride in the Redwood forests is projected:

... our days and years are not enough to comprehend the ancient redwoods. Twenty generations have passed since the tallest trees first emerged from the soil. Twenty more will come and go before today's seedlings fall to give life to a new generation of redwoods. Oldgrowth forests are timeless, persisting and patient, moving forward in time with or without us. Left alone, the forces of nature will continue to shape and recreate the majesty of these ancient redwood forests. (Brochure, Lady Bird Johnson Grove Nature Trail)

This has not occurred by accident. The RNSP Management Plan clearly states 'what visitors should know'. Themes include:

- The ancient Coast redwood ecosystem preserved in RNSP protects some of the world's most majestic forests and is home to an interrelated biotic community.

- The mosaic of habitats within RNSP, which includes ancient forests, prairies, oak woodlands, and coastal and near-shore marine environments, provides increasingly important refugia for a number of rare and endangered species.
- RNSP preserve the living legacy of 19th and 20th century conservation efforts, which helped spur a worldwide environmental movement and set aside diminishing Redwood forests as parks, parks that now provide a testing ground for cooperative management and large-scale restoration of severely impacted forest lands.



Education materials in the Prairie Creek visitors centre describing the efforts to protect the Coast Redwoods.

The materials and their presentation convey the land managers' connection with the Coast Redwoods and their commitment to their preservation.

The Giant Sequoias (USA)

World Heritage Site:

Yosemite National Park, California, USA

Area: 308,283 ha

Year of protection: 1864

Year of listing: 1984

Management authority: National Park Service (USA)

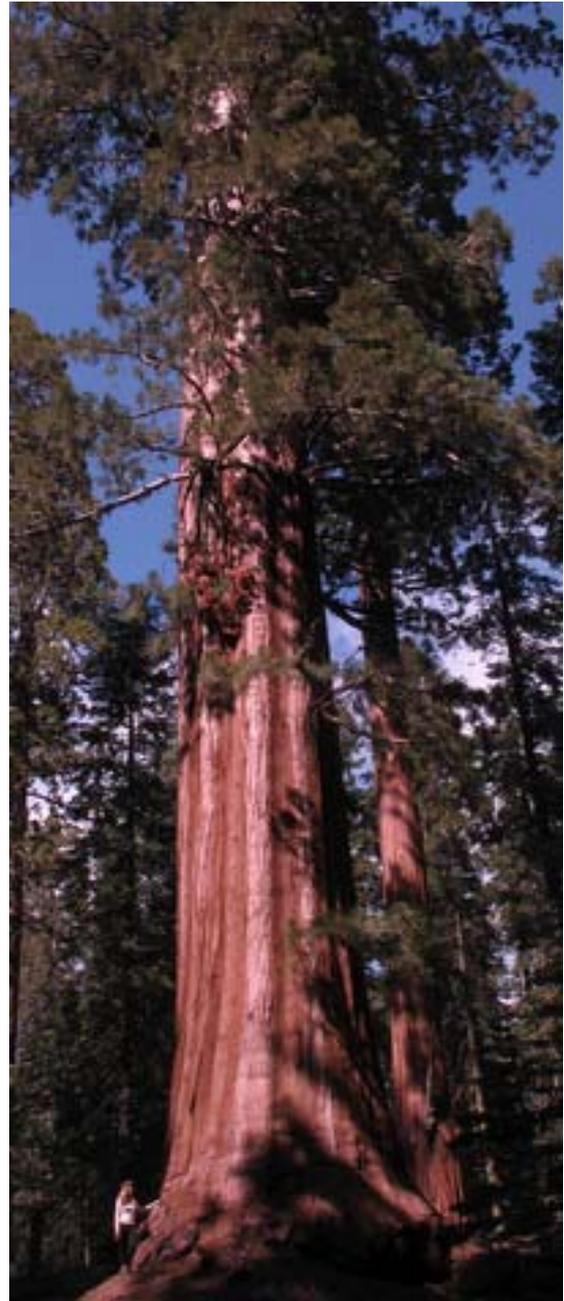
Additional site visited:

Sequoia National Park, California, USA

Area: 163,500 ha

Year of declaration: 1890

Management authority: National Park Service (USA)



General description

In volume of total wood the giant Sequoia stands alone as the largest living thing on Earth... At least one tree species lives longer, one has a greater diameter, and three grow taller, but none is larger.

So says the USA National Park Service about the Giant Sequoia (*Sequoiadendron giganteum*), which in sheer volume dwarfs all other tree-species in the world. The General Sherman tree, arguably the world's largest single living organism, occupies a stupendous 1487 cubic metres (more than four times the volume of the Arve Big Tree in Tasmania). The General Grant tree is some 12 metres in diameter. The oldest known Giant Sequoia is some 3200 years old; the tallest stands 95 metres above the forest floor.

The fossil record of the Giant Sequoias stretches back over 125 million years and is widespread across the northern Hemisphere. Today, this extraordinary living entity occurs only in 75 scattered

groves occupying less than 15,000 hectares on the western slopes of the Sierras of California, overwhelmingly between the altitudes of 1600 and 2400 metres. The tree's drastic reduction in distribution is attributed to its very specific requirements regarding temperature, sunlight and soil-moisture and the impacts of historic climate change.

Rare they may be, but the Giant Sequoias occur in landscapes of extraordinary beauty and majesty. The trees of the Giant Forest, which include the General Sherman tree and other celebrated giants, tower above grassy swales and meadows where bears forage. In winter, the trees carry a massive burden of snow. As spring gives way to summer, snow-drifts alternate with carpets of pine needles. Adjacent to the forests, rocky viewpoints provide vistas to the snow-capped high Sierras.



A black bear forages in a meadow bordered by Giant Sequoias and snow drifts in the Giant Forest.

It's no wonder that this wild country was the birthplace of the global wilderness movement.

Conservation history

When the Giant Sequoias first came to prominence in the 1850s, claims of their prodigious dimensions came under question. To provide proof of the Sequoias' size, certain giants were felled and reassembled elsewhere, such as at the Crystal Palace in England in the 1860s and the Philadelphia centennial exhibition in 1876.

Others were keen to fell the trees for more mercenary purposes than simply satisfying the curiosity of distant city dwellers. Serious logging of the giants commenced in the late 1850s and many groves would be decimated over the next 100 years. A single tree could produce almost unimaginable quantities of timber. Yet the wood was brittle. The felled trees would shatter on the ground, destroying as much as 75% of the wood. As a result, these forest monarchs were used mostly for low-value purposes such as grape stakes, shingles and fence posts.

America's fledgling wilderness-conservation movement responded passionately. Pioneering wilderness advocate John Muir played a key role. He had first encountered the Giant Sequoias in the 1860s: "When I entered this sublime wilderness, the day was nearly done. The trees with glowing rosy countenances seemed to be hushed and thoughtful, as if waiting in conscious religious dependence on the sun, and one naturally walked softly awestricken among them." He named this grove the Giant Forest.

He was soon warning that logging would reduce the Giant Sequoias to ‘a few hacked and scarred monuments’. Other influential citizens joined the cause and over the coming decades, politicians gradually responded to the calls of the growing movement.



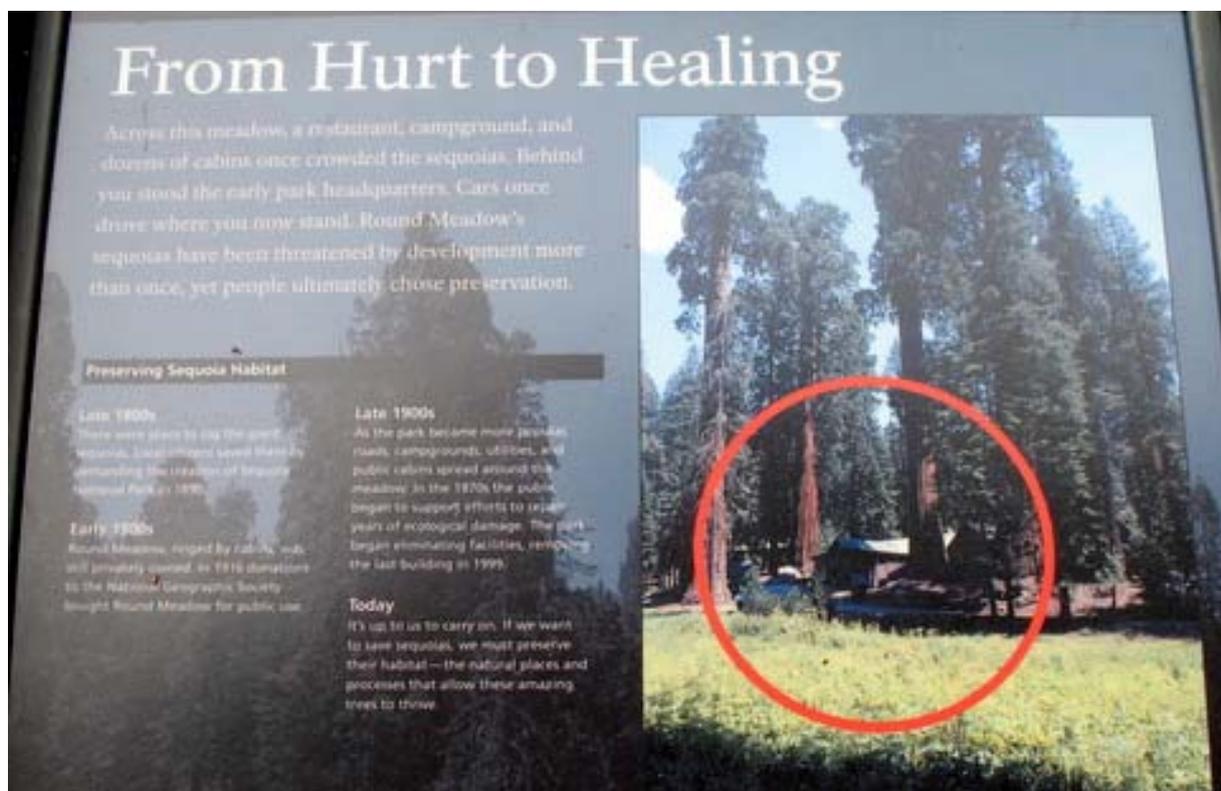
Cones, fronds and needles litter the forest floor of the Giant Forest, Sequoia National Park

In 1864, during the Civil War, President Abraham Lincoln found time to enact a landmark piece of legislation that declared the Yosemite valley to be protected ‘for public use, resort and recreation and shall be inalienable for all time.’ Yosemite and its groves of Giant Sequoias thereby became the forerunner of the America’s national parks. After Yellowstone in 1872, the next national parks to be declared were the General Grant and Sequoia National Parks, including the Giant Forest. Public concern for the Giant Sequoias was therefore instrumental in developing the world’s first national-park system. Extensions to the parks occurred until the 1950s, after which logging of Giant Sequoias ended.

After the high-profile campaigns came the tourists. More and more people wanted to see these celebrated parts of America’s heritage. In 1903, there was a wagon road to the Giant Forest. Then came the cars and major roads. By the 1930s there were buildings with over 300 rooms. Campsites proliferated in this sensitive environment.

Before the establishment of the NPS, the Giant Forest was supervised by the military. An early guardian, Colonel John R. White, objected to the intruding commercialisation of the Giant Sequoias. He wore the term ‘obstructionist’ as a badge of honour and said: ‘We should boldly ask ourselves whether we want the national parks ... to duplicate the entertainments of other resorts, or whether we want them to stand for something distinct in our national life.’

White’s concerns were finally taken on board by park managers having to cope with failing tourism infrastructure that was degrading the Giant Forest. In the 1960s rehabilitation commenced, leading to the removal of over 100 buildings, including restaurants, cabins, toilet blocks and administration offices. The complete re-design of facilities in the Giant Forest was completed in 1999. Today, there is only one major building remaining in the Giant Forest – the visitors centre known as the Giant Forest Museum. Accommodation and services have been moved over six kilometres away, outside the Giant Sequoia groves.



Education panel about restoration of areas degraded by tourism development, Giant Forest, Sequoia National Park. Buildings in the circled areas have been removed and the natural environment restored.

Major issues facing the Giant Sequoias

Fire management

In the 1960s, after several decades of managing Giant Sequoias, the NPS observed that a new generation of trees was not developing. This followed a long period of deliberate fire suppression on America's public lands.

Native American Indians had long burnt the foothills of the Sierras in order to stimulate the growth of food-providing plants and game. But the increase in population density as a result of European settlement resulted in an abhorrence of wildfires. Managers concerned for the future of the America's forests did their best to eliminate fire from the environment. Eventually, this policy came under question as impacts on the species composition of various forest-types were observed. In the groves of Giant Sequoias, for example, the shade-tolerant white fir had proliferated, shading the forest floor.

In 1964, a research team from San Jose University began burning 2-hectare areas amongst Giant Sequoia trees to examine the role of fire in their ecology. They concluded that fire could be used as a management tool to reduce the accumulation of forest fuels and to stimulate the growth of Sequoia seedlings. 1968 was the first year of a new fire policy in Sequoia forests – deliberate burning was carried out, and fires caused by lightning strike were not all immediately extinguished.

