



Streamlines

Newsletter of the Pullen Pullen Catchments Group Inc.

August 2018

Welcome to a wonderful variety of articles in this issue of Streamlines.

As usual we begin with news of PPCG activities during the past three months. The lack of rain has been a problem everywhere and has made work on all our sites more difficult. Our Wildlife Officer, Irene Darlington, has indicated that she will be changing her involvement while remaining on the PPCG Committee. We extend a very big thank you to Irene for her past, present and future efforts looking after orphaned and injured wildlife and look forward to continuing the long association with her.

Spring has brought a crop of invitations to activities. Several are mentioned on page 3. We are also invited to contribute to the Wild Macadamia Hunt for wild, uncultivated macadamias for a research project (see page 8).

After the news and coming events, we move on to Rob Preslmaier's evocative description of training members to use brush cutters for weed control in Anstead Bushland Reserve. We stay in ABR as several members present a proposal being put to Brisbane City Council to upgrade the current deteriorating track to Council-provided facilities at the lower level of Sugars Quarry. Special thank you to Brian Dean who took VERY recent photographs to illustrate the article.

The bird-watching opportunities at the Moggill Wetlands are the subject of Brendan McIntyre's article before John Ness continues his series of articles on leaves and photosynthesis. The article culminates with the results of an investigation into the relationship between latitude and leaf size.

All members are welcome to submit articles to Streamlines via helian@pretirementresorts.com.au. The deadline for the next issue is 15 November 2018.

Very best wishes,

Helen Ogle

Editor

Contents

Pullen Pullen Catchments Group.....	2
NEWS	3
COMING EVENTS.....	3
Fifty Shades of Weeds.....	4
Proposed Walking Track in Anstead Bushland Reserve.....	4
The Moggill Wetlands – A Secret Oasis on our Doorstep.....	6
The Wild Macadamia Hunt.....	6
Life of a Leaf.....	7



Pullen Pullen Catchments Group

A Landcare Group

Meetings

Meetings are held at 7pm on the first Wednesday of each month at Pullenvale Environmental Education Centre, 250 Grandview Road, Pullenvale.

Website

www.pullenpullencatchments.org.au

Working Bees

Anstead Bushland Reserve – 1st Sunday of the month, 8.30 - 11 am.
Pullenvale Forest Park – 2nd Sunday of the month, 8.30 – 11 am

Tools, gloves, etc are provided at Working Bees. Just wear sturdy boots, tough clothes and bring water and a hat!

Committee Members 2017

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Membership Options

Membership fees are:

- Annual Membership – \$10 per person payable on March 1 each year
- Life Membership – \$100 per person

We are delighted to accept donations.

- a) Send a cheque payable to PPCG to PO Box 1390, Kenmore, 4069 or
- b) Transfer the funds electronically to BSB 064 152, Account No.10107038 Ref: your name.



“The PPCG acknowledges the support of the Lord Mayor’s Community Sustainability and Environmental Grants Programs for a grant to help with administrative, bushcare and educational costs”

Dedicated to a better Brisbane

NEWS

Anstead Bushland Reserve Rob reported that several members undertook weed management training in April (see his report on page 4). A local church group that meets in the quarry added their very welcome numbers to the June working bee at which previously planted seedlings were watered and weeded and some brush cutting and line trimming was carried out. Rob and Tracy also reported seeing a small snake in the storage container and advise caution when entering it. **Working bees are scheduled for September 2, October 7 and November 4.**

Pullenvale Forest Park Lynn reported that plastic rubbish, including old plant guards, was removed, some vines were cleared and new plants watered. The Park is looking good despite needing rain. A fauna survey has been carried out with a report expected shortly. In response to a query from the Richmond Birdwing Conservation Network, Lynn reported that the 15 vines planted in PFP are regularly checked, watered if necessary and are all still alive. Paul Devine has advised that weeding can be done by contractors but watering and control of balloon vine and cat's claw should be done at working bees. **The next working bees are on September 9, October 14 and November 11.** Lynn is very excited to report that a regent bower bird was recently spotted in PFP

Moggill Wetlands Contact details for several residents who indicated at the Pullenvale Marketplace display that they are interested in looking after the Moggill Wetlands were provided to Paul Devine to see if there was sufficient interest for a Habitat Brisbane group and/or a PPCG Bushcare group. No further information has been made available. However, one of our Creek Catchment Officers, Brendan McIntyre, has prepared a very interesting report on a recent visit to the wetlands (see page 6).

