



STEP Matters

Number 176 June 2014

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Professor Johnston is an Australian Research Fellow at the University of New South Wales. She will be a familiar face to some as a co-presenter for the Foxtel/BBC television series *Coast Australia*.

STEP LECTURE: SYDNEY HARBOUR – BIODIVERSITY AND THREATS

Date: Thursday 16 October
Time: 8 pm
Place: St Andrews Uniting Church,
corner of Chisholm Street and
Vernon Street, Turrumurra

We are pleased to announce that the 2014 STEP Lecture will be presented by Professor Emma Johnston, Director of the Sydney Harbour Project at the Sydney Institute of Marine Science.

Sydney Harbour's beauty draws tourists from all over Australia and from around the world and it provides a wonderful living and visual environment to many of Sydney's population. However, the increasing population of Sydney and climate change will add significantly to the existing pressures upon the harbour with as yet unknown consequences.

The lecture will demonstrate the biodiversity and ecological systems of our iconic harbour that have been highlighted by the Harbour Project and describe the work being done to provide a scientific basis for future management and policy decisions.

Many people are saying that Sydney Harbour should become a marine park. Will this help make a difference?

STEP TALK: NSW ICONS UNDER THREAT

Date: Tuesday 17 June
Time: 8 pm
Place: St Andrews Uniting Church,
corner of Chisholm Street and
Vernon Street, Turrumurra

We will screen a short film which demonstrates the beautiful places in NSW that are under threat from coal mining and coal seam gas projects. Then Michael Keats will talk and show photographs about his personal experience of the amazing landscapes in the Gardens of Stone National Park and Ben Bullen State Forest. Michael is an avid bushwalker and author of a series of books on the Gardens of Stone National Park.

Proposals to expand a coal mine in the Ben Bullen State Forest near Cullen Bullen were rejected by state planning authorities in October 2013 because of unacceptable environmental impacts. The proponent, Coalpac Pty Ltd then went into voluntary administration. Now the company has lodged an application to restart and expand the project so this beautiful pagoda wonderland is again under threat.

STEP Inc

Community-based Environmental Conservation since 1978

secretary@step.org.au
www.step.org.au

PO Box 5136, Turrumurra, NSW 2074
Facebook: <https://www.facebook.com/STEP.Inc.Sydney>

ABN 55 851 372 043
Twitter: @STEPSydney

STEP WALKS

Sunday 22 June, Castlecrag: The Legacy of Marion and Walter Burley Griffin

Time: 1.15 for 1.30 pm start
Length: 2 to 3 hours, approx 4 km
Meet: Warners Park, Northbridge
Grade: Medium, some steep steps
Limit: 15 (booking recommended)
Contact: Frank Budai (9411 6048, budai@internode.on.net)

This walk will cover the highlights of the suburban areas that were designed by Marion and Walter Burley Griffin to integrate with the beautiful bushland setting of Castlecrag.

From Warners Park we will follow Sailors Bay Track to The Barquette, visit the Haven (outdoor theatre), then climb to Tower Reserve via The Bartizan track and cross Edinburgh Road to view the Castlecrag Northern Escarpment nature reserve. The return walk will be via The Citadel track to Warners Park.

For more information on the Griffins' legacy see the articles on pages 3 and 10.

Sunday 27 July, Garigal National Park, Mountain Bike Trail Area

Time: 1.15 for 1.30 pm start
Length: 2.5 to 3 hours, approx 6 km
Meet: Ararat Reserve, Grattan Crescent, Forestville
Grade: Moderate to hard, one steep section
Contact: Jill Green (jillpgreen@gmail.com, 9489 8256 or 0408 470 043, booking recommended)

This walk will view the high quality bushland where the mountain bike trail will be built despite opposition from all local environment groups.

From Ararat Reserve we descend to Forestville Park, then follow the Currie Road Track, go out and back along the Cook Street Track to Middle Harbour, then take the Natural Bridge Track (100 m climb) back up to the Bluff Lookout and Drum Cave.

We will have afternoon tea and strudel at the Austrian Club after the walk.

Advance Notice: Sunday 21 September, Hornsby Blue Gum Walk

CHANGING OF THE GUARD AT PARLIAMENT HOUSE

The unfortunate resignation of Barry O'Farrell on 17 April and the subsequent significant change in ministerial allocations driven by the ICAC revelations have raised hopes that the environment will receive better treatment from the NSW Government. We now have an environment minister, Rob Stokes, who has a PhD in environmental law.

The first major step was a restructure to create the Department of Planning and Environment and the appointment of Pru Goward as Planning Minister. It is hoped that there will be a change of attitude so that the views of communities and the need to protect the environment will no longer be subverted to the interests of the mining and development lobbies.