Such policies were not without critics, especially amongst regular visitors to the Sequoia groves who had become used to a green forest environment. The visual impact of blackened trees and a bare forest-floor did not go down well. In 1986, after certain big trees had been killed by such fires, a moratorium on further burns was applied.

However, research backing the need for regular fires in the Sequoia environment continued to accumulate. It was observed that Sequoia seedlings grow best in full sunlight where the soil is

covered by a thin layer of leaf litter. Sequoias are classic fire-resistant species with thick, laminated bark and cones that can remain on the tree for many years, dropping only when ground conditions are right for germination of seeds – usually after a recent fire. And examination of up to 2000 years worth of tree rings in sections of Sequoia trunks indicated that Giant Sequoia forests typically experienced a light fire about every 20-30 years.



Tree rings in a section of a Giant Sequoia illustrate a 20-to-30 year fire frequency stretching back to the 14th Century AD. Courtesy Tony Caprio, NPS.

Fire is now an essential part of the NPS's management of Giant Sequoias. Within the Giant Forest at least 40 prescribed burns covering over 46% of the area have been carried out since 1979. The burns have ranged from one hectare to over 70 hectares in extent; several areas have been burnt twice. The fires have reduced the extent of white fir understorey and opened up sections of the forest floor to sunlight, allowing Giant Sequoia seedlings to sprout and grow.

This policy still faces critics and challenges. Stands of Sequoia saplings are sometimes killed, as is the occasional mature giant. Adjacent to the Sierras is the San Joaquin valley, an area with atrocious air quality due to traffic, industrialisation, certain agricultural practices and frequent temperature inversions. And the NPS has recently experienced a 20% cut in its budget for fuels management.



Giant Sequoia forest burnt 3 years previously (October 2008), Yosemite.



Fire-management office Tony Caprio and Fire Education Specialist Deb Schweizer, Sequoia National Park

The NPS has addressed concerns about the policy by engaging with the public through an energetic education program. In the forest itself, iconic giants such as the General Sherman tree are excluded from burning. Instead, fallen branches and leaf litter are manually raked away from the tree trunks to reduce the chance of accidental incineration.

The use of fire in this environment will remain visually confronting. Some stands of forest appear to have been very intensely burnt. Against the longevity of the Giant Sequoias, the duration of modern humanity's varying fire policies has been tiny. A transparent, conservative, cautious approach to the use of this agent that can be both creative and destructive is warranted.

Tourism and Education

Aside from the small portions of the Giant Forest made accessible by the Generals Highway and Crescent Meadow Road, the grove remains exclusively the province of the foot traveller. This is as it should be, for only on foot can one truly come to know these giant trees and the unique forest in which they make their home. (Giant Forest, Sequoia National Park, California brochure; National Park Service)

Up to two million people visit the Mariposa Grove in Yosemite National park every year. The key attractions in the Sequoia National Park, such as the General Sherman Tree, are also heavily visited.

In both these national parks, visitors are encouraged to leave their cars and board free buses to the many attractions and trailheads. This policy reduces congestion, traffic hazards and the need for ever-expanding car parks. Visitors can also see the trees at close quarters from special viewing trolleys towed past the trees on bitumen roads that snake through the forest. Impacts of this sort of intrusion, however, include cutting root-systems, thereby reducing the supply of water to parts of

the tree. Even the foot traffic has had impacts. With so many people traipsing through such a delicate environment, the need for properly-sited walkways and fenced-off icon trees is obvious.

Education materials inside and around the Giant Forest Museum are well presented and imaginative acknowledging the contributions of conservation pioneers to the protection of the giant trees.



Junior ranger and volunteer ranger, Mariposa Grove, Yosemite National Park

In all presentations, national pride in the Giant Sequoias shines through. Past presidents designated certain trees as national monuments, national shrines or even the nation's Christmas Tree. The reverence people feel for the Giant Sequoias gives the NPS powerful moral authority in applying measures whose clear purpose is the protection of these great natural wonders.



The General Grant tree looms through the mist, Kings Canyon National Park, USA.

The Great Smoky Mountains National Park (USA)



Area: 209,000 ha

When listed: 1983

Management authority: National Park Service (USA)

General description

The Great Smoky Mountains are part of the spine of the mighty Appalachian Range that parallels the eastern seaboard of the USA. ‘The Smokies’, as they are locally called, run for 90 kilometres along the border between the states of Tennessee and North Carolina. From summits over 2000 metres high, thickly forested spurs descend steeply to tourist towns, woodlands and cultivated fields in the lowlands.

The Smokies are a biodiversity hotspot. Their geographic location to the south of Ice Age glaciers and just to the north of the sub-tropics have made them a refuge for cold-climate and warm-climate species alike. Conifer forests of spruce and fir cover the mountaintops together with broad-leaved deciduous trees such as beech, birch and maple; sheltered valleys with deep soils nurture oldgrowth forests; stream-sides and shaded slopes harbour evergreen hemlocks; and sunny well-drained spurs provide perfect conditions for pine-and-oak forests that include laurel, poplar, rhododendron and hickory. The Smokies contain more tree-species than does the whole of northern Europe.

Within this vast range of habitats live large mammals such as black bears, red foxes, coyotes, deer and bob cats; small tree-dwelling animals such as squirrels and chipmunks; aquatic species such as trout, turtles and salamanders; and over 200 types of birds, including owls, woodpeckers, grouse, warblers, native turkeys and chickadees.

Occupying a central part of eastern America, the Great Smoky Mountains National Park is within two days’ drive of over 200 million people. They are a massively popular destination for hikers, naturalists and motorists. Each year, between nine and ten million people in over four million motor vehicles visit the Smokies, making them America’s most-visited national park. Yet the average

visitor spends just two hours in the park, leaving the car only to enter a visitors centre, take photos at a lookout, and 'go to the bathroom'. There are hundreds of kilometres of sealed roads that millions of motor vehicles, including thousands of startlingly large mobile homes, drive on to reach at least eight developed campsites, several picnic grounds, three visitors centres, two educational institutions, and dozens of toilet blocks. At Cades Cove, over two million motorists each year drive around a loop through meadows and woodlands, admiring the view, hoping to see bears, stopping at log cabins, and creating traffic jams that stretch for kilometres.



Visitors at popular Laurel Falls on a June weekday, Great Smoky Mountains.

The small percentage of the 9-10 million visitors who do go further afield add up to a substantial number of hikers, campers and horse-riders. Each year, about 25,000 permits are given for about 80,000 overnight stays on hiking trails that total over 1400 kilometres in length. There are nearly 100 back-country campsites and 15 shelters; and 117 km of the 3450-km-long Appalachian Trail traverses the top of the Smokies. The Park generates over 17,000 jobs and is worth over \$820 million per annum to the local economy.

Conservation history

In the 1920s, influential people concerned by proliferating logging in the Smokies initiated the movement for a Great Smoky Mountains National Park. In 1925, park advocates in Tennessee and North Carolina joined forces to raise the funds necessary to buy the land required for the national park. In 1926, Congress passed a bill that backed the park but left purchase of park lands – most of which were in private or company hands – to the states. These efforts were boosted in 1927 when millionaire philanthropist John D. Rockefeller pledged \$5 million on the condition that these funds were matched by governments

Persuading over 6000 land-owners to sell was complex and time consuming. President Franklin D. Roosevelt came to the party with \$1.5 million and in 1940, a public dedication of the Great Smoky Mountains National Park occurred on the ridge straddling Tennessee and North Carolina.

By then, over 60% of the park's lands had been logged and 12% cleared for agriculture and settlement. Native forest has grown back in most of these areas. An exception is Cades Cove, where sweeping, grassy plains contrast with thickly wooded mountains in the background.

In recent decades, conservationists have fought and won a battle against a proposed new road across the entire southern face of the Smokies. If built, the road would have fragmented the largest intact tract of forested mountains in the eastern USA with devastating ecological consequences.



A profusion of flowering broad-leaved trees and shrubs in the Smokies.

Major issues facing the Great Smoky Mountains

The Great Smoky Mountains are a park besieged. Problems occur at different scales, from mountain-size down to microbes.

Air pollution

Around the Smokies, coal-fired power stations and hundreds of millions of motor vehicles create acid rain and ozone that threaten vegetation, streams and human health. Since 1948, this polluting haze has reduced visibility in the Smokies by 40% in winter and 80% in summer. When particularly severe, visibility is reduced to less than two kilometres.

Dealing with something as pervasive and widespread as air pollution is well beyond the scope of the NPS. Nevertheless, under the Clean Air Act federal land managers are directed 'to assume an aggressive role in protecting the air quality values' under their jurisdiction. This has given the NPS a role in the process for approving power plants and other sources of air pollution located near national parks. The situation has improved recently as aging power plants have closed and been replaced by plants employing pollution-reduction technology. Between 1990 and 2009, scientists recorded a 25% drop in acid precipitation within the Park.

Fire

For the first 70 years of its existence, the Great Smoky Mountains National Park were subject to a policy of suppressing wildfires. Subsequent research has shown that this was at odds with the

ecological history of the 40% of the Park that had been periodically burnt by lightning and native Americans over many thousands of years. The elimination of fire degraded ecosystems such as pine-oak woodlands, with a resultant decline in species such as Table Mountain pine and the Red-cockaded woodpecker. Additional species, weakened by competitive stress, became vulnerable to attack by parasites.

Research, trials and monitoring led to the production of fire-management plans. The 2010 plan has goals of maintaining and restoring fire-adapted ecosystems and integrating ‘fire as a natural process’ into the Park’s ecosystems to the fullest extent possible. The Park has been divided into fire-management zones. Fires in zones next to built-up areas, subject to high visitation, or that contain critical infrastructure are extinguished immediately. In other zones, natural wildfires are allowed to burn until deemed an unacceptable risk. The NPS deliberately burns some areas to benefit fire-adapted species. In all parts of the Park, fires caused by arson are extinguished immediately.

Biological invaders

The most horrifying threat to the Smokies is the army of biological invaders that are killing the park’s natural vegetation. The list of casualties is long. The Chinese chestnut blight long ago eliminated magnificent full-sized American chestnuts from the park. The hemlock woolly adelgid, a tiny insect spread by birds, wind and horticultural materials, is killing large tracts of hemlock. This tree is a crucial part of the park’s ecosystem, binding soils on steep slopes, providing habitat for birds, and keeping streams cold enough for native trout and other aquatic species. The Balsam woolly adelgid has devastated high-altitude stands of Fraser fir trees. An estimated 91% of the Park’s mature firs – and many of the rare mosses, liverworts and spiders that depend on them – have been killed since discovery of this non-native insect pest in 1962. The fungus Dogwood Anthracnose is an introduced pathogen that has killed almost all dogwoods – an important food for herbivores such as deer – in some of the Park’s catchments. There is no known treatment for this disease. Other exotic diseases, fungi and pests are killing native walnut, ash, beech and elms in the Park; still more could become a problem in the future.



Stags of Fraser fir, killed by Balsam woolly adelgid, at about 2000 metres on the ridge of the Smokies.

The precise consequences of the totality of this assault are barely understood. But it's clear that the wonderful World-Heritage-Listed Great Smoky Mountains face ecological catastrophe.

The NPS has tackled this diabolical cornucopia of destroyers using chemical, biological, genetic, quarantine and educational means. Over 132,000 hemlock trees have been successfully treated with insecticidal oil and soap. Yet even this prodigious effort has accounted for only a small percentage of hemlock forest in the park. Of greater potential effectiveness are biological controls in the form of predatory beetles being trialled in several locations throughout the Smokies with early positive results. While Fraser fir can be treated for Balsam woolly adelgids, the species' main hope appears to rest in a tiny plantation where intensive monitoring and treatment of the trees aim to maintain a safe reservoir of genetic stock. Research into other pathogens is still at an early stage. The NPS is educating the public about the impacts of these biological invaders and attempting to quarantine the Park from imported firewood and horticultural products.

This host of physical problems is exacerbated by an administrative and political predicament. Due to a tradition that goes back to the Park's establishment in the 1930s, the NPS does not charge park entry-fees. This policy costs the National Park Service more than \$100 million per annum – funds that could be spent (at least partly) on tackling the myriad threats to the Smokies that have been outlined above. As it is, the Park has generally received fewer than \$20 million in its annual budget (less than two hours' spending on the war in Afghanistan) and has recently incurred annual shortfalls of over \$11 million in its operating budget.

Right: cars caught in a traffic jam at Cades Cove, a scenic loop driven by over two million motorists per annum.



External support

The park's grim situation is mitigated by the efforts of volunteers who have dedicated many hundreds of thousands of hours to the Smokies. These concerted efforts to maintain park tracks and huts; to inform visitors of rules, regulations and desirable behaviour; to raise literally millions of dollars of funding for management; to research the park's scientific and ecological treasures; and to advocate for the park in surrounding communities and in Congress are evidence of a deep love of the Smokies that prevails in the USA.