Airlie Rd Park In-fill planting of trees provided by MCCG nursery has continued with a further 50 or so trees being planted and watered during May. Survival rate is good except for deer damage on certain types of trees. Hares continue as low level pests for small (<1m high) trees. Creek bank stabilisation using closely planted lomandras is progressing and if no flooding occurs for the next 6 months or so then the trial should be successful.

Wildlife Our Wildlife Officer Irene tendered the following letter to the June Meeting of PPCG:-

'I am continuing in my role as wildlife representative on the PPCG committee. However I have decided to dedicate more time and energy to management, research and recording of wildlife data and information. I plan to continue to fostercare wildlife on a smaller level, particularly intensive/long term care of animals and orphaned baby Possums. Most of my energy will be placed into the management of our animal organisation (phone duties with the organisation of rescues, vet pick-ups, organising carers for treated wildlife, etc). I had been attending to these duties in previous years but now shall do this to an increased degree. I also plan to finally rewrite the possum and glider care and management training manual which I wrote over 20 years ago. Medications, diseases, management care techniques, etc have all changed significantly over this time, so an updated training manual (with training courses for our wildlife carers and other interested individuals) will also be attended to. I am contactable as always for assistance and advice regarding wildlife on 0409 026 883 and am still a very active volunteer in the wildlife of Brisbane, especially within our Pullen Pullen Catchments Group.'

At the August meeting, Irene reported that wildlife carers have been particularly busy with lots of orphans, babies arriving early and the effects of the dry conditions. She also emphasised the need for traffic calming near the Moggill Wetlands, especially once the nearby sporting facilities come into use.

COMING EVENTS

Native Plants Markets Native Plants Queensland Ipswich Branch will be hosting a Plant and Enviro Day at the Rosewoods Showgrounds on Sunday September 2 starting at 9 am. A wide range of plants, including food trees for koalas and Glossy Black Cockatoos, will be on sale. Many and varied societies will have displays and Australian Bush Buddies will be in attendance. On September 15-16, there will be a Wildflower Show and Native Plant Market at Mt Coot-tha Botanic Gardens.

Land for Wildlife 20th Anniversary Art Show at The Old Friary, 139 Brookfield Rd, Kenmore Hills begins on Saturday 8 September (9 am-4 pm) and continues until Sunday 16 September (10 am-3 pm). It will showcase creative artworks and photographs contributed by Land for Wildlife participants and inspired by Brisbane's unique natural environment and what it means to be part of Voluntary Conservation.

Fifty Shades of Weeds

Rob Preslmaier

He stood above her, his sinewy muscles sweaty and rippling beneath his Hi-Viz vest, her well-developed flowers ready to burst into seed, her trunk shimmering green in the gentle morning sun. He paused for a moment considering his tools. Would he gently caress her with a film of Duo Glyphosate 360 solution? That would take weeks too long perhaps for the mood he was in. No, he wanted it quick so the Stihl FS85 would be his choice. Stroking the shiny shaft and holding it firmly he grabbed the pull cord and, with a series of short rapid jerks, brought the beast to life. He held the Stihl aloft, rampant in its splendour, and brought it down upon his target, lashing the tender bodies of his victims with nylon flails that they could not withstand, sending them running for cover...

And so it happened that on a bright sunny Sunday morning on 26 April seven members of the PPCG received their Habitat Brisbane weed management training. A tall bearded fellow from the BCC brought with him the knowledge required for attendees to safely and competently operate knapsack weed sprayers and brush cutter/line trimmers that will enable us to lay waste to the weeds that threaten to choke the efforts of native species to regenerate.

Attendees Karen Roberts, Liz Dominguez, John Ness, John O'Grady, Brian Dean, Bill Dominguez and Rob Preslmaier absorbed the information with vigour and practiced their skills with brush cutters on the morning. In fact many of the attendees have already been able to put their skills into practice, a fact that the wasted fields of weeds at Anstead Bushland Reserve will attest to.



PPCG's intrepid weed killers in training

Proposed Walking Track in Anstead Bushland Reserve

Brian Dean, Rob Preslmaier and John Ness

Anstead Bushland Reserve covers 80 Ha and offers exceptional environmental, recreational and educational activities. It has a well-equipped area immediately adjacent to the car park for conventional BBQ and picnic family recreation. Leading up from this area to the first lookout is a walking track with some areas maintained by the PPCG. This track, which is the chief pedestrian access to the lookout area, was "blazed" by PPCG members who mapped it out for BCC to clear and grade. Later, markers identifying various plants (one of which is the relatively rare native lime *Citrus australis*) were installed along the track, again with PPCG input.