Barry O'Farrell is a life member of STEP. The committee and members have always been able to meet and explain their views to Barry as our local member of parliament and as premier.

There is still much to be done to improve local decisions for development to prevent further degradation of the bushland character of the Bradfield electorate.

FORUM ON EFFECTS OF LONGWALL MINING ON SYDNEY'S WATER CATCHMENT

A large group came to the Turramurra Uniting Church Hall on 10 May to hear the presentation by Julie Sheppard from Rivers SOS on what is happening to Sydney's water catchment in the Woronora area.

Some of the catchment of the four dams in the area has already been affected by longwall mining (see *STEP Matters* Issue 173, p7 and Issue 175, p2). The NSW Government has granted approval for new longwall mining areas that are under the catchment of the Avon Dam. These dams comprise about 20% of the total Sydney Basin capacity. However they are in an area with higher and more reliable rainfall than Warragamba and many other storages. Therefore they are important dams.

It was shocking to see photos of water contaminated with iron and other chemicals and the bone dry coastal upland swamps and streams. Treatment is required to make the water safe for drinking.

The government asked the Chief Scientist to report on the long-term cumulative impacts of coal and coal seam gas development in the Sydney catchment. The report released on 3 June acknowledged the contamination and water loss but said there was no cause for concern. Modern treatment methods can handle the contamination. Her main recommendation was to improve data collection!

By the time we have the full picture from this data analysis it may be too late to reverse serious damage. The public will then have to bear the cost of water treatment and/or building extra desalination capacity. The precautionary principle has been thrown out the window. It should be up to the coal companies to prove that they will not damage our water supply.

HORNSBY IS LOSING ITS TREES

In 2011 Hornsby Council amended its Tree Preservation Order (TPO) so that only tree species indigenous to the Hornsby area (about 100 species) would be protected apart from heritage conservation areas where all trees are protected. Recently the Council resolved to review the Order and consider adding 22 species to the list of trees to be protected and conducted a community survey of this proposal.

As part of the review the Council also commissioned a survey, using aerial photography, of tree canopy loss comparing loss rates before and after the change in the TPO. This survey revealed that there has been a huge loss of tree cover and an increase in the rate of loss since 2011.

The canopy loss over the two years 2011–13 was 27% higher than from 2009–11. From 2011–13 about 2% of the tree canopy area was lost. This is an extraordinary rate of loss when it is likely that this rate will continue.

The bushland character of Hornsby is changing rapidly. The building of more apartment blocks, the construction of the new freight rail line and North West Rail and F3/M2 link will add to the losses occurring in suburban streets. The proposed changes to the clearing regulations on bushfire prone land are also likely to add to these losses – more detail in a future edition of *STEP Matters*.

Turning to the community survey, there were 286 responses from 2,000 mailed surveys plus 42 replied online. 55% opposed the addition of more species to the protected trees list.

The Council's decision was to retain the current list of protected species on the grounds of a lack of community support and the extra administration of protected tree removal applications. The only answer to the loss of tree cover is to investigate additional planting of street and park trees. No wonder Hornsby is no longer called the Bushland Shire!

THE GRIFFINS' LEGACY IN CASTLECRAIG

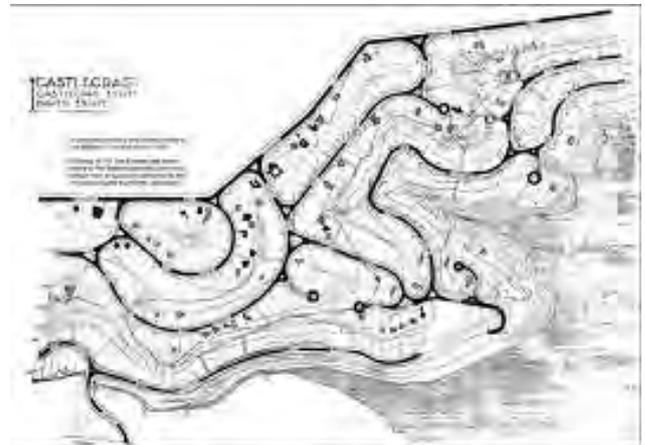
In anticipation STEP's next walk in Castlecrag on 22 June (see page 2) this article provides background information on the design by the Griffins of this unique suburb. The source of this information is mostly from the Griffin Society, www.griffinsociety.org/Conservation/legacy_castlecrag.html.

A decade after Marion Mahony Griffin and Walter Burley Griffin won the design competition for Canberra they embarked on the development and subdivision of Castlecrag.