Organisations that donate money to the national park include the Great Smoky Mountains Association and the Friends of the Smokies. The former generates its funds from visitor-centre shops. From 1992 to 2010, over \$23 million in aid were donated to the Park. In 2011, it budgeted a spectacular \$4.8 million for Park aid; \$3.05 million of this was allocated to a new visitors centre and a further \$200,000 to the renovation of another. Other funds were earmarked for restoration of historic buildings, environmental education, support for Park volunteers, and free publications. A seemingly paltry amount – \$27,500 – was allocated to treatment of hemlock trees.

In 2010, Friends of the Smokies raised over \$250,000 from donation boxes within the Park and an extraordinary \$800,000 from licence tags on motor vehicles. In 2009, from a total of \$1.4 million granted to the Park, approximately \$780,000 were spent on education; \$330,000 on facilities and ‘back-country’ management; and about \$161,000 on management and science. Within the last category, \$100,000 were spent on responses to the Hemlock woolly adelgid infestation.

While the fundraising efforts of these groups have been exemplary, the spending priorities appear skewed towards human activities and infrastructure. It is questionable whether the seriousness of the ecological crisis facing the Smokies has been honestly faced.

Local Sierra Club conservationists believe that Congress can support the NPS and the Smokies’ battalions of volunteers by designating the Smokies under the national Wilderness Act to provide yet more protection for this great wild region.



Lichen adorns a boulder next to a lowland stream, Great Smoky Mountains.

Another beneficiary of volunteer work is the ground-breaking All Taxa Biological Inventory (ATBI). This ambitious project, commenced in 1997, aims to discover and record every species within the Great Smoky Mountains National Park. By mid-2011, over 910 species new to science and over 7000 other species previously unknown in the park had been recorded out of a total exceeding 17,000. Newly-discovered species include 41 spiders, 56 beetles, 36 butterflies and moths, 29 flies and 78 algae.

The project is not simply a counting exercise. Sophisticated mapping and modelling are carried out as part of an endeavour to understand the relationships between different species and their environments.



The All Taxa Biodiversity Inventory aims to record every species in the Great Smoky Mountains National Park – a number that could exceed 100,000.

Interpretation and education

Crucial community support for the Great Smoky Mountains National Park has not come about by accident. The NPS has actively pursued a policy of building stewardship for the park amongst adults and children, with particular focus on the areas adjoining the park.

The NPS has created an environmentally literate constituency by instituting a progression of activities that begin with a Junior Ranger program for children (accompanied by a Not-So-Junior Ranger Program for the kids' parents), and then progress to high-school internships that last six weeks, to seasonal employment programs for young adults, culminating in higher education at the University of Tennessee and the Great Smoky Mountains Institute. Community leaders in the surrounding counties are targeted separately through the 'Experience your Smokies' program.

This inspired outreach has created ambassadors for the national park who have become active in local communities on issues such as bear management, the ATBI, and generating still more volunteer support and fundraising for the Smokies.

The Primeval Beech Forests of the Carpathians (Slovakia)



Area: 8298 ha of core zones and 17,433 ha of buffer zones
Year of World Heritage listing: 2007

General description

The Carpathian Mountains form a great arc across central and eastern Europe. The range harbours isolated rural communities, natural grasslands, deep valleys, the habitats of bears, wolves and bison, and great tracts of native forest.

Where eastern Slovakia borders Poland and the Ukraine, these forests are relatively intact. In Poland, the Bieszczady National Park covers 300 square kilometres. In the Ukraine, the forest stretches away to the east in a series of World-Heritage-listed conservation reserves. And in Slovakia, a large national park is the setting for that country's components of the Primeval Beech Forests of the Carpathians. Here, small village communities worship in ancient wooden churches next to rushing streams, overlooked by darkly forested mountains.

The World Heritage beech forests occur in four locations – Stuzica, Vihorlat, Havesova and Rozok – which together occupy about 83 square kilometres. Of these, Stuzica is by the far the largest. In the pristine heart of these forests, the broad leaves of oldgrowth trees adorned with moss and lichens drip with moisture from the enveloping fog.

The dominant tree is the European beech, *Fagus sylvatica*, which in the wetter environments shades out other tree species. In drier locations, it grows in association with fir (*Abies alba*). Associated forests contain spruce (*Picea abies*), larch (*Larix decidua*) and birch (*Betula verrucosa*). The forests and adjacent meadows provide homes for brown bear, grey wolf, common lynx, the Eurasian otter, beaver, roe deer and wild boar. Breeding in this forest environment are European bird-types such as eagles, goshawks, storks, woodpeckers and pigeon. The relatively pristine streams allow salamanders, newts, frogs and toads to flourish, while resident reptiles include adders and lizards.

Thousands of outdoor enthusiasts, including hikers, hunters and mushroom gatherers, visit these forested hills every year.

Conservation history

Europe is not generally regarded as the home of large tracts of wilderness. It is a crowded and developed continent, where even the most rugged of mountains are festooned with cable cars, funicular railways, opulent hotels and ski-runs. Most rivers have been dammed in several places; most lowland marshes were systematically drained over 100 years ago; large predators such as wolves and bears have been all but wiped out; and the continent's forests have been cleared or highly modified. Europe has not been immune from the creeping urbanisation that has affected the rest of the world – in the 50 years to 2010, the populations of European cities increased by 78% while the overall population grew by 33%.

With the last of Europe's natural environments under increasing threat, a wilderness movement has emerged. Organisations such as WWF, ARK Nature, Wild Wonders of Europe and PAN Parks have developed a vision for large protected areas. PAN Parks, for example, says:

Wilderness in Europe is a concept many do not recognise – yet there is still wilderness throughout Europe. It survives in virgin forests, along rivers, in marshlands, in high mountains or caves, or under the sea. ... PAN Parks Wilderness areas are places where natural processes and wildlife thrive and people are only occasional and respectful visitors. PAN Parks defines wilderness as an area of at least 10,000 hectares of land or sea, which together with its native plant and animal communities and their associated ecosystems, is in an essentially natural state... There is no extractive use allowed within these areas, which means that activities such as hunting, fishing, mining, logging, grazing, grass-cutting, new roads and building construction are not accepted inside the wilderness area.

The movement sees opportunities as well as threats. Across Europe, land in isolated areas has been abandoned as villagers move to the cities in search of economic opportunities. Such processes have caused a 20% reduction in farmland. Wildlife that had previously been extirpated from these places has been returning due to regeneration of natural vegetation and reduced hunting.



Juraj Vysoky of the Slovakian Forest Stewardship Council was one of the architects of the 'Pralesy' report – a survey of oldgrowth forests in Slovakia.

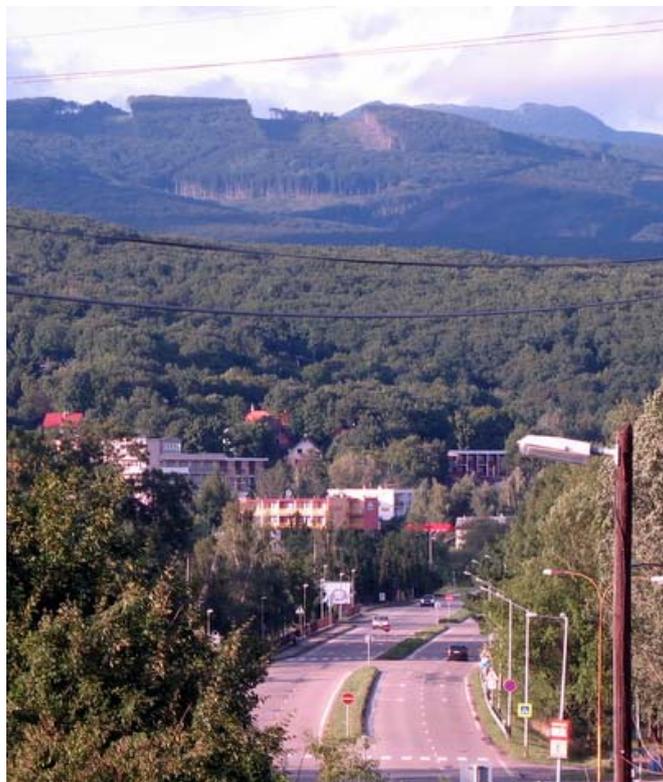
The concept of wilderness penetrated the processes of the European Commission nearly two decades ago, with the program of declaring Natura 2000 parks. In 2009, the European Parliament welcomed the establishment of the Wild Europe Initiative, a collaborative effort to promote the concept of wilderness. In May 2009, more than 230 representatives of governments, conservation agencies, NGOs and academic institutions met at a ‘conference on wilderness and large habitat areas’ hosted by the Czech European Union Presidency in Prague. Resolutions called for recognition, definition, mapping and promotion of wilderness.

The participants’ vision includes: *Open, broad-leaved forests where bison, deer, wild horses and bovines exist alongside wolves, lynx and bears and where most of the original plants and animals of lowland Europe thrive. Mystical oldgrowth forests with woodpeckers, mosses, lichens and mushrooms and where the voices of the Capercaille and owls resound at the dawn of spring.*

The resulting publication, ‘Rewilding Europe’, aims to restore and protect 10 areas of at least 100,000 ha each by 2020. One trial area for this objective is the forested triangle at the junction of Poland, Ukraine and Slovakia.

Slovakia is one of Europe’s most forested countries. Forest covers some 44.3% of the country; national parks cover approximately 6.5%. Outside of the major towns and farmed river flats, forests dominate the scenery.

Yet all is not as well as it seems. Logging occurs within national parks. Less than 2% of the country’s forests enjoy full protection. Logging practices such as clearcutting are widespread. A 2010 study into oldgrowth (‘pralesy’) was carried out by the Forest Stewardship Council (Slovakia), WWF and other conservation groups. It found that only 0.47% of Slovakia’s forests can be classified as oldgrowth. This occupies about 10,000 ha in 122 different locations, the largest being 630 ha at Stuzica, part of the World Heritage site.



Clear-cuts in the forest are clearly visible from this major road in eastern Slovakia.
On the far skyline is part of the Vihorlat massif, part of the World Heritage Area.

When the IUCN evaluated the World Heritage nomination of the Carpathian beech forests in 2007, it said the area contained indigenous European beech forests growing in mountain areas,

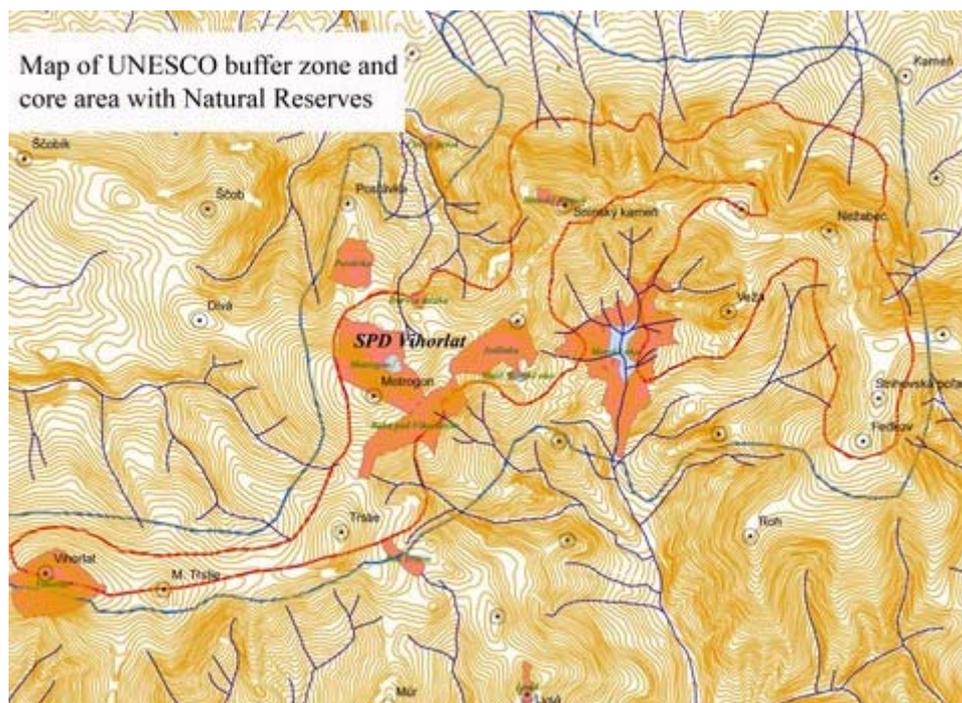
representing biomes that have mostly been devastated elsewhere across Europe. It said ‘these are the best of the last’. The level of protection of the nominated sites was said by IUCN to be ‘very high as the State Parties nominated only strictly protected areas.’ It said that ‘the protection and management of the nominated core zones is enhanced by the size and breadth of the buffer zones as well as the proposed ecological “connecting corridors”.’ It said that the forests concerned are ‘not threatened by developmental pressures as they enjoy strict protection’.

And so, in June 2007, the Primeval Beech Forests of the Carpathians – including those in Slovakia – were duly inscribed on the World Heritage List.

Major issues facing Slovakia’s Primeval Beech Forests

Consisting of small and scattered areas, the integrity of the Slovakian component of the Primeval Beech Forests of the Carpathians is questionable. The 83 square kilometers of listed forest occur in four separate areas, one of them only 0.7 square kilometers in extent. Their boundaries do not appear to follow well-defined features of the landscape such as watersheds, streams or even contours.