The lookout itself is a few metres back from a sheer cliff face with a drop of around 40m to the riparian zone along the Brisbane River. The cliff is not natural but forms the wall of an abandoned quarry (Sugars Quarry)

where the old quarry workings and infrastructure for processing the rocks and loading onto barges in the Brisbane River can still be identified. The lookout offers spectacular views of the Brisbane River and the Dividing range.

The quarry floor was the subject of extensive improvements in 2012, carried out by BCC and Anstead Bushcare Group. These comprise another lookout, access paths, safety fencing and informative signage describing quarrying activities and infrastructure, remains of which can now be safely viewed. Access to this area from the upper lookout level is via a 4WD track which can be carefully navigated on foot in dry weather. Even so it is not suitable for people other than the young and fit. In wet weather or after rain the track is positively dangerous. Nonetheless, people regularly make their way to the quarry floor to look at the ruins and for picnics as this offers a quietness and solitude very rare in Brisbane.



Existing 4WD track



Lookout over Brisbane River



Pathway and informative signage



Quarry floor and group of visitors

In the opinion of PPCG, it seems a great pity that the expensive improvements by BCC of the quarry precincts are only accessible by the steep and potentially hazardous track described above, and so the PPCG proposes the construction of an all-weather, safe walking track from the upper lookout level to the quarry floor using as much of the existing track infrastructure as possible. The proposed track will begin near the upper lookout and follow the existing 4WD track down to the base of the quarry to join the track built to the lower lookout in 2012. In various sections it is proposed to plant suitable trees alongside the track for ground stabilisation, to limit soil erosion and to enhance the walking experience.

At this early state of the proposal, it has not been decided if steps or slopes with/without handrails will be required in some sections. This will be decided during the detailed planning stage. To build the track it is proposed to start at the lower lookout area where the existing track finishes and then work up about 300m or so to the upper quarry area following and crossing the 4WD track as required.

If you have comments or can contribute in any way to this project, please contact

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Anstead Bushcare	Rob Preslamier robvonpretzel@gmail.com
General	John Ness 3202 7556 john.ness@emsolutions.com.au

The Moggill Wetlands – A Secret Oasis on our Doorstep

Brendan McIntyre

Travelling along Moggill Road to the ferry, it is easy to miss the small wetlands nestled against the corner of Aitcheson Road on the right. They certainly don't seem out of place in the rural surroundings. It is as if they've always been there. Historic aerial imagery confirms they were there in 1946, and it is likely they have been part of the landscape for decades or even centuries before.

This easily bypassed patch of green hides a secret known only to a few. It is a fantastic place for bird watching! 72 different species of bird have been spotted in the wetlands. One May morning in 2018, I was fortunate to witness a number of them myself. Peering through the long undergrowth of her island kingdom, neck outstretched, the elegant white form of an intermediate egret (*Ardea intermedia*) emerged. She manoeuvred her body to serve as a solar panel absorbing the morning's rays.

Bobbing up in the foreground, Australasian swamphens (*Porphyrio melanotus*) and their chicks strutted along the water's edge foraging. Light reflecting off the water's surface enhanced the metallic hues of the adult birds' feathers. Flicking white tails served as little white flags used to signal to each other across the waterscape. There was something regal about their gait, their red helmets and matching trouser legs, along with their shiny well-groomed uniforms. The Australasian swamphens are amongst the most conspicuous of the local residents, running the perimeter of the wetland's naturally formed moat.

In contrast to the imperial presence of the swamphen, grey fantails (*Rhipidura albiscapa*) seem decadent in their flamboyance. Fluttering through the mid-canopy of the surrounding scrub, they seemed unable to stay still. Highly strung, jittering and swinging their tails with wild abandon, they cartwheeled from branch to branch, unwilling to limit themselves only to flight.

Standing like watch towers at the outer limits of the wetlands, ancient Queensland blue gums (*Eucalyptus tereticornis*) overlook the two western water holes. These ancient guardians heave and brim with life, providing homes and refuge for an abundance of resident local birds and mammals, as well as those in transit. Beyond the wetlands, straw-necked ibis (*Threskiornis spinicollis*) graze the horse and cow paddocks. They keep their young close by while tending to the pastures and nimbly picking the riches exposed by the other residents' hooves.

These are just a few examples of the inhabitants of the Moggill Wetlands. And as the seasons change, so do the birds using the area.

Human activity at the wetlands has also changed over time. In 2008, Brisbane City Council's *2 Million Trees Program* planted local native species around the wetlands to help maintain resilience of the ecosystem. Weed species such as leucaena (*Leucaena leucocephala*), glycine (*Neonotonia wightii*) and the African tulip tree (*Spathodea campanulata*) have also been removed. The local community also worked to maintain this special habitat in the past, with a *Habitat Brisbane* Bushcare group meeting regularly to weed and plant at the wetlands until around 2008.