In 1920 they founded the Greater Sydney

Development Association. This Association purchased 650 acres of land at Middle Harbour including the south-west part of Castlecrag for the sum of 25,000 pounds. The area was described as one of the most generous subdivisions in Australia. They set out to prove that 'architecture and landscape should be designed together and inhabitants grouped by communal interests'. Their concept is explained further in this description by Walter Burley Griffin:

People spend a lifetime trying to get a large piece of land, put a house on it and plant it like a park. Few can afford to reach their goal. What I want to do is to give everyone a chance to attain such a dream. I want Castlecrag to be built so that each individual can feel that the whole of the landscape is his. No fence, no boundaries, no red roofs to spoil the Australian landscape; these are some of the features that will distinguish Castlecrag.



A walking tour of Castlecrag reveals the following physical aspects of their design principles.

Houses

The 15 houses built to the Griffins' designs plus two others with designs that Walter approved, are distinctive in their use of local stone or Griffin's knitlock bricks, their flat roofs to minimise their impact on others' views and their organic design. They are part of, not perched on, their land.

To preserve his vision for the future of Castlecrag, Griffin instigated a system of covenants over the residential allotments within the estate. These covenants were to control building so as to prevent unsympathetic development as well as to protect the native flora and fauna.

Street Layout

The curvilinear roads follow the contours unlike the regular grid pattern of neighbouring suburbs. Streets at different levels are linked by pathways. The streets include bush covered islands and several cul-de-sacs. The original plan not to build fences still predominates.

Connected Reserves

Griffin planned a series of reserves connected

by a network of pathways. Residents are able to walk across the suburb while staying off roads. Many reserves have dramatic rocky outcrops and views. Individual topographical features suggested appropriate names, such as Buttress, Gargoyle and Retreat. Haven Reserve has the unique open-air amphitheatre.

Accessible Waterfront

Foresight was shown by setting aside many kilometres of continuous foreshore as reserves.

The Legacy

Today, the overall plan still allows a shared landscape as the Griffins intended, with the merging of public and private spaces to create the unique effect of houses nestling within the landscape. In Griffin's words this was 'so that each individual can feel the whole landscape is his'.

The houses form a nationally significant precinct of outstanding inter-war architecture that is nationally and internationally recognised.

An important aspect of the Griffin legacy, although less tangible but still palpable today, is its community spirit. This is evidenced in the numerous community groups and activities in the peninsular suburb. Music, play reading and discussion groups, tree planting and bushland conservation activities, and the open-air Haven Valley Scenic Theatre, were established by the Griffins and their associates in the 1920s and 1930s.

Today the Castlecrag Progress Association, the Castlecrag Conservation Society, the Castlecrag Playreading Group, the Haven Theatre Committee and the Walter Burley Griffin Society continue that community spirit initiated and inspired by the Griffins.

Conservation Measures

To assist in the conservation of the Griffin legacy the local government council, Willoughby City Council, has undertaken a lengthy process of study and community consultation to produce its own heritage conservation policy. This plan applies to all buildings and places of heritage significance in what is known as the Griffin Conservation Area at Castlecrag. The controls within the plan are designed to ensure that heritage significance and amenity of views, vistas and landscape are retained.

The Griffin Conservation Area, which is also classified as an Urban Conservation Area by the National Trust of Australia, is one of the twelve conservation areas of Willoughby City Council. Within the Conservation Area, the most significant objective of the heritage controls is to ensure the subordination of buildings to the landscape.

In addition to the controls, the Griffin houses at Castlecrag are listed in Local Environment Plan 1995 (LEP1995) as heritage items classified to

be of state and regional significance.

In 1997, a Plan of Management for the Griffin Reserves at Castlecrag was prepared and is now being implemented by Willoughby City Council. This seeks to regenerate and maintain the network of reserves and the surviving canopy of the urban forest that gives a bushland atmosphere to the suburb, despite past depredations and neglect. Council officers and a resident advisory group are preparing detailed management plans for each reserve, to document their condition and set out the actions required for their rejuvenation.

Castlecrag continues therefore to demonstrate the Griffins' deep respect for the natural landscape and their ideal of a community living in harmony with its beautiful setting.

VALE ALAN CATFORD

STEP members will be saddened by the death of Alan Catford on 5 June. Alan has been an active member of STEP for over 30 years. He was president for two years between 1983 and 1985 during the period of campaigning against the Lane Cove Valley freeway.

Alan Catford, bushwalker and conservationist, became involved in environmental conservation in 1961, after many years of bushwalking and a lifelong interest in nature. He worked for the Wild Life Preservation Society of Australia before joining the National Parks Association of New South Wales (NPA) in the mid-1960s.

