Love Your Lagoons
Place based learning and environmental action in south western Sydney

Margaret Somerville, Kerith Power, Jen Dollin, Tonia Gray, Susanne Gannon, Carol Birrell, Lin Brown
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FINAL PROJECT REPORT

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We acknowledge the project funding as community reparation provided by AGL Energy Limited, which allowed this project to be undertaken with the breadth and scope of engaging with 6–10 schools across three Local Government Areas in south western Sydney. The generosity of the schools and the teachers was crucial to the project’s success. The University of Western Sydney provided campus facilities for the initial planning day, which involved over 300 children, their teachers, and community educators. The administrative support of Lin Brown and Tracy Buckridge was essential to the organisation of the Planning Day and the functioning of the project.

Finally we would like to acknowledge the Macarthur Sustainability Expo Committee, under the leadership of Brian Trench, Principal of the Camden Environmental Education Centre, for allowing children from the Love Your Lagoons project to share what they learned in interactive workshops with children from throughout the region.

Margaret Somerville and Jen Dollin for the project team

Tonia Gray
Carol Birrell
Susanne Gannon
Kerith Power
EXECUTIVE SUMMARY

Background
The project *Love Your Lagoons* was developed in the context of the implementation of the Australian Curriculum. Sustainability is identified as one of three cross-curriculum priorities to be taught across all subject areas in order to: “address the ongoing capacity of Earth to maintain all life and meet the needs of the present without compromising the needs of future generations” (ACARA, 2013). New South Wales is scheduled to start implementing the curriculum in a staged sequence from 2014. The Centre for Educational Research at the University of Western Sydney (UWS), funded by AGL, conducted *Love Your Lagoons* from September 2013 to September 2014 with six schools from south western Sydney.

The project’s objectives were:
- to research the planning, implementation and evaluation of a cross sectoral wetlands education program for long term wetlands health;
- to document development of an engaged sustainability curriculum in school education; and
- to build strong and enduring cross sector community partnerships in wetlands education and management.

Project description
Wetlands, streams and rivers are key sites for environmental action and education (Somerville & Green, 2012). In this multi-council and school environmental education project, 300 young students were empowered to learn about environmental sustainability through taking action in their local area. Councils in three shires – Camden City Council, Wollondilly Council and Campbelltown City Council – were partnered with local schools to work with UWS and community and government organisations to undertake a participatory action research study of place-based wetlands education in local primary and high schools. This assisted in teacher preparation for the introduction of sustainability as a cross curriculum priority area (ACARA, 2012).

The undulating landscape of the Macarthur region in south western Sydney is host to the Upper Nepean, Wollondilly and Georges River catchments – the focus areas of this study. One of the most significant river systems in NSW, the Hawkesbury-Nepean, runs through this region, and it was the Upper Nepean River and its tributaries that provided a plentiful supply of food and water for the traditional custodians of these lands: the Gundungurra, Darug and D’harawal peoples.

We were called the Bitterwater clan because we drank water from the rivers. There is Sweetwater and they drink water from the springs. Then there’s Saltwater – they eat fish from the sea. (Aunty Fran Bodkin, D’harawal Elder).

The “Sweetwater” D’harawal clans actually occupied much of this region, and the living culture of these Aboriginal people is still evident today. By 1806, however, Scottish entrepreneur, pastoralist and rebel John Macarthur occupied 8,500 acres of D’harawhal lands deemed to be “the best land in the colony”, thus establishing himself as a “hero of the fleece”.

This semi-rural pastoral identity of the Macarthur region has been retained, though the “Sweetwater country” has not escaped the 21st century pressures associated with increasing population and urbanisation. Over the past 50 years the catchments and river systems in the Macarthur region have suffered reduced water flows, riparian degradation, creek and wetland drainage and associated reduced ecosystem services. This decline is typical of peri-urban
areas, and the three local councils that comprise the Macarthur region, Campbelltown City Council, Camden City Council and Wollondilly Shire Council, all have strong commitments, dedicated projects and educational programs targeting water management and water health.