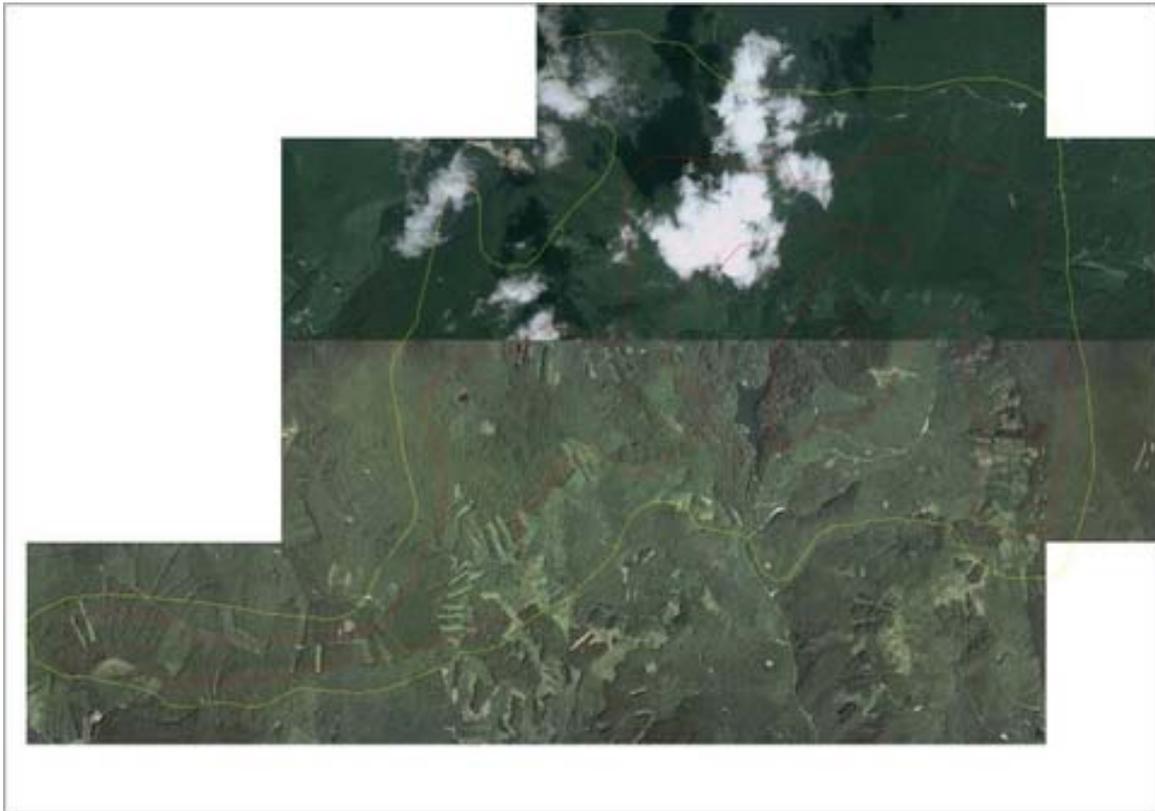
The World Heritage forests at Vihorlat, for example, occupy a convoluted noodle-shape that crosses contours and ridges, excluding substantial tracts of oldgrowth but including recent ugly clear-cuts. This 2578-hectare core area contains only 414 hectares of oldgrowth; additional tracts occur within a buffer zone severely fragmented by logging. Aerial photos clearly show that parts of the core area have been recently logged; even worse, they appear to have been oldgrowth.



Map 2. This map of part of the World Heritage Area illustrates the convoluted shape of the core zone (red line) and its buffer (blue line).

Criticism of the way in which the World Heritage Area’s boundaries were determined was common amongst the local, national and international conservationists consulted. Particularly perplexing was the exclusion of Vihorlat’s beautiful lake Morske Oko, large parts of the lake’s catchment, and significant tracts of adjacent oldgrowth. This is a shame because the oldgrowth beech forests here were clearly of great significance. And while there has been widespread logging, there are also great opportunities for rehabilitation because the species-composition in the regenerating forests remains relatively natural. Indeed, the inclusion of logged forests inside the World Heritage Area is

entirely appropriate – provided they are subject to active restoration (as is the case with damaged forests in the Redwood National and State Parks).



Recent aerial photos illustrate that parts of the Vihorlat component of the WHA had been heavily logged before listing in 2007. The red line shows the core area and the yellow line the buffer. Photo courtesy Peter Sabo.

The Stuzica core area has a much simpler shape, consolidating Slovakia's single biggest tract of oldgrowth into a viable reserve of nearly 30 square kilometres. The catchment of a significant watercourse is enclosed by two steep ridges, thereby insulating this precious forest from outside influences. This catchment straddles the Slovakia-Ukraine border and is protected by World Heritage listing in both countries. This comprises one of Europe's most important tracts of forest.

This core area's buffer zone is the rest of the Poloniny National Park. Technically, this area should enjoy the highest possible protection, being subject to the European Diploma of Protected Areas, awarded by the Council of Europe. The function of this prestigious diploma was to 'protect the character of the landscape' and 'for the conservation of biological diversity in Europe'.

Unfortunately, according to a 2008 official review, logging and hunting are permitted on over 90% of the Park's core territory, 'with relatively few constraints from the point of view of conservation of biological and landscape diversity.' Management regimes have relentlessly eliminated ancient stands, replacing them with even-aged trees. Only 8% of the national park was strictly protected – and even this occurred in scattered pieces. Hunting of wolves (prohibited in the neighbouring Polish national park) was authorized in the rest of the national park for four months of the year.

These problems – raised by local conservationists, documented in reports, and observed during field trips – seriously undermine the integrity of the Slovakian component of the Primeval Beech Forests of the Carpathians. Attempts to meet with the Slovakian Nature Conservation Agency to discuss the situation were unsuccessful.

Fortunately, Slovakia is blessed with some very dedicated conservationists working for environmental NGOs such as the Forest Stewardship Council and Wolf. They are using highly

professional means – research, mapping, publications, media, grassroots mobilisation and lobbying – to pressure the Slovakian Government to improve protection of these internationally important natural places. Their efforts are bearing fruit, with government announcements on further forest protection foreshadowed in late 2011.



Local conservationist Peter Sabo and the author converse about the boundaries of the Carpathian Beech Forests World Heritage Area at Vihorlat, July 2011.

Visitation and education

About 25,000 people visit Stuzica forest each year. Adjacent to the World Heritage Area is a popular visitors centre with interesting exhibits of natural history. There is a network of excellent, well-mapped, well-signposted walking tracks. Vihorlat’s forest-fringed lake, Morske Oko, is similarly popular and well served by walking tracks and other facilities.



Dáša Lukáčová and Juraj Lukáč, dedicated conservationists from the NGO named ‘Wolf’.

The Udava forest, containing mature stands of beech, fir and spruce, is traversed by the International Forest Trail, which takes walkers into neighbouring Poland and its Bieszczady National Park. Signs educate the hiker about the forest's tree-species, fauna, history and ecology – with English-language sections as well as the native Slovak. Most of the education is strictly scientific; some of it less so:

This kingdom has been ruled for eons by the sage, creased Mother Fir... She oversees this magical cycle of life... In her protective embrace, everyone can feel safe and loved, whether it is a little lost fawn, home-seeking squirrels, baby birds or tiny worms... She is not desperate when the forest elders are losing their life-vigour and humbly lay their heads to her feet. She knows the secret of life.

Such poetic presentations display the Slovak love of their natural environment, particularly their forests. This is particularly poignant in Udava, a forest whose protection was recently lifted from 52 ha to 398 ha, thanks to the efforts of Wolf, and where recent political breakthroughs will restore still more of the forest to its former glory.



Beech forest and undergrowth in the Udava forest, a protected area recently extended through the efforts of conservation NGO, 'Wolf'.

Shirakami-Sanchi World Heritage Area (Japan)



Area: 16,971 ha

When listed: 1993

Management authorities: the Environment Department, the Forestry Agency, the Agency for Cultural Affairs, and the Aomori and Akita Prefectures.

General description

Nestled in the mountains of North Honshu is the Shirakami-Sanchi World Heritage Area, a tract of natural forest dominated by the Japanese endemic Siebolds beech (*Fagus crenata*), known in Japanese as *buna*, and also containing oak, magnolia, white pine and Japanese maple. The rugged hills and ridges, varying in altitude from 200 metres to 1243 metres, are steeply incised by clear, quick-flowing streams that plunge over cascades and waterfalls. The forests provide habitat for native species that have become rare or threatened elsewhere in the archipelago, such as the serow (a kind of goat), the red-capped crow-sized black woodpecker, the golden eagle and the Japanese black bear. The more common Japanese macaque (a monkey frequently seen on TV documentaries) is another inhabitant. Shirakami-Sanchi straddles the prefectures of Aomori and Akita.

Shirakami-Sanchi is subject to significant seasonal variations in weather. In winter, the mountains (no taller than Hobart's Mt Wellington) are blanketed under up to four metres of snow; late summer, by contrast, is typhoon season, with maximum temperatures in the 30s and very high humidity. The perpetual wetness has created perfect conditions for temperate rainforest. In late spring and summer, the foliage is verdant. Autumn brings intense reds, yellows and oranges as the deciduous forests lose their leaves; in winter, the bare trees give the snow-covered hills a bleak appearance.

Shirakami-Sanchi in summer resembles parts of Tasmania's Tarkine rainforest. Its autumn-winter transformation is reminiscent of Tasmania's West Coast mountains, where the Tasmanian endemic

deciduous beech undergoes a similar transformation. Like Tasmanian rainforests, the Shirakami beech forests have colonised their habitats after the last ice age, about 8000 years ago.

Conservation history

Shirakami's similarities with Tasmania do not end with the area's appearance. The protection and subsequent listing of Shirakami in the early 1990s occurred only after a decade-long battle against plans by the Forestry Agency to construct new roads through the area to open it up for logging.

Two local citizens who were part of strenuous efforts to protect Shirakami were Koichi Kamata and Zenkichi Ichikawa. Both are now in their eighties but still very active as mountain guides and conservationists.



Conservationist Koichi Kamata next to a forest haiku that stopped logging here in 1972.

*Golden light
Overflowing the forest
Fresh green spreads
All across the beech forest.*

Kamata-san first visited Shirakami when he was 19 and 'fell in love' with the area's wild beauty. When he learnt of plans for a 30-km logging road through Shirakami, he helped form the Protect the Nature of Shirakami Association and immersed himself in the campaign. His stand did not win support from all parts of the local community. He and his family suffered an organised campaign of intimidation in the form of abusive phone calls and vandalism of his shopfront and garden. After he took his case to the media – which was supportive of protecting Shirakami – the abuse stopped.

Ichikawa-san was an employee of the Forestry Agency. His dedication to protecting Shirakami was at odds with the policies of his employer, many of his colleagues, and the relevant labour union. Despite pressure from these sources, Ichikawa-san retained his stance and continued to work on the campaign.

Help from elsewhere was recruited. The Tokyo-based national organisation, the Nature Conservation Association of Japan, developed plans for the World Heritage Listing of Shirakami. At that stage, Japan was not a signatory of the World Heritage Convention.

A turning point occurred in 1985 when a symposium on how to protect Shirakami, held in the city of Akita, attracted over 2000 people. Shirakami was now a national issue. The campaign developed momentum and, in June 1992, Japan became a signatory of the World Heritage Convention. Shirakami-Sanchi and the forested island of Yakushima were nominated for World Heritage Listing in October 1992. Meanwhile, Shirakami-Sanchi had been protected under Japanese law, becoming a Forest Ecosystem Reserve in March 1990 and a Nature Conservation Area in July 1992.



Author and mountain guide Zenkichi Ichikawa in the Shirakami-Sanchi forest, September 2011.

Shirakami-Sanchi was listed in December 1993 and became a source of national pride. The Japanese Government has subsequently taken its obligations under the World Heritage Convention very seriously, applying strict laws to protect Shirakami-Sanchi's natural values. The whole area has been designated a Forest Biosphere Reserve. Logging and mining are prohibited. Native animals are protected. Fishing and hunting are prohibited. Even traditional activities, such as gathering edible mushrooms and bamboo shoots, are prohibited. The Government also took the unusual step, after complaints by conservationists and action by a member of the Diet, to disallow low-altitude military flights over Shirakami-Sanchi to minimise disturbance to fauna.

The Government has constructed excellent facilities and infrastructure, including visitors' centres, public toilets, parking areas, walking trails and education signs. Local services and businesses, such as public transport, accommodation, tour guides, retail outlets and a nature school, are nourished by Shirakami's tourists. At least six guide organisations or clubs are located in towns around the World Heritage Area.

Major issues facing Shirakami-Sanchi

The heavily populated industrial powerhouse of Japan retains a surprising amount of native forest. Trees cover two thirds of the country – over 50% of this is native forest (rather than plantation). 42% of the forests are publicly owned.