Alan's early interests included bushfire control and ecology. He was actively involved in coastal conservation, particularly the campaign for a Myall Lakes National Park and his involvement in the Myall Lakes Committee. He was a member and long-time chair of the NPA's Park Management Committee which, among a number of issues, ran a campaign against motor vehicles driven on beaches, and protested regularly about excessive vehicular access to national parks. Alan was NSW Liaison Officer of the Australian Conservation Foundation for a number of years until he resigned in 1986.

Our heartfelt condolences go to his wife, Janet and family and neighbours from the close knit community of South Turramurra.

OUR NATIONAL PARKS ARE GOOD BUT NOT PERFECT

This article was written by Professor Rod Keenan, Head of Department of Resource Management and Geography, University of Melbourne. It was published in The Conversation on 7 March 2014 (<http://theconversation.com>).

Prime Minister Tony Abbott this week told a timber industry dinner that he doesn't think national parks should be a growth industry:

We have quite enough national parks. We have quite enough locked up forests already. In fact, in an important respect, we have too much locked up forest.

Is he right? How much forest should be in conservation reserves, and does Australia really have too many?

Parks and Protection

Australia has a world-class system of reserves, with just over 13% of its land area currently protected. Governments of all political persuasions have created national parks and protected areas for a range of reasons including biodiversity conservation, wilderness protection, scientific study and to protect specific natural features.

The most recent national figures indicate that 16% of the native forest area, some 23 million hectares, is inside reserves. This includes 70% of known old-growth forests and 55% of rainforest types. The iconic tall, open eucalypt forests (greater than 30 m in height) are also relatively well protected, with 26% inside reserves.

This stacks up fairly well against internationally agreed conservation goals. In 2010, parties to the Convention on Biological Diversity agreed to the Aichi Biodiversity Targets which aim to conserve at least 17% of terrestrial ecosystems. In Australia, 54 bioregions already meet or exceed the 17% Aichi target, but 35 have less than 10% of terrestrial ecosystems protected.

These reserves have generally been created on public land, but 70% of Australia's forest estate is privately managed, including private freehold and leasehold land and land managed by indigenous people.

Some significant conservation efforts are happening on these lands. For example, 83,000 hectares of forest on private land in Tasmania have been protected through programs such as the Private Forest Reserves Program and the Forest Conservation Fund developed under Tasmania's Regional Forestry Agreement.

Biodiversity conservation goals won't be achieved simply by creating more reserves on public lands. More of these types of incentive

programs will be required to encourage private landowners to participate in conservation.

While significant areas of forest on public land are not in reserves, these forests are not simply open slather for clearing or timber harvesting. Most states have legal restrictions on clearing and timber operators adhere to a code of practice. In many cases the land is inaccessible or not suitable for other uses.

(Editor's comment: Queensland has recently relaxed land clearing regulations and the NSW rules are under review.)

As a result, only about 6% (or 9 million hectares) of Australia's native forest area is available for wood production.

The Tasmanian Question

The forest conservation debate is hottest in Tasmania, where the federal government is seeking to remove 74,000 ha of forest from the World Heritage list just a year after it was added.

The 2012 Tasmanian State of the Forests report indicates that 49% of the state's native forest area (1.5 million of 3.06 million hectares) is in conservation reserves. Of the 50 native forest communities, 37 have at least 15% of their estimated pre-1750 extent protected in reserves. This includes the very tall *Eucalyptus regnans* (16% in reserves) and *E. delegatensis* forests (26% in reserves) in places like the Styx and Florentine Valleys.

Seven communities, mainly shorter-statured dry eucalypt types, have less than 7.5% of their pre-1750 extent protected in reserves. For most of these communities, the remaining extent is largely on private land.

As a result of this agreement, the previous federal government added 172,000 hectares to the 1,412,000 ha in the Tasmanian Wilderness World Heritage Area. But the Abbott government claims that 74,000 ha should be delisted because it is 'degraded or logged'.

But it is misguided to describe harvested areas added to the Tasmanian Wilderness World Heritage Area as 'degraded'. Whatever your views on whether it should have happened at all, timber harvesting in Tasmania has generally been well-managed, with limited impacts on soil and water values. Harvested forests have been regenerated with the local species, and many other trees, shrubs and other life forms return to site within a short period of harvesting.

It is precisely this careful land management that has provided the opportunity to include these areas as World Heritage.

So was Abbott's Claim Right?

In one sense, Abbott is correct about our national parks. We do have an excellent conservation reserve system with significant

representative areas of many forest types. The vegetation types subject to timber harvesting are relatively well protected, both within national parks and outside them, by the restrictions and regulations on timber harvesting.

However, for the Prime Minister to suggest that we have 'too much' forest in reserves overlooks the fact that there are many types of forest where the reserved areas do not meet national or global protection targets.