**Research design and methods**
An innovative design identified schools from a satellite map that had a wetland (river, creek, lake or lagoon) within walking distance from the school. The schools were required to walk to the wetlands on a minimum of three occasions within the data collection period (March to August 2014) and to integrate study of the wetland into their curriculum. Ten schools agreed to participate and adjustments were made to gain a spread across the three LGAs. A participatory action research approach was employed as a means for schools, teachers and students, in partnership with their communities, to design their own local teaching and learning activities for integrating sustainability across the curriculum. One member of the university research team was allocated to work with each school to plan, implement and evaluate their local program of place-based wetlands learning. Researchers documented data from their school visits using site photographs, field notes, audio- and video-taped interviews, and collections of student work in progress. Building on previous work by the researchers (see literature review below), the project was designed to generate knowledge in the new priority area of Sustainability.

The research project commenced with the ‘Love your Lagoons’ Conference and Planning Day at UWS Campbelltown Campus, with over 300 children and 40 teachers and community educators. The aim of the day was to equip participants with the skills and confidence to develop their own plans for a relevant project in relation to wetland education and research documentation. Photographs, videos, field notes and researchers’ reflections were generated by the planning day and shared in the project Dropbox.

During the project, three teacher professional learning days were led by the research team to inform teachers about place-based sustainability, share how schools’ plans and projects were progressing, and analyse students’ work in order to evaluate the learning taking place. Audio-taped and transcribed focus group discussions, teachers’ place learning maps, and in-depth interviews in which teachers analysed their students’ work, were examples of data generated by the teacher professional learning days.

From March to August 2014 intensive project implementation and data collection took place. Researchers visited schools and participated in wetlands activities. Data was collected of all wetlands activities both in school and at the wetlands. A culminating visit was made by the lead researcher and project officer to conduct a summary interview with all participating teachers and view their final work.

The implementation phase finished at the end of September, with Love your Lagoons schools presenting five interactive workshops in the Macarthur Sustainable Schools Expo in order to share their learning with schools from throughout the region. The Expo Committee, including representatives from each of the local Councils, greatly appreciated the financial and intellectual input from Love your Lagoons and initiated ongoing collaborations.

**Conclusions and recommendations**
The innovative project design of connecting schools with a local wetland within walking distance and requiring them to engage with that wetland was fundamental to the success of the project.
The very wide range of ways that schools engaged with their local wetlands, especially in relation to how the work was positioned in subject areas and grade levels, extends the possibilities for achieving place-based sustainability in ways not previously considered.

Planning for projects such as these during the year prior to the one in which they are scheduled is desirable, because it enhances schools’ capacity to engage, and increases the range of ways that experienced teachers and innovative schools can find to incorporate new learning experiences for their students.

The integration of wetlands into the curriculum is a process that takes time and resources and it is important to recognise and accept that each school and teacher is at a different beginning point in their ability to integrate their local wetlands into their school curriculum. The diversity of the implementation and outcomes at each site is a testament to their commitment to the project.

The level of funding and resources granted to this project was critical to its success, especially in supporting teachers’ release from some regular duties in order to facilitate their participation in professional learning and collaborative research.

Forming partnerships between schools and community-based organisations is one way to leverage resources for both partners, but there are significant barriers to overcome in cultural differences and time pressures in schools.

All of the schools in this study expressed a wish to continue with this project and felt that they had only just begun to scratch the surface of its possibilities; other schools both within this region and beyond have expressed a wish to join the project. Therefore, further funding is being sought to extend this valuable work.
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Timeline

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<tr>
<td>Recruited research team, participating schools and community partners</td>
<td>Planned and conducted Love Your Lagoons Conference and Planning Day UWS Campbelltown (first teacher professional learning day)</td>
<td>Second teacher professional learning day, schools scheduled wetlands activities, researcher visits and community partner liaison</td>
<td>Close of data collection</td>
<td>Love Your Lagoons school students present at the Sustainable Schools Expo, one teacher was a keynote speaker</td>
<td>Researchers prepare individual case studies for each school and a case study on community partner perspectives</td>
<td>Draft case studies Completed and sent to schools for comment</td>
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<td></td>
<td>Third teacher professional learning day (collaborative data analysis) Plan Expo</td>
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<td>Final report in preparation</td>
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| | | | | | Presentations at AARE conference, Brisbane. | **Table 1: Project timeline**