Large tracts of the original species, however, have been replaced by cedar (*sugi*) because of its desirable qualities as a commercial timber species. Japanese forest vistas are often characterised by dense stands of cedar grafted on to steep mountain slopes. This practice – not unlike the replacement of native forests by radiata pine in Australia – has faced criticism because cedar is known to destabilise slopes already prone to landslide. Beech – a forest-type frequently replaced by cedar – has been severely reduced in extent and now represents only 4% of the forest area. Since 1989, primary forests in Japan have been off-limits to logging (a result stimulated by the outpouring of sentiment over Shirakami).

Boundaries and integrity

The Shirakami-Sanchi World Heritage Area is not large. It is about the size of Tasmania’s Mt Field National Park and less than one fiftieth the size of the Tasmanian Wilderness WHA. Shirakami-Sanchi consists of a 10,139-hectare core area and a 6832-ha buffer zone. The total area’s oval shape and generally smooth boundaries mean that the World Heritage Area has reasonable integrity. Yet opportunities for extension of the World Heritage Area exist, with protected forests occurring both to the west and south-west of the listed area. Extensions to the north would do away with boundary convolutions and enhance the integrity of the listed area. At least one interviewee believed that a boundary review to look at including more areas of habitat for the black woodpecker should be carried out.



Looking into the strictly protected core of Shirakami-sanchi from the buffer zone.

According to the Department of Environment, adjacent National Forests are managed to ‘avoid any drastic environmental change’ to the property. Volunteers from conservation NGOs, however, believe that adjacent forestry operations have had an impact on Shirakami-Sanchi. They indicated places where clear-cutting had occurred on steep slopes within one or two kilometres of the boundary of the World Heritage Area. They want to rehabilitate these forests to enhance Shirakami-Sanchi’s ecological integrity.

Management

Shirakami-Sanchi is managed according to the provisions of a Management Plan developed with public participation. The WHA is managed through formal collaboration between the Environment Agency, the Forestry Agency, the Agency for Cultural Affairs and Aomori and Akita Prefectures. That formal collaboration occurs through the 'Shirakami-Sanchi World Heritage Area Liaison Committee'. On-the-ground management of facilities such as toilets and parking lots is usually carried out by local municipal authorities. In Nishimeya, Shirakami's park headquarters, a well-appointed World Heritage Conservation Centre houses ranger staff and other support services.

In 2010, the national, provincial and municipal governments allocated 138 million yen (approximately \$1.8 million) to the management of Shirakami-Sanchi. Visitors are not charged an entry fee, however management funds are augmented by commercial activities in the Anmon falls area. The resulting 'cooperative fund' is used to maintain hiking infrastructure such as boardwalks.

Entry to Shirakami-Sanchi's core zone, which occupies 60% of the WHA, is permitted only for designated routes by way of formal notification submitted in advance. Walking off these official trails is strictly prohibited. Access restrictions do not apply in the buffer zone but visitors must abide by rules that prohibit littering, pets, fires, picking of plants, fishing, and walking off the trails. Such measures help protect the area's ecology from the sort of damaging biological agents that bedevil the Great Smoky Mountains.

The management arrangement for Shirakami-Sanchi was criticised by volunteers who believe that having multiple agencies involved complicates decision-making, blurs lines of accountability, creates unnecessary bureaucracy, and encourages buck-passing. A strong view was that the Forestry Agency should not be involved in management, and that Shirakami-Sanchi should be declared a national park managed solely by the Environment Agency.

Associate Professor Yoshida-san, from the World Heritage Studies Program at Tsukuba University, pointed out that Japan's Forestry Agency has undergone many changes in approach since the 1980s and had, for example, protected Japan's oldgrowth forests from logging. The agency's debt of some 100 billion yen (over \$1 billion) was a problem. It was possible that the Forestry and Environment agencies could eventually merge, creating a super department responsible for all public land in Japan. Such a move would certainly simplify management arrangements.



A volunteer botany student and a Japanese maple tree on a Department of Environment field trip, Shirakami-Sanchi, September 2011.

External support

The official management of Shirakami-Sanchi is backed by significant contributions from volunteers and NGOs.

The World Heritage Conservation Centre in Nishimeya, for example, coordinates regular field-monitoring trips into the forest. Funding from private or corporate sources such as the Nissan Science Foundation have helped facilitate volunteer and NGO participation. Information gathered is available to all institutions involved in the monitoring, and the insights derived from this study inform the development of management plans for Shirakami-Sanchi.

The Management Plan provides for the involvement of volunteers in carrying out patrols of Shirakami-Sanchi to help deter illegal activities within its borders. However, some volunteers say they are not well supported by the Forestry Agency in matters such as costs of fuel and insurance covering accidents. Damage done by people carrying out illegal activities within the WHA's borders (cutting of trees, fishing, illegal hut construction) has been observed but volunteers are not given authority to confront law-breakers and are actually discouraged from doing so. Concern was expressed that the large debt of the Forestry Agency inhibited the provision of an adequate budget to support volunteer patrols.



In September 2011, over 30 people participated in a planned three-day monitoring trip into Shirakami, including university professors, botany students, volunteers from NGOs, and one visiting Australian.

Visitation and Education

Nishimeya's World Heritage Visitors Centre is surely one of the best educational facilities in the world for a natural-heritage site. The building is set amongst landscaped beech trees, ferns, ponds and streams. The centre's spacious interior is brought to life by a lifelike replica of a mature beech tree which sprawls across the ceiling. This exhibition hall is a museum with excellent displays and written interpretation in both Japanese and English describing all aspects of the natural history of

Shirakami, including the life-cycle of the beech trees, the area's seasonal changes, and the creatures that rely on the forests, from tiny invertebrates to tree-climbing bears. A section devoted to the World Heritage Convention and other World Heritage sites is an exemplary exercise in setting the context for Shirakami's listing. The centre also includes a capacious Imax theatre in which spectacular movies of Shirakami-Sanchi – including a first-class English-language documentary portrayed from the viewpoint of an ancient beech tree – can be viewed.

Free brochures and maps are available to the public. English-language versions are extremely helpful to foreign visitors.

To protect the forest of Shirakami, local residents are untiringly active, making great efforts to preserve their forest. Their activities ... 'Operation Clean-Up' to remove the trash left by ill-mannered visitors. People in the neighbouring areas are also nurturing and planting beech saplings, in an effort to restore the lost forest. We welcome your eager participation in these activities.

Education board in Fujisato World Heritage Conservation Centre

The Shirakami Mountains are known for their virgin beech forests and (the Anmon Falls area) is one of the most accessible to get a feel for these forests. The thick layer of fallen leaves that carpet the forest floor make the ground underfoot soft and spongy before eventually decaying into the leaf mould that nourishes and sustains the flora and fauna of this rich ecosystem. This leaf layer is also the origin of delicious natural water.

Brochure for the Anmon Falls and Tsugaru Pass areas

At Fujisato, in the Akita prefecture, is another World Heritage Visitors Centre, with a similarly impressive array of exhibits. Nearby is the Fujisato nature school, Bunakko Kyoshitsu, a privately-run institution devoted to increasing awareness of nature. The school provides accommodation and meeting facilities and is used to run training sessions relating to Shirakami. Several learning centres occur in other locations adjacent to the World Heritage Area. Together, these facilities and their publications convey the great sense of pride felt by Japanese people in their World Heritage Areas.



The spacious World Heritage Visitors Centre in Nishimeya contained inspiring exhibits as well as an Imax theatre. Text was in both Japanese and English.

Climate change

According to the Department of Environment, climate change is the only major issue affecting the future of Shirakami-Sanchi.

According to Associate Professor Masahito Yoshida, the main climatic influence for Shirakami is the Tsushima warm current into the Sea of Japan. The collision of the moist warm air over the water with chill north winds from Siberia creates the massive snow falls that blanket northern Honshu, including Shirakami, in winter. If climate change affects this system, there will be significant effects on Shirakami-Sanchi.



A massive oldgrowth beech tree in one of the reserves adjacent to Shirakami-Sanchi.

Conclusions and recommendations

Each World Heritage Area visited offered unique insights which together converge towards some essential conservation themes.

The Redwood National and State Parks protect a relatively small area that holds the greatest remaining tract of the world's tallest forests. Their long-term viability requires expensive, difficult and prolonged rehabilitation of severely logged areas that cover nearly one third of the parks. The NPS is carrying this out with great professionalism and dedication despite many obstacles – not least of which is funding. External support for the parks' assets, from NGOs such as Save the Redwoods League, at a time of severe budget pressure is essential. The NPS is also admirably managing high levels of visitation and producing inspiring educational materials.



Ground ferns, Redwood National Park.

The Giant Sequoia forests of Yosemite and Sequoia national parks are a global gem. Their tiny natural distribution is well protected in large national parks subject to excellent management. However, over the past 40 years, the NPS has had to re-think its management of these forests and to actively restore the natural process of fire to the landscape, a process that has had its pitfalls. Areas degraded by ad hoc tourism development have had to be restored.

The Great Smoky Mountains National Park enfold the greatest remaining tract of wild country left in the USA's south-east. But the park's 200,000 hectares have not been enough to protect its natural treasures from a horrifying biological assault in the form of exotic diseases, pests, parasites and weeds. If these processes continue unabated, this invaluable biodiversity hotspot faces ecological catastrophe. Clearly, air pollution, massive visitation, inadequacy of USA quarantine controls, suppression of natural fires, and the early destruction of the Smokies' forests have created environmental stresses that are overwhelming nature's defences as well as the capacity of the NPS to fight back. The NPS itself is bizarrely under-resourced in this, the USA's most visited national park. Battalions of volunteers and fundraisers ameliorate this situation. However, most of these efforts appear to focus on dealing with the park's visiting multitudes. Mobilising resources to combat the park's biological enemies seemed to be of lower priority. It's to be hoped that inspiring initiatives such as the All Taxa Biological Inventory won't become an exercise in monitoring the slow demise of the Smokies' legendary habitats and species.

Whatever the problems and challenges facing national parks in the USA, one shining positive stood out. Almost all employees of the NPS interviewed referred to the organisation's mission statement of managing the parks so as to 'leave them unimpaired for the enjoyment of future generations'. This, together with the NPS's clearly displayed professionalism, engendered great faith in this organisation's cohesion and effectiveness.



Giant Sequoias bathed in reflected light, Sequoia National Park.

Europe was a different story. Slovakia's Primeval Beech Forests of the Carpathians contains miraculously preserved remnants of the great beech forests that once blanketed central Europe. However, while the World Heritage Listing of these forests is laudable, the boundaries of the small, scattered 'core areas' leave much to be desired. The surrounding buffer zones contain recent clearcuts. These problems will hopefully be rectified by the efforts of conservationists, whose vision for 're-wilding' the eastern Carpathians will supersede current small-scale protection. The result should be expanded national parks, full reservation of oldgrowth, restoration of logged areas, and the reintroduction of wild animals into the places where they once roamed free.



Beech leaves and the waters of Morske Oko, Vihorlat, Slovakia.

Japan's Shirakami-Sanchi is a small but beautiful, well managed and highly revered oldgrowth remnant in a country renowned for the intensity and scale of its economic development. Facilities such as accommodation and visitors centres are located well outside of the World Heritage Area. Walking tracks bring visitors to popular attractions on the periphery of the property's wild heart. The core area is protected by strong restrictions on access, minimising egress of pests and diseases. Scientists and students have been well mobilised by park managers in monitoring the area's ecological well-being. However, other volunteers (who include the local people most active in achieving Shirakami's World Heritage status over twenty years ago) feel marginalised by the institutional arrangements between the multiple government agencies that together manage the site. Educational facilities and presentations were outstanding.



A forester's markings on a beech tree, Shirakami-Sanchi.

All of these World Heritage Areas are vulnerable to climate change, though potential impacts are generally yet to be predicted. An exception is California, where threats have been clearly defined and where conservationists are mobilising and altering their usual *modus operandi* in response. Whatever the local specifics, it is clear that protecting large tracts of forest not only helps protect them from climate change, it also helps combat climate change itself.

The lessons for Australia's temperate forests of World Heritage value are compelling. Large protected areas with clear boundaries that follow natural features of the landscape are necessary, even when this requires restoration of forests damaged by logging. Given the expense, difficulty and long time-frames involved in restoring wild landscapes, it is sensible to end damaging activities such as logging immediately. These large protected areas should be managed wholly by parks services with strong mission statements whose work should be boosted by volunteer organisations whose strategic aims are to protect the natural assets of protected areas. Natural processes should be restored to these protected landscapes wherever appropriate and practicable. Access to the remote core areas of pristine forest should be minimised, while tourist enjoyment of attractions at the fringe (such as the giant trees of the Styx valley) should be encouraged according to proper planning.

Each of these themes is explored below, concluding with a section on the giant trees and how tourism to these spectacular attractions can be enhanced in Tasmania.

1. World Heritage Areas containing large tracts of natural forest

World Heritage Areas visited were significantly smaller than the Tasmanian Wilderness World Heritage Area (TWWHA), as shown in Table 2. Other well-known natural WHAs are inserted by way of additional comparison.

Table 2. Comparison of sizes of World Heritage Areas. Highlight denotes those visited.