These are generally not the iconic tall wet forests adjacent to Tasmania's wilderness areas. They are the shorter, less aesthetically appealing (to some) forest types in drier areas along Australia's east coast. Remaining areas are often on private land, and the main threats are urban and infrastructure expansion, weeds, pests and feral animals.

Focusing the debate simply on areas in reserves also misses the need for a 'whole-landscape' approach to conservation. Protected areas are just one part of the picture – areas outside reserves also need to be carefully managed so that conservation can co-exist with other land uses, such as agriculture.

This holistic approach will give us the best chance of protecting and conserving our unique native species and ecosystems.

DOWNFALL OF THE PLASTIC BAG: A GLOBAL PICTURE

Most Australian governments are still procrastinating on banning plastic bags. A recent visit to Buenos Aires in Argentina provided an example of the ease with which bans on plastic bags have been implemented around the world. This article from the Earth Policy Institute and written by Janet Larsen and Savina Venkova provides a comprehensive perspective. See http://www.earth-policy.org/plan_b_updates/2014/update123.

One small step of progress is the initiative of Coles supermarkets to provide a recycling service that accepts all types of soft plastic bags such as supermarket bags, bread bags, pasta packaging and newspaper wrapping. Worn out 'green' bags are also taken. The plastics are made into benches and similar products. See <http://redcycle.net.au/redcycle/how-to-redcycle>. Of course it is preferable to minimise the use of these bags by bringing your own bags to the supermarket.

Worldwide, a trillion single-use plastic bags are used each year, nearly 2 million each minute. Usage varies widely among countries, from over 400 a year for many East Europeans, to just four a year for people in Denmark and Finland. Plastic bags made of depletable natural gas or petroleum resources are often used only for a matter of minutes. Yet they last

in the environment for hundreds of years, shredding into ever-smaller pieces but never fully breaking down.



Over the last century, plastic has taken over the planet. On the one hand, plastic seems a miracle material, with beneficial uses ranging from medical devices to making vehicles lighter and more fuel-efficient. On the other hand, it is a curse, allowing for the seemingly cheap mass production of disposable materials that fill up landfills, cloud the oceans, choke wildlife, and sully vistas. Filled with additives that lack a safety record, plastics have been linked with a slew of health concerns, including certain types of cancer and infertility. While plastics can be used and recycled wisely, the majority of those produced are not treated this way. Perhaps no other item symbolises the problems of our throwaway culture more than the single-use plastic bag.

Given the multitude of problems associated with plastic bags, many communities around the world have attempted to free themselves from their addictions by implementing bag bans or fees. The oldest existing bag tax is in Denmark. Passed in 1993, this regulation affected plastic bag makers who paid a tax based on the bag's weight. Stores were allowed to pass the cost on to consumers either in bag charges or absorbed into the prices of other items. The initial effect of this system was an impressive 60% drop in plastic bag use.

One of the most well-known bag measures is Ireland's national bag tax, adopted in 2002. It was the first to charge consumers directly, starting at a rate of 15 euro cents (20 cents) per bag. Within five months of the measure's introduction, bag usage fell by over 90%. Litter was greatly reduced as well. Over the years, bag use started to creep up, however, so in 2007 the charge was increased to 22 euro cents, and in 2011 the law was amended with the aim of keeping annual bag use at or below 21 bags per person. Frank Convery of University College Dublin calls Ireland's plastic bag levy 'the most popular tax in Europe' and believes that it would be politically damaging to remove it.

Indeed, many communities looking at plastic bag reduction measures hope to emulate the

Irish success. Other European countries where consumers pay for plastic shopping bags – either through law or voluntary initiatives – include Belgium, Bulgaria, France, Germany, Latvia, and the Netherlands. Throughout the European Union, member states will soon be required to take measures to reduce plastic bag use 80% by 2019.

Reducing the amount of plastics in the marine environment has been a major driver of bag regulations in Europe and elsewhere. In a memo on its bag reduction proposal, the European Commission notes that:

... in the North Sea, the stomachs of 94% of all birds contain plastic. Plastic bags have been found in stomachs of several endangered marine species, such as green turtles, loggerhead turtles, leatherback turtles, black footed albatrosses, and harbour porpoises.

In sum ‘at least 267 different species are known to have suffered from entanglement or ingestion of marine litter.’

The desire to protect the whales that migrate off the coast of Tasmania led to Australia’s first local plastic bag ban in 2003. Now half of Australian states and territories ban plastic bags.