If you'd like to be involved in caring for Moggill Wetlands, there's the opportunity for support through Council's *Habitat Brisbane* program. We are always on the lookout for more volunteers, so if you or someone you know would like to help, please contact Paul Devine on (07) 3178 7161 or via email paul.devine@brisbane.qld.gov.au to discuss the options.

The Wild Macadamia Hunt Cultivated macadamias are now abundant but their wild relatives are under threat. The hunt is on to find wild macadamia trees and their descendants around Brisbane. Healthy Land and Water is looking for Queensland Nut (*Macadamia integrifolia*), Rough-shelled Bush Nut (*Macadamia tetraphylla*) or Gympie Nut (*Macadamia ternifolia*) trees that are at least 100 years old for genetic analysis. For further information, visit hlw.org.au/macadamias or facebook.com/groups/wildmacadamiahunt or contact Vanessa (Vanessa.d@hlw.org.au, 3816 9720) or Liz (Liz.g@hlw.org.au, 0400 748 157).

Life of a Leaf

John Ness

Basic Operation

The humble leaf is the bridge between inanimate molecules and life on earth. The leaf is a thermodynamical marvel. It takes in water and random, that is high entropy, carbon dioxide molecules, applies energy from the sun and converts these molecules into a highly organised, or low entropy, carbohydrate structure, namely a plant, and all without generating excess heat. No machine made by humans can replicate this feat of engineering.

Using clever molecular antennas to specifically select a certain frequency range from the solar radiation spectrum, the leaf adopts probabilistic quantum behaviour to split water molecules and then shunts the hydrogen nuclei and free electrons into the reaction centres to produce carbohydrates. At the same time it has to rapidly shift the oxygen away from the hydrogen to avoid recombination. It does this over a billion times faster than it takes for the reflected photons from the leaf, usually green in colour, to be received in the retina of the human observer's eye and processed into the format that the observer recognises as a leaf. Green is the colour range where the energy of photons from the sun is a maximum. Since a typical leaf reflects green colours, this indicates that leaves generally have too much rather than too little solar energy for photosynthesis. This partly explains why plants will grow 5-10% faster from scattered rather than direct sunlight.

At the fully deterministic level of macro physical process, the leaf then switches gear and operates at the rather slow pace of 24hrs for a complete inhalation/exhalation cycle where it takes in carbon dioxide and 'exhales' oxygen which is the reverse of animal life. The volume of oxygen released is about the same as the volume of carbon dioxide absorbed. This combination of nondeterministic quantum mechanical and fully deterministic physical behaviour is perhaps the fundamental step in what constitutes life. Certainly the leaf provides the first food layer for terrestrial fauna from the smallest insects to the largest animals, extant and extinct, that have ever walked on land. The main waste product from the photosynthetic activity of the leaf, namely oxygen, is freely spread into the biosphere where it supports all life.

Well intentioned humans often try to help leaf development in small plants by surrounding them with fully enclosed green protectors. These, of course, provide precisely the spectral frequency range (green) that leaves don't need and as well prevent the free flow of heat and oxygen away from the leaves and the inflow of carbon dioxide. One can almost see the plants relief when they finally rise above their green prisons, get clear access to broad spectrum solar radiation and breathe in fresh carbon dioxide.

In the Brisbane catchments, the usual practice is to use triangular shaped green plastic prisons for tree seedlings which at least provide some room for growth and removal of the oxygen waste product. In the temperate forests of the NE USA, tall thin pale green cylinders about 1.5m high and 120mm in diameter seem to be in vogue for tree revegetation. These force seedlings to grow only vertically with all the leaves on top. Maybe this is intended to make the seedlings as tall as possible during the brief summer growth period and to roughly resemble natural growth patterns when small breaks appear in the forest canopy.

Functions

On a single tree or a small stand of trees, leaves provide shade, localised cooling and filtering of air, noise suppression and homes for insects, birds and small mammals. Even the dead leaves that drop to the ground supply nutrients to the soil invertebrates and fungi that lay down the fertile layers for subsequent plant growth.

In much larger assemblies such as forests, leaves affect wind flow, temperature, ground water flows, humidity and rainfall. Tropical forests, via a cyclical process of leaf evapotranspiration, can generate as much as 50% of the rainfall over the forest and adjacent areas. Since this evapotranspiration is countercyclical to the rain brought in from moisture laden winds from the oceans, forests such as the Amazon can survive droughts and gradually expand their footprint into what would otherwise be savannah lands.