World Heritage Area	Area (hectares)
Alaskan / Canadian wilderness (USA, Canada)	9,839,121
Te Wahipounamu (New Zealand)	2,600,000
Kakadu (Australia)	1,979,766
Serengeti (Tanzania)	1,476,300
Tasmanian Wilderness	1,407,513
Greater Blue Mountains (Australia)	1,032,649
Grand Canyon (USA)	493,077
Yosemite (USA)	308,283
Great Smoky Mountains (USA)	209,000
Sequoia National Park* (USA)	163,500
Redwood National and State Parks (USA)	56,863
Primeval Beech Forests of the Carpathians (Ukraine)	23,514
Shirakami-Sanchi (Japan)	16,971
Primeval Beech Forests of the Carpathians (Slovakia)	8,298

* Sequoia National Park is not listed as World Heritage but should be.

Even this basic comparison shows how fortunate Tasmania is to have world-class tracts of wilderness where fragile and ancient life-forms can persist.

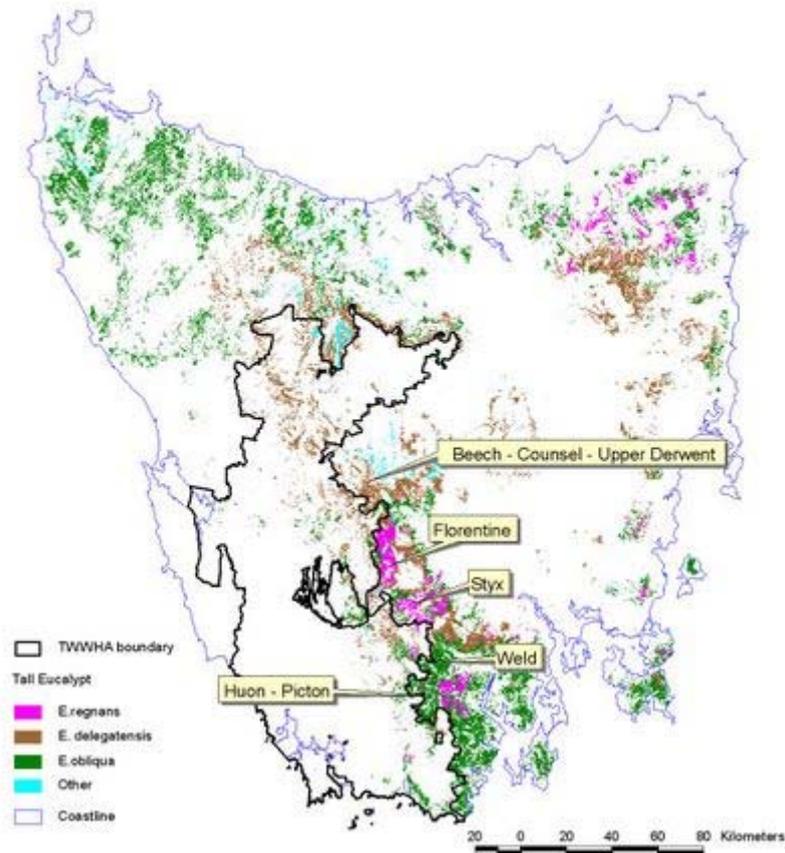
When it comes to forests, however, such a table is deceptive. The TWWHA contains a huge variety of landscapes, including bare mountaintops, deep gorges, wetlands and coastal heaths. Genuinely tall forests occupy a small proportion of the TWWHA, and when it comes to *Eucalyptus regnans*, the tallest flowering plant of Earth, the situation is actually quite grim, as Table 3 shows.

Table 3. Key tall forest-types in the TWWHA

A. Forest-type	B. Original extent (ha)	C. Remaining area 2007 (ha)	D. Protected in TWWHA (% of original area, B)	% of TWWHA occupied by D.
<i>Eucalyptus regnans</i>	99,900	68,000	3600 (3.6%)	0.3%
<i>Eucalyptus obliqua</i> (tall)	606,800	394,000	22,700 (3.7%)	1.6%
<i>Eucalyptus delegatensis</i> (tall)	316,800	272,000	45,300 (14%)	3.2%
Tall rainforest	212,700	187,000	30,400 (14%)	2.2%

The area of tall forest within the TWWHA is not large. There is about as much *E. regnans* protected in the TWWHA as there is beech forest in the small and scattered reserves that constitute the Slovakian World Heritage Area. Map 3 illustrates these points more graphically.

Map 3. Distribution of tall-eucalypt forest in Tasmania vs boundary of the TWWHA.*



*Note: TWWHA boundary not updated for small boundary modification in 2010. However forest figures in Tables 3 and 4 have been updated for this recent change.

To improve and, where possible, rectify this situation, the following recommendations are made.

- Australian State Governments should extend national parks, wherever possible, to incorporate adjacent areas of oldgrowth forest;
- The Australian and Tasmanian Governments should extend the TWWHA to incorporate areas of tall-eucalypt forest and rainforest in areas such as the Styx, Florentine, Weld, upper Derwent, Huon-Picton valleys, and the Tarkine;
- A Valley of the Giants National Park should be established in the Styx Valley to create a southern counterpart to the Redwood National and State Parks and to stimulate interest in Tasmania's giant trees.

2. Restoration of World Heritage landscapes

Given the scarcity of substantial tracts of primeval forest in the Northern Hemisphere, it is unsurprising that there are serious attempts to restore such landscapes. These widespread and expensive efforts underline once again the international value of Tasmania's forests. They also highlight the short-sightedness in allowing new logging roads to be built in such places. With over \$100 million of American taxpayers' funds spent so far on restoring Redwood forests, it seems incongruous that Australian governments have spent even more on subsidising the destruction of the Redwoods' southern counterparts.

The figures for conservation of tall-tree species such as *Eucalyptus regnans* in Table 4 demonstrate a strong case for restoration of such forests in Tasmania.

Table 4. Reservation of Tall-Eucalypt Forests in Tasmania

A. Forest type	B. Original extent (ha)	C. 2007 oldgrowth (ha) (% of original extent)	D. 'Reserved' oldgrowth (ha) (% of original extent)
<i>Eucalyptus regnans</i>	99,900	11,800 (12%)	7600 (8%)
<i>Eucalyptus obliqua</i> (tall)	606,800	78,500 (13%)	52,400 (9%)
<i>Eucalyptus delegatensis</i> (tall)	316,800	97,200 (31%)	63,800 (20%)

* 'Reserved' includes small, scattered, unviable areas such as narrow strips along streams

Forests in some of the valleys adjacent to the TWWHA should be restored. The Styx, in particular, mirrors the predicament of Redwood National Park. Upstream of existing reserves of giant trees in the Styx are invasive logging roads and at least 2000 ha of clearcut land. This has fragmented the natural forest, creating the sort of 'edge effects' that bedevil the Coast Redwoods. Weeds and diseases are spread; regeneration burns scorch and sometimes incinerate adjacent forest; high winds buffet giant trees; erosion next to major streams has occurred.

Logged areas in the Styx requiring restoration occupy only about 10% of the extent of the damaged forests in Redwood National Park, and the length of associated logging roads is proportionately less. Restoration will therefore be correspondingly cheaper.

The following measures are recommended:

- The Tasmanian and Australian governments should incorporate logged areas upstream of reserves in the Styx valley into the Styx Valley of the Giants National Park and TWWHA;
- Such areas of clearfelled and regenerated native forest should be allowed to rehabilitate naturally. Plantations in areas to be rehabilitated should be re-sown to native forest after the next harvest. Funds generated by sale of logs from those harvested plantations should be used to fund re-planting of native species;
- Associated spur roads not required for significant management or tourism purposes should be closed and rehabilitated;
- The Tasmanian Government should carry out an audit of State Forest areas where similar rehabilitation would be both beneficial and cost effective;
- Officers of the Tasmanian Parks and Wildlife Service should visit the Redwood National and State Parks to familiarise themselves with the necessary rehabilitation techniques.

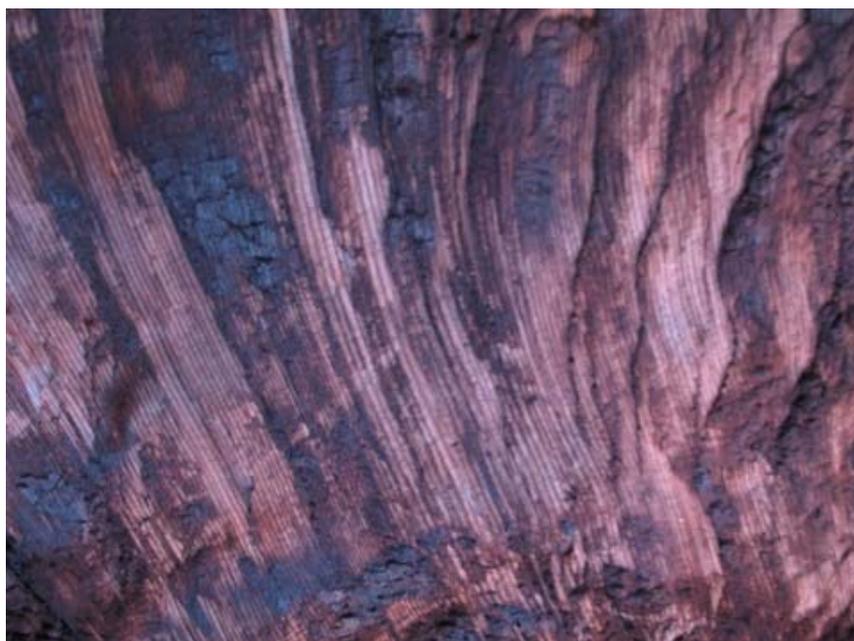


Coast Redwood log and fronds, Redwood National Park, USA.

3. Restoration of natural processes such as fire

After many decades of unquestioned suppression, fire has been reintroduced to certain natural landscapes of the USA's Redwood, Sequoia and Great Smoky Mountains national parks. Zones are defined within which different approaches to fire are applied. In large natural areas, most fires caused by lightning are allowed to burn until deemed a threat to human property or lives. Controlled burns occur in appropriate vegetation under clearly defined conditions. All fires resulting from arson are immediately suppressed.

Under these circumstances, fire can restore the natural mix of plant species and reduce the incidence, threats and impacts from uncontrolled outbreaks of wildfire. Controlled burning is not regarded as a panacea to all ecological ills, however, and is selectively used.



Fire-affected section of a Giant Sequoia, Giant Forest, Sequoia National Park.

The use of fire in Tasmania's national parks can be problematic due to the interface between fire-adapted vegetation such as buttongrass and fire-sensitive vegetation such as rainforests. Burning requires sophisticated techniques and a super-precautionary principle if mishaps are to be avoided. Tasmanian environments in which prescribed burning is appropriate include buttongrass moorlands and dry-sclerophyll forests (such as east-coast peppermint and central Tasmanian *E. delegatensis*). Environments where suppression is necessary include rainforests and alpine vegetation.

The tall-eucalypt forests are a more awkward case. Fires play an important role in the ecology of these forests, but only at very long intervals. When fires do occur, they sometimes kill the entire stand. Between these fires, for periods that can span several centuries, eucalypts reach their prodigious dimensions and rainforest species reach maturity. Some forests (as in the Huon and lower Styx) show evidence of multiple wildfires, with huge eucalypts hundreds of years old standing side-by-side with saplings of the same species.

A 'controlled burn' in such an environment is a misnomer. The prospect of incineration of the entire stand is high. Giant trees in *Eucalyptus regnans* and *E. obliqua* have become rare due to the large-scale logging and clearing operations of the last 50 years. Further losses due to misapplied controlled burning are to be avoided. There is no shortage of areas of so-called regrowth that have arisen from past wildfires and which, if left unburnt and unlogged, can provide future generations of oldgrowth giants. Suppression of fires is therefore the most appropriate policy in reserved and unreserved wet-eucalypt forests.

Recommendations for Tasmania's protected areas are as follows:

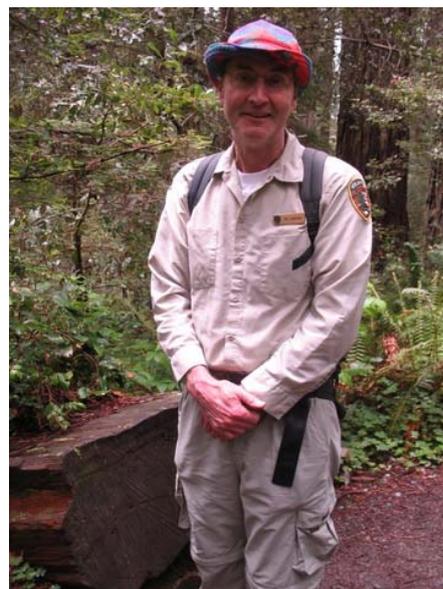
- Fire-management plans should clearly state ecological objectives;
- Fire-management plans should clearly identify zones where different policies apply;
- Policies of immediate suppression should apply to rainforests, alpine vegetation, wet-eucalypt forests and all fires caused by arson;
- Monitoring and limited intervention should apply to zones where frequent burning is appropriate (such as open woodlands, moorlands and dry-sclerophyll forests);
- Prescribed burning should apply to zones both where burning is appropriate and where high-priority objectives will be achieved;
- Given Australia's lamentable history with respect to escaped 'controlled burns', a super-precautionary principle (if in any doubt, don't burn) should apply to all prescribed burns.