Beyond the seas, the reasons for taking action against plastic bags vary from malaria outbreaks associated with bags collecting water in Kenya to sewers clogged with plastic bags exacerbating flooding in Bangladesh, Cameroon and the Philippines. Cattle choking on plastic bags gave impetus for bag regulations in Texas ranch country and in Indian communities concerned about the sacred cow. In the capital of Mauritania, an estimated 70% of cattle and sheep deaths are from plastic bag ingestion; in the United Arab Emirates, the concern is for camels.

The world’s strictest anti-plastic bag implementation strategy may be in Rwanda. Since a ban went into effect in 2008, airline passengers arriving from outside the country have recounted being forced to surrender plastic bags on arrival. It is unclear, however, how successful the ban is at reducing overall bag use, particularly in less urban areas, because of an active black market for plastic bags.

In South Africa, where plastic bags caught in bushes and trees had become so common that they were called the national flower, a ban on the very thin non-biodegradable bags that tear readily and easily blow away went into effect in 2003. Thicker bags are taxed. Botswana’s plastic bag fee, which began in 2007, is credited with cutting bag use in half at major retailers. All told, at least 16 African countries

have announced bans on certain types of plastic bags, to varying levels of effectiveness.

In China, where plastic bag pollution was widespread, a few cities and provinces tried to introduce policies to limit bag use in the 1990s, but poor enforcement led to limited success. Before Beijing hosted the 2008 Olympic Games, a national law went into effect banning extra thin bags and requiring stores to charge a fee for thicker bags. The Chinese government reported that bag use has dropped by more than two thirds, although compliance appears to be spotty. A number of cities in Southeast Asia, the source of many of the world’s plastic bag exports, have come up with legislation to reduce bag use.

In the United States, 133 city- or county-wide anti-plastic bag regulations have been passed. Bag bans cover one of every three Californians and virtually all Hawaiians. Chicago’s city council voted for a bag ban in April 2014. Dallas and Washington DC are among the handful of jurisdictions that charge 5–10 cents for each plastic or paper bag; in both cities, charges were instituted to reduce the number of bags in local rivers. In Canada, much of the anti-bag action is voluntary, with a number of retailers participating. The provinces of Ontario and Quebec have each halved their plastic bag use through a variety of measures, including store incentives for using reusable bags and retailer-imposed fees. Liquor stores in Manitoba, Quebec and Nova Scotia have tossed out the plastic bag for good.

Latin America also hosts a number of initiatives to reduce plastic bag litter and waste, including bans in the Chilean cities of Pucón and Punta Arenas and in the states of Buenos Aires and Mendoza in Argentina, to name a few. Carryout bags in a couple of Brazilian states are required to be biodegradable. São Paulo state banned free single-use plastic bags starting in January 2012, allowing heavy reusable or biodegradable bags to be sold for 10 cents, but the measure was removed by an industry-supported court injunction, despite the backing of the supermarket trade association. Similarly, Mexico City banned plastic shopping bags in 2009, but, under pressure from plastics manufacturers, the measure was replaced before enforcement began with a recycling initiative – a common tactic used by industry groups around the world against stricter bans or fees.

Plastic bags clearly have a cost to society, one that is not yet fully paid. Reducing disposable bag use is one small part of the move from a throwaway economy to one based on the prudent use of resources, where materials are reused rather than designed for rapid obsolescence.

RECEDING GLACIERS IN PATAGONIA

Last February I travelled to Patagonia to see and walk in the impressive glacier and mountain scenery. I visited several of the same areas in 1996 so it was very interesting to see the changes over 18 years.

A feature of the trip was the five day walk over about 75 km in Torres de Paine National Park known as the W Trek. On the last two days we walked out and back to Grey Glacier on the western side of the park. The glacier is fed by the Southern Patagonian Ice Field and flows into a large lake (Lago Grey) with numerous icebergs floating in it.

This glacier has changed dramatically since 1996. An internet search provided some explanations.

Patagonian Ice Field

A highlight of the trip was a flight from Puerto Montt to Punta Arenas (in Chile) on a brilliant day. This flight basically covered the length of the Patagonian Ice Field with Chile on the west side and Argentina on the east side. The actual border has still not been officially marked on a map in one section, but that is another story.

The Ice Field covers a massive area of 17,000 km² making it the third largest continental ice sheet after Antarctica and Greenland. It looks fairly flat from the air with the occasional peak poking out, for example Mt Fitzroy at 3,405 m (in Argentina). The average altitude of the Ice Field itself is only 1,600 m. Glaciers emerge from the ice field heading westwards into bays and the Pacific Ocean or eastwards into lakes. Most of the area looks to be totally inaccessible except by boat.