The productivity of leaves is quite variable. A hectare of a moderately dense subtropical forest might store up to 10tonne of carbon per hectare per annum. This is roughly equivalent to removing a slab of carbon dioxide 4m thick over that hectare and replacing it with a similar size slab of oxygen.

Leaf Sizes

Leaves come in an incredible range of shapes with a size range from around 1mm² to 3m² or a factor of 3 million or so in size variation.

Hot wet conditions favour large leaves as anyone who grows bananas would know. The basic banana leaf can readily reach an area of 1m² and in calm conditions the leaves will remain intact as Darwin observed over 150 years ago when he fought his way through tropical forest ravines where the air hardly moved and large leaves

retained their full structural integrity. About the only way for leaves to grow much bigger than banana leaves is to abandon the need for self-support by taking to the water. The largest leaves are on water plants with the *Victoria amazonica* lily taking out the prize with areas exceeding 3m². The smallest leaves also occur on water plants with the North American duckweed having leaf areas as small as 0.5mm².

Leaves on plants in hot dry conditions, such as those of quite a few eucalyptus species, tend to be smaller and often of a much lighter shade of green. These attributes help with conservation of water and reflection of solar heat.

In cold wet environments, leaves will again be of a reasonable size, but not approaching the very large variants found in the tropics. The leaves need to collect as much sunlight as possible so are typically of a deep green when in full growth mode indicating that all frequencies above the green colour range are being absorbed for photosynthesis and warmth. These leaves typically solve the problem with below freezing conditions by returning most of their constituent materials for photosynthesis to the tree before winter sets in and then committing suicide for the greater good of the overall plant.

Under the even more difficult conditions of cold and dry, leaves revert to again being quite small.

Latitude and Energy Determinants

While these localised variants are well known and reasonably well understood in terms of the need for leaves to be able to photosynthesise and, at the same time, protect themselves from too much or too little water, heat and light, a more general approach has withstood a satisfactory analysis for about 150 years.

Globally, it has been observed that leaf sizes are correlated with latitude and the closer to the equator, the larger the average leaf size. Researchers at Macquarie University and elsewhere set out to see if this correlation and graduation in leaf size could be predicted theoretically and matched empirically using an energy balance technique (Science, September 2017).

Using data from over 7500 species combined with temperature, rainfall, solar radiation and soil moisture data, they found that they could reasonably model leaf size as a function of latitude. Over the range of latitudes of +/-60deg (basically from the tip of South America in the south to Alaska, Sweden and Siberia in the north) the average leaf size varies from approximately 1mm² at the latitude extremes to about 8000mm², or about the size of a human palm, at the equator (0deg latitude). This empirical data now has a theory to explain it.

To get maximum photosynthesis production relative to the resources required to build the leaf itself, the area of the leaf should be maximised. Other things being equal a leaf that has double the area will produce a bit more than double the photosynthetic production of carbohydrates. However, a leaf also has to minimise the risk of overheating during the day or of being chilled at night as well as coping with large seasonal variations in moisture availability.

The theory basically considers the leaf in terms of the dual energy balance that the leaf has to maintain to avoid overheating during the daytime summer maximums and freezing during the night time winter minimums while maximising the rate of photosynthesis for plant growth.

Some leaves of course adopt more drastic strategies of opting out of dry summer or cold winter extremes by shutting down and dropping off the main plant but they still have to manage this dual balancing act during growth periods. To replicate the reality of leaf size distribution with latitude this dual energy balance analysis is necessary. Considering the ability of a leaf to survive the extremes of heat or cold or moisture availability separately did not lead to a theory with predictive powers.

In arid areas leaf size is limited mainly by daytime constraints whereas at wet sites, daytime constraints are unimportant and night time sets the limits to leaf size. Leaves are especially small in hot deserts and cold, high elevation regions but for different reasons determined by daytime and nighttime constraints. Nighttime constraints were estimated to be dominant in about 50% of cases, daytime constraints in about 40% and both for about 6% and around 4% was due to structural limitations.

In the last decade or so, analytical techniques have advanced to the stage where the fundamental process of photosynthesis and the molecules that control this can be examined almost in real time and the shapes of the molecules involved accurately determined. This work is helping to elucidate what leaves do at the very fast and very small level. The work referred to in this note is more to do with what leaves do at the macro level and how they manage to survive across virtually all ecosystems on earth. Both lines of analysis illustrate the amazing performance properties of the humble leaf.