4. Management of World Heritage Forests by Appropriate Authorities

The USA National Park Service demonstrated world-class management of forests, with frequent reference in publications to its Mission Statement:

"...to promote and regulate the use of the...national parks...which purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."

Employees of the NPS frequently and proudly quoted the words 'unimpaired for the enjoyment of future generations'.



Volunteer ranger, Redwood National Park

In Tasmania, however, most of Tasmania's tall-eucalypt forests are managed by Forestry Tasmania, a government business enterprise whose main priority is growing and selling logs to companies that make woodchips, veneer and sawn timber. In 2011, Forestry Tasmania managed some 1.5 million hectares of land in Tasmania including the majority of the valleys where the big trees grow. Its contested policy of logging oldgrowth forests has persisted long after large forest-product companies such as Norske Skog, North Broken Hill and Gunns have moved on. Its emphasis is on 'multiple-use management', which is intended to combine nature conservation and recreation with wood production. The Styx valley provides a vivid case study for the failure of this policy, and is described under the Giant Trees section below.

The Tasmanian Parks and Wildlife Service (TPWS), however, has a strong commitment to protecting the natural environment, as encapsulated in its own vision and mission statements:

Vision

To protect, present and manage, in concert with the community, Tasmania's unique and outstanding reserve system for all people, for all time.

Mission

To create and maintain a representative and world-renowned reserve system. To conserve the state's natural and cultural heritage while providing for sustainable use and economic opportunities for the Tasmanian community.

The following recommendations are therefore made:

- The entirety of the TWWHA should be managed by the TNPWS, including the three forest reserves on the Great Western Tiers;
- Extensions to the TWWHA (such as the oldgrowth forests of the Styx, Florentine and Weld valleys and the rainforests of the Tarkine) should be managed by the TNPWS.

5. External support

Management in each of the USA World Heritage Areas visited was strongly bolstered by the efforts of volunteers. Volunteers raised funds, greeted and educated visitors, and helped maintain infrastructure such as huts and tracks. Without such external support, the plight of the cash-strapped Great Smoky Mountains would be dire indeed. In the Coast Redwoods and Giant Sequoias of California, scientific research invaluable for long-term management of the forests was provided by the Save the Redwoods League. At Shirakami-Sanchi, regular surveys of biodiversity were carried out by volunteers from universities and NGOs. Along the boundaries of Japan's Shirakami-Sanchi WHA, volunteers carried out patrols to guard against illegal hut construction, extraction of plants, and fishing. In Slovakia, the Forest Stewardship Council played a leadership role in a study identifying the country's remaining areas of oldgrowth forest.

In places where public financial resources have become tightly constrained, cuts to the already thin budgets of park-management agencies have become debilitating. In California, over 70 state parks are being closed for this reason. The Save the Redwoods League may well soon be managing some of these parks – and the new ones it is creating through land purchases – by itself. In Japan, the national Forestry Agency has a \$1-billion debt. Park management in Slovakia will no doubt be affected by the financial crisis afflicting the Euro-zone.

Tasmania is fortunate to already have in place a well-organised, well-supported volunteer organisation, WildCare, that assists the TPWS in managing Tasmania's parks. With over 50 WildCare groups around the state and an estimated 250,000 person-hours per annum of volunteer effort, this organisation must be one of the best of its kind in the world. Services provided by WildCare go well beyond unskilled labour; many retired professionals donate their skills in planning, zoology, botany, archaeology and care of wildlife.

Such measures should be reproduced around Australia to guard against the impacts of budget cuts and to engage more of the community in management of our natural assets. They help moderate the impacts of the ebbs and flows in government funding for protected areas.

In Tasmania, the contributions of WildCare could be enhanced through the following measures:

- Consideration of giving WildCare franchises for the retail outlets in Parks' visitors centres;
- The Premier and other relevant government ministers should join WildCare and participate in some volunteer activities;
- WildCare should remain under the auspices of the TPWS (rather than be shunted off to the latest incarnation of the Department of Primary Industries, Water and Environment);
- Co-management of an appropriate reserve, involving TNPWS, WildCare and potentially another organisation (such as an indigenous group or local government) should be trialled.

Additional recommendations to enhance external support for parks include:

- Consideration of a volunteer-based All Taxa Biological Inventory a Tasmanian reserve;
- Developing a program of fostering custodianship of parks and reserves amongst community leaders in adjacent towns and municipalities;
- Instituting a program of Junior Rangers to educate young people about caring for the natural environment and to encourage their concern for wild animals and natural places.

6. Restrict access to pristine, remote core areas of forest while encouraging sustainable tourism to attractions on the fringe

The ecological integrity of Japan's Shirakami-Sanchi WHA is protected by restricting the vast majority of visitors and associated infrastructure to the World Heritage Area's periphery. Similar restrictions effectively apply to significant areas of Coast Redwood forest due to a combination of rugged terrain and dense vegetation.

Similar restrictions can apply in Tasmania's forests without impinging on tourism or recreation:

- The primeval forests of the middle Weld valley, the North Styx Forest Reserve, the upper Gordon, the Spero and Wanderer Rivers, and the Savage River National Park are currently devoid of access and infrastructure and should remain that way to prevent egress of exotic pests, parasites and diseases.

Meanwhile, visitor access and facilities can be developed on the fringes of pristine forests, in areas such as the south Styx. Means of developing tourism in these forests are explored in the next section.

7. The Giant Trees

Like the Coast Redwoods and Giant Sequoias of California, Tasmania's tall eucalypts can attain prodigious dimensions if allowed to grow for long enough. The table below compares the dimensions of the world's tallest hardwoods with the world's tallest and most massive trees.

Table 5. Comparisons of giant trees – California and Tasmania

	Tasmanian eucalypts (<i>Eucalyptus regnans</i> unless otherwise stated)	Coast Redwoods (<i>Sequoia sempervirens</i>)	Giant Sequoias (<i>Sequoiadendron giganteum</i>)
Height (metres)	Centurion, Arve valley, 99.6 m Icarus Dream, Styx valley, 97 m Mount Tree, Styx valley, 96 m Firebird Wonder, Styx Road, 95.9 m	Hyperion, RNSP, 115.6 m Helios, RNSP, 114.7 m (numerous others) Big Tree, RNSP, 92.6 m	Nine unspecified trees from 91.7 to 95.8 metres
Volume (cubic metres)	El Grande*, Florentine valley, 439 m ³ Arve Big Tree, Arve valley, 360 m ³ Two Towers, Styx valley, 358 m ³ , 007, Conways Rd., 350 m ³ Chapel Tree, Styx valley, 347 m ³	Lost Monarch, RNSP, 1206 m ³ Melkor, RNSP, 1109 m ³ Iluvatar, RNSP, 1064 m ³	General Sherman Tree, SKCNP, 1487 m ³ General Grant Tree, SKCNP, 1344 m ³
Width (metres)	Big Foot, Arve valley, 6.5 m El Grande*, Florentine valley, 6.0 m El Maestro, Bennetts Road, 5.9 m Two Towers, Styx valley, 5.8 m Chapel Tree, Styx valley, 5.6 m Rullah Longatyle**, Esperance valley, 5.5 m (<i>Eucalyptus globulus</i>) Papa Zig, Arve Rd., 5.5 m The Big Tree, Arve valley, 5.4 m	Lost Monarch, RNSP, 7.92 m Del Norte Titan, RNSP, 7.2 m Big Tree, RNSP, 7.2 m Westridge Giant, RNSP, 7.0 m	General Grant Tree, SKCNP, 12.3 m General Sherman Tree, SKCNP., 11.1 m Grizzly Giant, (Mariposa Grove) Yosemite Nat. Pk., 7.8 m
Age (years)	Unspecified <i>Eucalyptus regnans</i> , Styx valley, 5-600 years old	Unspecified tree, 2000 yr	Unspecified tree, 3200 yr

* El Grande was killed in 2003 by a Forestry Tasmania prescribed burn and has subsequently fallen.

** This giant was originally christened The Grieving Giant because the oldgrowth forests surrounding it have been destroyed. Forestry Tasmania did not accept this name.

The tallest of the Coast Redwoods are taller than the tallest eucalypts by 15%. When it comes to sheer mass and volume, the biggest of the Giant Sequoias simply have no equal – they dwarf even the most massive of Tasmania’s giants. However, some of the ‘smaller’ giants, such as the highly visited Grizzly Giant in Yosemite National Park, bore a resemblance to some of the Tasmanian big trees.

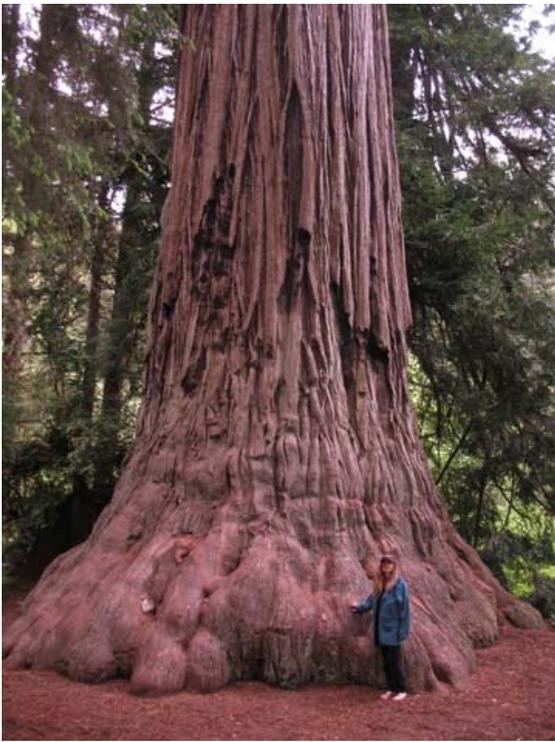


Yosemite’s Grizzly Giant (left) and Tasmania’s El Grande (before it was killed by a forestry burn in 2003).

The impressions given by the Tasmanian giant eucalypts and the Coast Redwoods at ground level are strikingly similar, both with bases 4-7 metres in diameter.

Both types of forest are sublimely beautiful. The Coast Redwoods soar cleanly upwards to a distant, complex canopy that is often shrouded in misty rain. Their bases are sometimes round and regular, sometimes gnarled and mossy. Between the great pillars of the Redwoods a tangled understorey drips with moisture. In the tall-eucalypt forests, clean, straight trunks emerge from a vibrantly green understorey, with mosses and ferns cloaking branches and trunks. The bases of the trees are often attractively buttressed. Above a ragged skirt, the trunks of *Eucalyptus regnans* are smooth and streaky, their colours intensified when glistening after rain. Tall *Eucalyptus obliqua*, or stringybark, are equally attractive, with vertical striations in the reddish bark accentuating the trees’ stature.

Beneath the canopies, similarities abound. Decaying leaf litter creates a soft forest floor with a rich earthy smell. The ground is carpeted in ferns of different sizes. The trees and shrubs of the understorey create a glorious confusion of leaves and limbs. Reddish tints contrast with the pervasive green. The Redwoods’ crystal-clear creeks rush or meander their way to the larger rivers which are a deep turquoise. Tasmania’s streams are usually tinted a reddish-brown tea colour by tannins in adjacent vegetation.



A Californian Coast redwood (left) and a Tasmanian giant eucalypt (right, Arve Big Tree, 1990s).

Over 440,000 people visited the Coast Redwoods in 2009, generating \$22 million in direct spending and 272 local jobs. The attractions inside Tasmania's forests of giants, however, received only a small proportion of that. The Styx valley, home of the greatest concentration of giant trees in the Southern Hemisphere, receives few visitors. (Forestry Tasmania said it lacked precise numbers)



A full carpark (above) on a Monday in June at the Mariposa Grove, Yosemite National Park, and the almost empty carpark at the Styx Big Tree Reserve on a sunny Saturday in November 2011.

The Tahune Airwalk receives approximately 80,000 visitors per annum. This attraction is heavily marketed but the emphasis tends to be on the aerial infrastructure, rather than on the forests. While beautiful, the trees here are much smaller than their counterparts in the Styx and Florentine valleys.

Tasmania's trees are not as huge as those in California. And the population of the whole of Australia is about the same as that of California, reducing the number of potential visitors to Tasmania's giant trees. It does seem, however, that Tasmania's giant trees are underperforming as a tourist attraction. There are a number of likely reasons for this.

Lack of awareness

The Coast Redwoods and Giant Sequoias have been a celebrated part of the heritage of the USA for over 100 years. The giant eucalypts of Tasmania, however, have not been part of the public's general knowledge until the controversies of recent campaigns put them there.