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Literature review
The term ‘Education for Sustainable Development’ (ESD) emerged out of a worldwide move toward sustainability education, supported globally by the United Nations Decade of Education for Sustainable Development (2005-2014), and in many national curricula. In 1987 the World Commission on Environment and Development commissioned The Brundtland Report. Entitled Our Common Future, the report defined sustainable development as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs”. The difference between this report and previous approaches to environmental concerns was its addition of a social component to former purely scientific or economic approaches to questions of global ecological balance. These early debates discussed the role of education in addressing global social, economic, cultural and environmental challenges. Following a series of international conferences on environmental education and on the broader concept of education for sustainable development, in 2002 the

Twenty-seven years on from the Brundtland Report, at the end of the UN Decade, educational responses to concerns about human impacts on planetary survival are just beginning to be integrated into national curricula such as The Australian Curriculum. The Brundtland ‘triple bottom line’ approach to sustainability as an issue comprising economic, environmental and social factors has become standard rhetoric, as has the educational aim of developing appropriate values, knowledge and skills for learners to deal with the issues. The UNESCO 2014 report states: “At the end of the DESD, of all the types and areas of formal education, ESD is most advanced in primary and secondary education” (p. 83). It goes further to state that “[I]eacher preparation for ESD is one of the most important challenges to address in the coming years” (p. 93).

It could be argued that, given the twenty-seven years since the Brundtland Report and the profile afforded to ESD by the UN Decade, empirical research on how ESD is actually practised in schools and other formal educational settings does not yet offer a rich evidence base concerning how to successfully design and implement ESD. Research about ESD can be framed in many different ways, depending on researchers’ traditions and beliefs about what constitutes being and knowing and what the purpose of education is. Much research in ESD is advocacy for particular approaches, supported not so much by carefully formulated questions and an unbiased examination of evidence but by strong beliefs and values of one kind or another. A more rigorous body of critically framed philosophical and conceptual research seeks to question, define, clarify and formulate what constitutes sustainability and to put forward arguments, based on this reasoning, as to how it should be implemented in educational systems.

Many educational researchers seek to apply standard rhetoric about sustainability to specific mandatory curriculum requirements such as the Australian Curriculum (Kennelly et al., 2011; O’Gorman & Davis, 2013; Salter, Venville & Longnecker, 2011). Conventional research studies in EFS, using large sample sizes and validated survey instruments, have generally sought to quantify how specific educational measures influence individual learners’ knowledge, values and dispositions to action on environmental issues (Ernst & Theimer, 2011; Hadzigeourgiou et al., 2011; Hill et al., in press). Qualitative studies interpret data like students’ drawings and writings to gauge students’ awareness of issues of sustainability (Kim, 2011; Shepardson et al., 2011; Yilmaz, Kubiatko & Topal, 2012). Socially critical research seeks to achieve social and educational transformation towards sustainability by addressing issues of power and social inequality in particular places and by empowering learners to act (Engdahl & Rabusicova, 2011; Gambino & Davis, 2009; Gruenewald, 2003a, 2003b; Tsevreni, 2011).

This report argues that in the complex world of the 21st century, where individual knowledge, values and decision-making must necessarily occur alongside diverse and often contradictory interactions of different people, non-human beings, physical environments, interpretations, belief systems, communities and activities, educational research requires the employment of multiple and complex approaches to investigation. The research approach taken in Love Your Lagoons follows work conducted over decades that might most recently be characterised as a “regional place-based approach to sustainability education” (Somerville & Green, 2011). This approach is based on a model of collaborative action research which allows for people (such as community members, teachers, industry partners, students, parents, teachers and university lecturers) to determine for themselves in their local places what questions to investigate, what information to collect, how to interpret the data and how to represent and share what they
learn. This work has found that by acknowledging and including diverse approaches and ideas about sustainability education, by designing open-ended processes that enable people of all ages and social positionings to connect with, care for and contribute to their local places and communities, learners become deeply engaged, self-motivated and productive in unpredictable and innovative ways that generate new knowledge and partnerships (Somerville & Green, 2011).