In the northern hemisphere you have to go above a latitude of about 60 degrees to find ice fields. The Patagonian Ice Field is only at 47 to 51 degrees, equivalent to London or the USA/Canada border. The reason for formation of the ice field at these lower latitudes is the 'roaring forties' that travel across the Pacific Ocean loaded with humidity when they hit South America. As the damp air rises over the Andes it chills to form snow with up to 5 m falling per year.

How Glaciers Form

I don't claim to have any expertise in glaciers and some research makes me appreciate that the behaviour of glaciers is very complicated and needs lots more research. Basically (and pretty obvious) for glaciers to be formed the amount of snow falling needs to be greater than the amount that melts or evaporates in the warmer months. This occurs in the accumulation zone where, from the air the snow looks smooth. However ice is formed underneath as the snow compacts.

A glacier is formed if there are conditions for the ice to move. It can move only if there is a slope and water at the base. Water can come from two sources, water that has melted at the surface that then percolates to the base of the glacier or when the base of the glacier rubs against rock the heat produced melts small amounts of water. A glacier is never solid ice there are always spaces for water to run through.

The surface of glaciers is covered in crevasses that are created as sections move at different rates or over an uneven surface or around a bend. Unlike mountain glaciers, the ice field glaciers end at a (self made) lake or the ocean. At the terminus of the glacier there is a spectacular jagged wall of ice that can be as much as 100 m high. The height depends on the momentum of the ice behind and the depth of the water below the ice in the lake or ocean. Chunks fall off the terminal wall creating icebergs with beautiful blue colours. This event is called calving – same word as a cow giving birth!

What Happened to the Grey Glacier?

I happened to take photographs in 1996 that can be compared against the glacier in 2014.

The glacier is divided into two sections that are separated by an island, La Isla. These two photos show how the western side has changed.



An internet search (see reference below) reveals that a massive calving event occurred in 1997. It filled the lake with so many icebergs that it was not navigable for three years. The front of the glacier retreated by over 700 m.

On the eastern side the change has not been as dramatic but it is still obvious. My photos don't show the difference clearly.

A View from Space

I found an aerial photograph on the NASA website that shows the changes to the whole glacier terminus between 1986 and 2007 (see <http://earthobservatory.nasa.gov/IOTD/view.php?id=7802>). The top photo was taken by astronauts on the International Space Station in 2007. The lower view is a false colour image taken by a satellite in 1986. The general position of the terminus in 2007 is marked on this image with a yellow line.

As you can see the Grey Glacier has receded significantly over the past 28 years as has happened to most glaciers in South America, a sign of rising temperatures and changing rainfall patterns – more rain and less snow.



June 4, 2007

ISS015-E-10704



January 14, 1986

Landsat 5 Thematic Mapper Path 231 Row 95

Contribution to Sea Level Rise from Patagonian Ice Fields

According to a study published in *Geophysical Research Letters* in September 2012, ice fields in southern South America are rapidly losing volume and in most cases thinning at even the highest elevations, contributing to sea-level rise at 'substantially higher' rates than observed

from the 1970s through the 1990s. The rapid melting, based on satellite observations, suggests the ice field's contribution to global sea-level rise has increased by half since the end of the 20th century, jumping from 0.04 mm per year to about 0.07 mm, and accounting for 2% of annual sea-level rise since 1998.

Overall, the Intergovernmental Panel on Climate Change has estimated that melting of the land-based glaciers (Antarctica, Greenland and South America) is currently contributing 1.2 mm pa to sea level rise.

The other major cause of sea level rise is thermal expansion as ocean water expands as it warms. Satellite data shows a total rise from both major causes of 3.3 +/- 0.4 mm per year from 1993 to 2009.

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BOOK REVIEW – COSMOPOLITAN CONSERVATIONISTS: GREENING MODERN SYDNEY

Thank you to Janine Kitson for this review of the book by Peggy James highlighting the valuable contribution made by several individuals to Sydney's environment.

STEP members will find this book of interest as it describes the environmental history of Sydney pre 1970s much of it connected to the protection of the North Shore. It includes a chapter on three significant Ku-ring-gai conservationists – Charles Bean, resident of Lindfield; Annie Wyatt, resident of Gordon and Marie Byles, resident of Cheltenham.



Cosmopolitan Conservationists celebrates Sydney's early conservationists who, with their professional and social networks, shaped many government initiatives, policies, and legislative reforms from 1900 to 1960s that led to the creation and protection of Sydney's parkland, bushland and national parks that we still enjoy today.

These 'cosmopolitan conservationists' were:

David G. Stead (1877–1957)

Internationally recognised for his study of fish, David Stead went on to found one of Australia's first conservation groups – the Wildlife Preservation Society in 1909. He campaigned for legislative changes to end the native bird feather trade in the 1900s. Later he campaigned to end the hunting of koala fur for the US market.