Lack of marketing

Places such as the Styx Valley simply do not feature in Government promotions. A request for literature about giant trees in September 2011 at Hobart's main tourist information centre produced only the self-drive brochures of the Wilderness Society. While these were perfectly serviceable, the promotion of the world's tallest flowering plants should surely be taken on by more than an NGO whose core business is not tourism but running conservation campaigns. The *Rivers Run* leaflet and map, which promote the Derwent valley as a whole, contains a brief reference by Forestry Tasmania to '... the Styx and Florentine Valleys, home to the world's tallest flowering plants' almost as an afterthought.

In California, by contrast, the giant trees are, if anything, over-promoted, with a great variety of books and brochures as well as road signs and veritable theme parks to attract the visitor.



The Californian Coast Redwoods receive heavy promotion.

Difficulty of access

Roads into the Styx Valley and other places where giant trees grow are generally unsealed. The major exception is the Tahune Airwalk. For those tourists not put off by gravel roads (and the restrictions on hire-car insurance that apply to them), there are also the hazards of pot holes and log trucks. Until the late nineteen nineties many of the roads that led to the giants were behind padlocked gates. Application to a logging company during working hours was required to secure access. This contrasts with the Sequoias, where

sealed roads and free public buses convey people to the attractions, and with the Coast Redwoods, where dozens of attractions are accessible via sealed roads.



A free bus from a carpark to the Giant Sequoias.

Lack of diversity of walks

In Tasmania, experiences available to the uninitiated visitor to the giant trees are dominated by very, very short walks. A walker of average fitness can easily complete the excursions to the Styx

Big Tree loop, the Arve Big Tree, the Mt Field Tall Trees, and the Evercreech White Knights in less than 20 minutes.

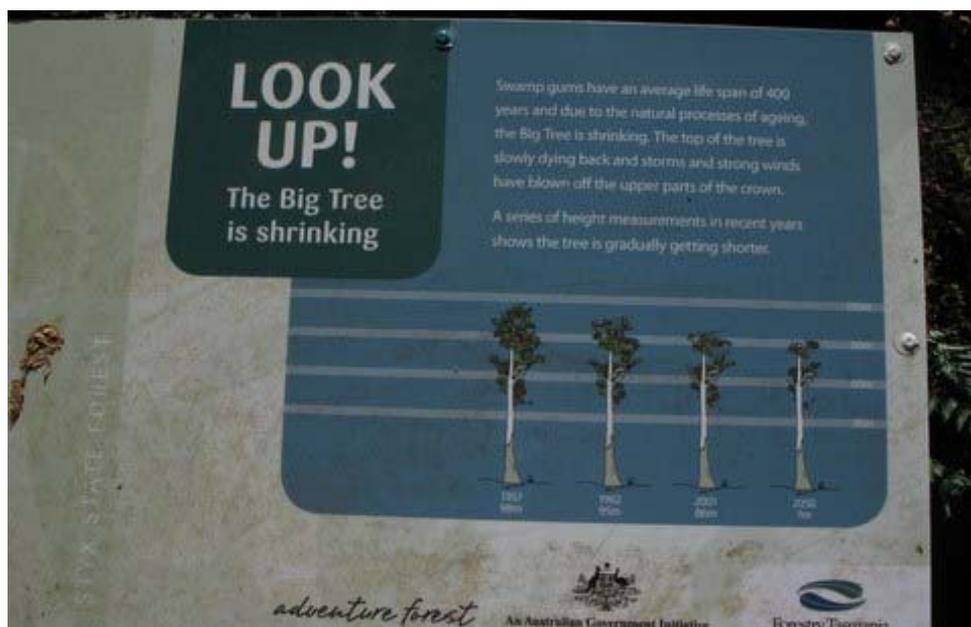
California's giant-tree parks, however, offer a diversity of trails that can take minutes, hours, days or even weeks to complete. Sequoia National Park's Giant Forest has 70 kilometres of well-maintained trails. Redwood National and State Parks have plenty of short, educational loops (such as the aptly-named Revelation Trail), superb trails that take a few hours to hike (Prairie Creek and Cathedral trails), and trails for more adventurous hikers prepared to camp out.

Institutional conflicts of priority

Most of Tasmania's tall-eucalypt forests are managed by Forestry Tasmania, whose priorities are dominated by wood production. Large tracts of oldgrowth tall-eucalypts remain under threat, with significant areas being felled each year, even in valleys such as the Styx. Reserves of giant trees are often tiny – the Styx valley's Big Tree Reserve, for example, is only 113 ha in extent – and have been hemmed in by clear-cuts. The visitor approaches these isolated stands of giant trees through landscapes tarnished by views of felled trees, stumps, plantations and large forestry burn-offs.

Forestry Tasmania's exercises in promoting the values of giant trees seem adversely affected by its pro-logging functions. The sign welcoming visitors to the Styx valley, for example, pictures a forestry worker in a hard hat at the base of a dimly perceived tree-trunk. Though entitled 'Home of the Forest Giants', virtually nothing is said about the trees themselves. The writing is dominated by the history of logging, the technicalities of reserve creation, and government attempts at balanced management. There is nothing in the text to inform the visitor that the Styx valley holds the world's greatest concentration of giant hardwood trees, to describe these forests in a global context, or to provide ecological information about the forest and its wildlife.

At the Big Tree Reserve, a sign tells visitors to look up because 'the Big Tree is shrinking'. The gradual loss of the tree's top-most branches is described in great detail in a series of signs that emphasise arboreal mortality. There is no mention of the continued growth of the girths and volumes of these ancient giants, nor of the fact that other tall trees in the valley are still growing taller. Other signs are more in tune with the visitor's responses to being in the presence of such mighty living entities. However, the giant eucalypts' fellow forest denizens, the rainforest species, are given cursory treatment, and there is no mention of the eagles, owls, quolls, bats, cockatoos and other creatures that live in oldgrowth forests, nor of the colourful conservation history of these sites, which have seen tree-top protests, rallies, and national controversy.



A strange way of promoting the wonders of Tasmania's giant trees (Styx Big Tree Reserve, November 2011)

The educational materials of the Californian giants stimulate the imagination, bring to life the complex ecological relationships, pay tribute to the pioneers of conservation, and foster a sense of wonder. Forestry Tasmania's treatment of giant trees is, by comparison, lukewarm, bland and ambiguous. This reflects the dual role of Forestry Tasmania. It is unsurprisingly difficult for an organisation to, on the one hand, engage in, defend and promote cutting down ancient oldgrowth forests and, on the other, to sing the praises of those very same forests.

After the little track in the Big Tree Reserve, visitors are enjoined to turn their cars around and drive out of the valley again lest they encounter a gate on private land (some 20 kilometres further down the valley). This turning circle occurs well short of the Styx Tall Trees Forest Reserve and giants such as Icarus Dream, Gothmog, the Chapel Tree, Two Towers and Gandalf's Staff.

At the nearby Mt Field National Park, a tall-trees walk that is promoted as one of Tasmania's 'Great Short Walks', is a welcome contrast to Forestry Tasmania's half-hearted efforts. The big trees here are not as extensive, tall or capacious, and the surrounding understorey species not as venerable, as those in the Styx. But despite the limited raw material, the Parks and Wildlife Service has created an engaging and informative experience. A 30-minute walk leads the visitor along an interactive educational trail that provides rich ecological insights.

There seems to be little effort to integrate promotion of the two main forest attractions in this region. Mt Field National Park and the giants of the Styx are within 45 minutes' drive of each other. Up to 120,000 people visit Mt Field National Park each year, yet there is no promotion of the Styx valley's giant trees at the national park's visitors centre. It would make sense for the otherwise excellent displays at the visitors centre to promote the attractions of the Styx. Having a single land-management agency responsible for the area's natural assets would greatly benefit local tourism.

It would be preferable for accommodation and other buildings to be developed where power lines, sewerage and main roads already exist, such as in the Maydena and National Park areas, rather than amongst the giant trees. In Sequoia National Park, millions of dollars of taxpayers' funds were spent removing buildings and restoring forests degraded by *ad hoc* tourism developments last century. Good planning can help avoid these problems in Tasmania.



It's preferable not to develop campsites amongst sensitive tall forests, as pictured in the Redwoods, but in more robust environments, usually outside park boundaries.

Recommendations:

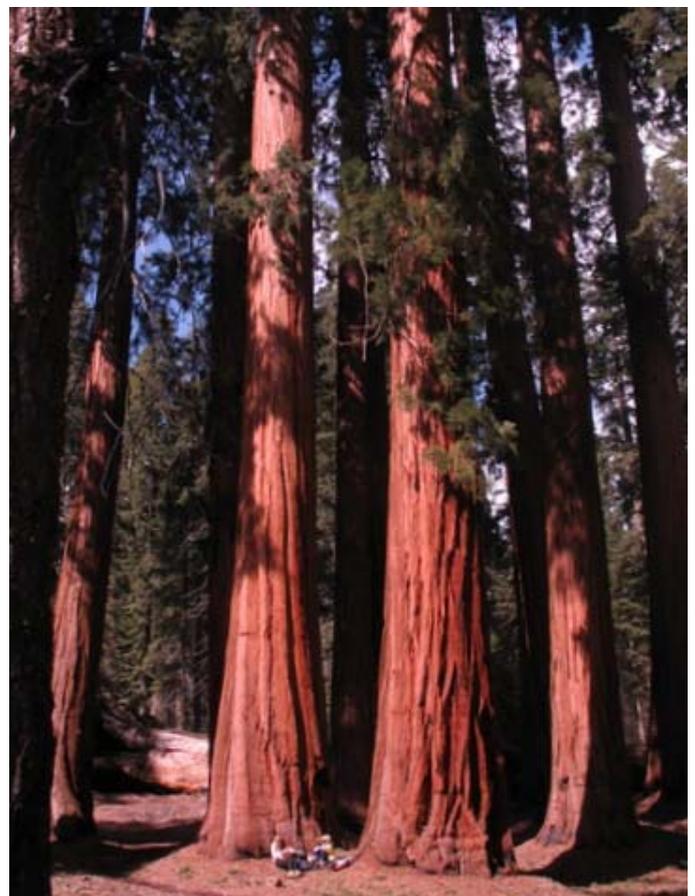
- To remove conflicts of priority that undermine Tasmania's promotion of giant trees, management of reserves in areas such as the Styx valley should be carried out by the TPWS;
- The road into the Styx valley should be sealed at least as far as the Styx Tall Trees reserve. Once this occurs, free mini-bus trips to the giant trees could be trialled;
- The TPWS should develop a new track through the Styx Tall Trees and Big Tree reserves in the Styx valley for walkers who want an adventure amongst the giant trees that can last about half a day;
- Development of facilities such as accommodation and visitors centres should largely be restricted to the towns of Maydena and National Park where infrastructure already exists;
- The Mt Field visitors centre should have a section devoted entirely to the Styx Valley of the Giants National Park and further efforts at coordinating the two attractions should be investigated;
- The Government should undertake promotion of Tasmania's giant trees as a tourist attraction in their own right;
- The objectives of education in giant-tree parks should be detailed in the relevant management plan. Such objectives should include informing visitors of the international context of Tasmania's giant trees, and the ecological relationships between the forests, rivers, wildlife, mountains and caves;
- Education materials, including signs, in areas of giant trees developed for tourists should focus on the forests themselves. The land manager's perception of itself should be accorded lower priority than describing pertinent ecological relationships, wildlife and history;
- Park managers should ensure that the task of developing the design and text of educational materials is carried out by skilled and knowledgeable people whose enthusiasm for this natural landscape is infectious.

8. Responses to climate change

Climate change poses a major threat to many of the World Heritage forests visited. The most important measure to protect forests against the impacts of climate change will also help combat climate change itself – and that is the protection of additional substantial tracts of native forest in secure reserves.

The following recommendations are made:

- Reserves of tall-eucalypt forest in Australia must be extended to incorporate adjacent oldgrowth forests as well as regrowth areas in relevant catchments;
- In carrying out the above, governments should declare an intention to fight climate change by sequestering carbon and thereby raise funds from relevant carbon off-set programs.



Giant Sequoias, Sequoia National Park

9. Recommendations for governments of countries visited

The objective of visiting World Heritage Areas in other countries was to learn from their managers and conservationists rather than to give unsolicited advice to host governments. However, the following requests are made, with apologies, to those governments and their agencies:

- The USA government is requested to consider designation of the Great Smoky Mountains National Park under the Wilderness Act; and to consider nominating the Great Smoky Mountains for the World Heritage in Danger list because of the park's lack of funding and the potentially catastrophic ecological impacts of the destructive and exotic pests and diseases afflicting the area's diverse natural vegetation;
- The USA government is requested to consider nominating Sequoia National Park for World Heritage Listing because of its awe-inspiring and ancient Giant Sequoia trees;
- The Slovakian government is requested to consider re-nominating its component of the Primeval Beech Forests of the Carpathians World Heritage Area with significantly larger and better defined tracts of forest, including all current core areas and buffer zones; inclusion of relevant catchments; full protection of all forests listed; a stated policy of restoration of logged areas; and full protection for all species, including bears and wolves;
- The Japanese government is requested to consider providing additional support to volunteers that help manage Shirakami-Sanchi, including additional consultation and resources, particularly in the Fujisato area.



Coast Redwoods, Redwood National and State Parks, California, USA.