Data collection and analysis
The data generated from this project includes: field notes by researchers who attended project events, such as the overall planning day, school visits, teacher professional learning days, audio-recorded interviews and focus groups with teachers, learners and community partners; collections of students’ work; and thousands of visual images and videos of wetlands, birds, animals, plants and water. While many images of children were taken, for ethical reasons any identifying photographs of children used in this report are used only within the project’s ethical approvals from the UWS and the Department of Education and Communities.

In each school, projects evolved in highly distinctive ways, and therefore it was decided that separate case studies would be generated and collaboratively analysed by researchers and teachers attached to that school.

Planning day/professional learning day 1
On Tuesday 18 February 2014, about 300 primary and secondary school students attended the Love Your Lagoons planning day with their class teachers. The students attended the plenary session at the Campbelltown campus of UWS, which comprised a Welcome to Country from Tahmoor resident and D’harawal Indigenous Elder Aunty Fran Bodkin, keynote speeches by project mentors Max Sargent and Dr Monica Green, displays by community and government environmental groups, educators and artists, and workshops on sustainability themes. Finally, the students were guided to conduct a short, practice ‘mini-project’ around the ponds on the UWS Campbelltown campus, before returning to their schools to plan their own investigations in their local wetlands over the next nine months.

Plenary speakers
Aunty Fran Bodkin is not only a keeper and educator of Aboriginal knowledge, she is also a scientist. She holds degrees in Environmental Science, Geomorphology and Climatology. Aunty Fran, a local Tahmoor resident, has deep traditional and scientific knowledge of the waterways around Sydney, in particular in the Nepean River catchment.

Max Sargent demonstrated to the children at the Love Your Lagoons planning day how his students reared tadpoles, conducted Frogwatch, Waterwatch and Weatherwatch, kept nature diaries that contributed to international scientific knowledge on the environment, and constructed artificial ponds in their classrooms at Commercial Rd Primary School, Morwell, in the Latrobe Valley, Victoria.

Dr Monica Green, a sustainability education expert from Federation University, Gippsland, outlined wetlands concepts such as ‘Environment’, ‘Adaptation’, ‘Sustainability’ and ‘Aboriginal knowledge’. She described the ‘inquiry learning process’ as encouraging learners to examine and to explore how the world works and their place in the world, in order to form nuanced understandings instead of being told simple answers to complex problems. Inquiry processes occur in cycles of tuning in, finding out, sorting out, reflecting and taking action.
### Workshops

**Table 2: Planning day workshops**

<table>
<thead>
<tr>
<th>Name of group</th>
<th>Nature of presentation</th>
<th>Sample image</th>
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<tbody>
<tr>
<td>Eaton Gorge, Independent local community theatre company</td>
<td>Greeted all arriving students and ran small group drama sessions as ‘King and Queen of Green’</td>
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<tr>
<td>Macarthur Centre for Sustainable Living</td>
<td>Described Centre’s purpose and activities; ran environmental sculpture sessions using sustainable building blocks</td>
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<tr>
<td>Australian Museum</td>
<td>Demonstrated ‘Museum in a Box’ diorama and working model of the water cycle</td>
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<tr>
<td>Camden Environmental Education Centre</td>
<td>Environmental drama workshops</td>
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</tr>
<tr>
<td>Aunty Fran</td>
<td>Traditional and scientific storytelling of wetlands in south western Sydney</td>
<td></td>
</tr>
<tr>
<td>Wollondilly environmental officer</td>
<td>Plant recognition and bush regeneration projects in the Wollondilly shire</td>
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</tbody>
</table>
During lunch, students had an opportunity to visit marquees with displays from all the community partners.

**Mini-project**

In the afternoon session Dr Kerith Power prepared students for a one-hour practice mini-project on the spot. As a group, students brainstormed and clustered ideas. They selected a group topic and a research question, then investigated the wetland in small groups to learn and document multiple answers to their questions by allocating each person in the group a specific mode of investigation.

Person 1: observe and draw something you see  
Person 2: think and write a thought, a story or a poem  
Person 3: make a map  
Person 5: listen and audio-record sounds, make music or a song  
Person 6: watch and imitate movements

![Figure 1: Wonder; observe and draw; map; tally; listen; move; narrate](image)

Students documented their learning during the planning day mini-project, then after a hasty sharing of their learning and farewell, students returned to their schools.