Walter Burley Griffin (1876–1937)

Chicago architect who won the international design competition in 1912 for the Australian Federal capital and then went onto oversee the development of Canberra, with the support and expertise of his architect wife Marion Griffin. On arrival in Sydney he went for long bushwalks, with botanical experts, to learn to identify Sydney's wildflowers. Disillusioned by the bureaucratic and political interference with his

Canberra work, he put his energy into town planning organisations, his architecture practice and designing Castlecrag which reflects his vision of how architecture could facilitate a bond between democratic communities and nature (see pages 2 and 3).

Charles Bean (1879–1968)

Barrister, journalist, war historian, resident of Lindfield, who spent a lifetime promoting the civic and health values of parks and playgrounds for children and communities through the Parks and Playground Movement. He actively promoted a green belt of parkland around Sydney and proudly lobbied for a new recreational reserve around Kurnell, only to be short lived with the Sydney's post-war demand for petrol.

Thistle Harris (1902–1990)

Teacher and later Botany lecturer at Sydney Teachers College. In 1938 she published the book *Wildflowers of Australia* which was instrumental in the promotion of Australia's flora internationally. After the death of her husband David G. Stead, she established one of NSW's first environmental education centres, Wirrimbirra at Bargo as a memorial to him. She was a great supporter of many of Sydney's fauna and flora preservation societies established after WW2.

Norman Weekes (1884–1972)

Town planner who won the design to landscape Hyde Park which had been turned into a construction site for Sydney's underground railway. His town planning legislative work established Sydney's 'green belts' that attempted to preserve zonings for parkland, urban bushland and open space, something to later unravel in the post-war years. He was appointed as the architect/engineer for the design and construction of the Lane Cove Park that included sandstone walls, gate posts and picnic areas.

Marie Byles (1900–1979)

First practicing woman lawyer in NSW, mountain climber, bushwalker and Buddhist. She successfully campaigned to establish Bouddi National Park. She provided legal advice to many conservation groups throughout her career as a lawyer. Her final days were spent living in bushland in Cheltenham, on the edge of the Lane Cove National Park, practicing as a Buddhist and calling her home 'Ahimsa' meaning non-violence. This property was bequeathed to the National Trust (NSW).

Myles Dunphy (1891–1985)

Marathon bushwalker, map maker, and architect – he was instrumental in establishing Sydney's bushwalking clubs and raising the funds to save the Blue Gum High Forest in the Blue Mountains from logging. He successfully

campaigned to establish the Blue Mountains and Garrawarra National Parks.

Annie Wyatt (1885–1961)

Resident of Gordon who founded the Ku-ring-gai Tree Lovers League, promoted the planting of Australian trees, campaigned to save the St Ives Blue Gum Forest during the Depression and went on to found the National Trust of Australia (NSW).

These conservationists were the 'critical mass' of their interwar generation. They successfully campaigned to conserve Sydney's bushland for reasons of wildflower protection, health, beauty and civic improvement. They wanted Sydney to be green, beautiful, forested, liveable, sustainable, and surrounded by a green belt. Their 'garden city' vision for Sydney valued its bushland, trees, wildflowers, Aboriginal and European heritage, its forests, lagoons and coastlines. They were acutely aware of the rapid degradation and destruction of Sydney's natural heritage.

The book is a historic record of Sydney's environment movement. It reminds us how the 1890s plague, pollution, poverty and overcrowding of Sydney's inner city suburbs set an agenda for environmental and town planning reform. It also reminds us that even in the 1920s there was concern about Sydney's suburban expansion and its pressure on the city's wildflowers and wildlife. Nationally, 1936 marks the extinction of the Tasmanian tiger.

Later in the post-war years, their influence waned as the 'phase of exploitation', came to dominate. State and Commonwealth governments boosted post-war housing and industrial growth with policies that encouraged rapid economic and population growth with new car dependant suburbs. However, even up to the 1960s, Sydney, and in particular Ku-ring-gai was blessed with areas of healthy, intact bushland.

The book describes the time before the 1970s Green Bans and 1980s Franklin Dam Campaign that galvanised state and national environmental legislation. It describes a time before the ideology of growth at all costs became the dominant planning priority.

Available for \$39.95 from Australian Scholarly Publishing, PO Box 299, Kew, Victoria 3101, www.scholarly.info, aspic@ozemail.com.au, 03 9329 6963.

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The editor of *STEP Matters* for this edition is Jill Green, who is responsible for all information and articles unless otherwise specifically credited. The STEP committee may not necessarily agree with all opinions carried in this newsletter, but we do welcome feedback and comments from our readers, be they STEP members or not.

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