**Professional learning day 2**

Part of the *Love Your Lagoons* research funding was used to provide release funds so that teachers could experience their own place-based learning. The second professional learning day occurred at the Bowden Centre, Australian Botanic Garden Mount Annan. The day had a triple purpose:

- to model how to facilitate place-based experiential learning experiences with explicit explanations of the pedagogical rationale;
• for teachers to interact, enjoy and learn from the contact with researchers, each other and the connection to nature afforded by the place; and
• to collect data about how teachers were approaching sustainability through local wetlands in the early stages of the project.

The project leader opened the day with a short rationale for place learning maps as creative method. Using the art materials provided, the teacher participants drew personal place learning maps and then introduced themselves to each other, each using the map they had created. In a second round in small groups (audio-taped and later transcribed as research data), teachers described their school, their local wetland and what had happened in the project since the planning day a month before.

In the second session teachers directly experienced the project approach. They were invited to investigate the Australian Botanic Garden Mount Annan through brainstorming, clustering and constructing a topic web, and they developed research questions through an EKWQ (Experience, Know, Wonder, Question) exercise. In the afternoon they carried out fieldwork investigations in groups, and documented and shared their learning. The teacher groups produced a dance performance, video clips, photo essays, poetry, drawings and artworks using natural materials.

From this day, teachers were free to take away whatever inspiration and information they wished to use in carrying out their school projects.

The interactive map below demonstrates how each school and wetland is physically located within the Macarthur Region of south western Sydney and in relation to the winding course of the Nepean River. Unlike a conventional map, the image is taken from an east–west aerial perspective as if flying westwards across the Pacific Ocean to the eastern rim of the Australian continent. The river’s flow runs from left to right of the image towards the Warragamba dam, Sydney’s main water supply. Each case study below will be presented in this order of flow, starting with the southernmost school in the study, Tahmoor Public School.

Figure 2: Interactive project map
Professional learning day 3
Professional learning day 3 took place at the Bowden Centre, Australian Botanic Garden Mount Annan, on Friday 29 August 2014, as a collaborative data analysis meeting with teachers participating in Love Your Lagoons.

The lead researcher began by framing and clarifying the intention of the day’s sessions, which were for each participant to:

• share with the others the experience of Love Your Lagoons at their own schools;
• analyse their students’ overall learning;
• engage in a deeper consideration of a small selection of student work;
• plan for dissemination of the project’s findings through a written case study for each school; and
• finalise plans for their students to showcase their learning to others at the Sustainable Schools Expo.

Each whole-group and small-group data analysis session was audio-recorded and transcribed for later use in compiling the case studies.

First round of data analysis
The focus shifted from the whole to small groups consisting of teachers from their own schools with their allocated researcher. The researchers’ roles were to lay out the data, listen and draw out teachers’ perspectives. They asked: What does each teacher understand from the data as a whole? The focus question was: What are you seeing here?

Second round of data analysis
At the beginning of this session teachers were asked, if they had not already done so, to select a small amount of data (5–6 items) to analyse in detail after the break. Staying with their own school, each teacher was asked by their allocated researcher to make a detailed specific analysis of their selected items.

One person from each small group then briefly reported back to the whole group to summarise potential themes/storylines for the case study chapter from their school.

The afternoon session after lunch was to enable teachers to participate in dissemination of the project’s findings. A suggested schema for an abstract was written up on the board at lunchtime by the project officer to assist less confident writers.

The lead researcher (MS) framed and clarified the forward plan for completing the case study publication for the Love Your Lagoons research project. In small groups with their allocated researcher, teachers wrote a draft abstract for their case study.

The Love Your Lagoons project worker framed and clarified parameters for student presentations at the Sustainability Expo. Each group decided which teacher would present at Expo, and the session closed.

A description of how each school took up the opportunities offered by the project to integrate place-based sustainability into their curriculum is presented below as a series of case studies developed in collaboration between researchers and participating teachers.
CASE STUDIES

Tahmoor Public School: How Long is the Bargo River?

*Kerith Power and Marc Noakes with Ian Booth and Kyle Jacobs*

**Abstract**

As part of *Love Your Lagoons*, students from diverse socioeconomic backgrounds from two primary school classes in a semi-rural school made three visits to the Bargo River, a tributary at the southern margin of the Nepean River catchment. Adopting a project approach and facilitated by a science mentor, individual and group ‘wonderings’ led to topic selection, field investigations and documentation. Students were ‘guided but not pushed’ towards formulating researchable questions. An environmental educator from the Wollondilly Shire spoke of the issues confronting the river. Meta-thinking about the learning process was framed in terms of scientific method and systematic inquiry. The students’ project topics fell into themes of: water and the river; animals and plants; history and language(s); and the inquiry process itself. A pedagogy of ‘organised chaos’ gave rise to a group generated ‘virtual wetland’ incorporating art, geography, construction, environmental science, music, civics and poetry.

**Background**

Located at the southern end of the Central Ward of the Wollondilly Shire, Tahmoor Public School joined *Love Your Lagoons* in February 2014. For the purposes of the research, the key characteristics for choosing the school were its location in the Wollondilly Shire and its close proximity to the Bargo River, a local tributary of the Nepean River. The project aims were to investigate how teachers worked to integrate the cross-curriculum priority of education for sustainability in the new Australian Curriculum through investigating a wetland within walking distance of their school.

Having selected the school by location, researchers subsequently found that two distinctive features of Tahmoor Public School are its semi-rural demographic make-up and its offering of a Gifted and Talented Opportunity class.

Marc: The social demographic is a real – it’s really diverse … You’ve got coal miners and then you’ve got people that work in offices in Sydney. There’s an incredible range … in the classroom because of that.

The school is one of the 75 NSW Public Schools to offer Opportunity classes for gifted and talented students via a test taken by prospective students in Year 4. This means the students travel to school from a larger than usual catchment area and are involved in a range of extension activities beyond the norm even for the ‘crowded curriculum’ characteristic of standard NSW primary schools. The school had a pre-existing focus on science and had directed funds to employ a science specialist part-time to mentor both teachers and students in this discipline area. *Love Your Lagoons* seemed a natural fit, and the Principal, two classroom teachers and the science mentor readily accepted the opportunity.

**Project planning day at UWS Campbelltown**

On 18 February 2014, 54 senior Tahmoor Public School students attended the *Love Your Lagoons* planning day with their class teachers, Ian Booth and Kyle Jacobs. In addition to the plenary sessions, the two groups participated in pond dipping and poetry writing workshops.

**Back at school**

The teachers developed the following rough schedule for the project:
Table 3: Campbelltown Teachers’ Plan

<table>
<thead>
<tr>
<th>Month</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>March</td>
<td>Questioning Visit 1: Wonderings completed, Mentor groups formed</td>
</tr>
<tr>
<td>April</td>
<td>Research Visit 2: Identify virtual wetland components &amp; data collection methods, Identify documentary methods &amp; narrative. Start virtual wetland data collection (Ian/Marc), Documentary planning (Kyle)</td>
</tr>
<tr>
<td>May</td>
<td>Investigating: Visit 3 Virtual wetland data collection (Ian/Marc) Documentary filming (Kyle)</td>
</tr>
<tr>
<td>June</td>
<td>Investigating/Creating: Visit 4 Data analysis (Ian/Marc), Virtual wetland construction (Ian/Marc), Documentary editing (Kyle)</td>
</tr>
<tr>
<td>July</td>
<td>Creating/Reflecting: Visit 5 (if needed) Presentation preparation and practice</td>
</tr>
<tr>
<td>August</td>
<td>Reflecting/Communicating: Conference</td>
</tr>
</tbody>
</table>

They undertook an ideas ‘clustering’ exercise before the first field trip:

Ian: The kids wrote their questions … and then we had 10 of these [large sheets of paper] scattered over the floor in the hall. … The whole purpose of this was to categorise these questions … so 60 kids and me being a bit of I suppose traditionalist making sure the kids are heading in the right direction I sort of thought how is this going to work and I said to … Kyle, ‘I’m not sure where I’m heading here with this so we [will] just bounce off each other’, but it worked brilliantly.

Fieldwork at the wetland

Tahmoor students first visited the Bargo River in mid-March 2014. On this occasion, the water was low and there were extensive flat rock shelves in the riverbed itself. The data available about this visit is the photographs taken by Kyle and Marc and interview transcripts from teachers.

Marc: We took the students out at the very outset, and that was to introduce them to the river system, to give them a context. We knew that we didn’t want to restrict them to science. We wanted to let the kids explore their own natural curiosity and use their own talents and abilities … They were photographing, they were recording. It wasn’t a structured data collection activity, but it really was very powerful in putting the project into context, in helping them to see what it was that they’re talking about. That was a real, a very helpful exercise … their questions were very general at the beginning, and they had multiple questions.

Ian: we found that after visiting the site the questions that the kids were then asking were way different than the initial ones. They were deeper; they were more meaningful, so we did the wonderings again.
The topic webs generated in this activity included: history, where the river is, animals, bird life, fish, reptiles, insects, and questions about the water itself. Some of the students’ ‘wonderings’ are directly quoted below:

- I wonder how much pollution is in the Bargo River
- I wonder what the history is of the Bargo River
- I wonder what you’re called if you take rate of animals at wetlands
- Why do we have rivers or lagoons?
- Exactly how far does the water reach?
- I wonder how fast does the water go
- I wonder how water and rocks got to the wetlands
- How do fish live when water is heated when its summer and when its winter [secondary] … and how do they survive the speed of the water [main]?
- I wonder how long the river is

On their ‘wonderings’ some students had also listed potential investigation methods:

- Draw a map, measure, ask Damion [Wollondilly Council officer], make a model
- Sample some water, test the water, record the water pollution
- Research it
- Draw a map of a bird eye view of the area, mark places in

The teachers scaffolded students’ meta-thinking about the inquiry process and organised small groups so that the more advanced students could lead the younger ones.

Ian: My kids initially modelled this to [Kyle’s group] … that’s your question, that’s what you want to answer, how are you going to show your learning?

Performance pressure is an issue in a system where standardised testing takes place every two years, is publicised on the MySchool website, and is commonly assumed to be a measure of school quality. Alongside the teachers’ excitement, generated by the students’ engagement with the project, it was clear that some anxiety was also being felt about how to organise and integrate Love Your Lagoons into the already demanding schedules and accountability
requirements of the school. Teachers were moving out of their comfort zones in trusting the
students to direct their own learning.

Ian: But how are we going to do it? … It’s just a matter of how we’re going to
do it in time. All these ideas, I guess I’m wondering, how are we going to get
it all done? We have got 6 months haven’t we? … I don’t feel we’ve done a
lot but I think the kids have probably – they’ve done a lot of talking and they
know now we haven’t imposed expectations on them – have we really? … But
we’ve guided –

Kyle: We’ve guided but we haven’t pushed.

Even at this early stage, ideas were current about making a ‘virtual wetland’ to eventually
share the learning. Since that had appeared in the initial schedule, perhaps this pre-determined
end product represented reassurance for the teachers that there would be demonstrable
outcomes.

The second main strand of the project, meta-thinking, or analysis of the inquiry process itself,
was present early in the project:

Ian: The project approach to your learning … comes under that meta-language
part of our quality teaching framework. We’ve talked about [how] it’s an
inquiring process … The kids are taking ownership now of it, which was
something we didn’t want to have to push, push, push and direct, direct, direct.

Kyle: The biggest thing out of that is they’re engaged, they’re up to actually
getting down there and picking things up and looking at things and seeing
things. It’s a lot more real and a lot more exciting to them than seeing pictures
of it on a board.

Ian: This kid … he went down there on the weekend and took his camera and
it’s got a video on it too and he said “you should have heard the frogs” …
He’s recorded the frogs.

First teacher professional learning day
On this day the Tahmoor teachers described plans for the next river excursion: making
equipment for magnifying and seeing under the water surface using glad wrap on ice cream
containers. They too had boned to the river.

Kyle: It’ll be great to see it before and then come back after it’s rained to see
how things have changed, and to see those rock pools … there’s another whole
set of them underneath too, you can see like there’s another layer that is still
under water, the same sort of formations.

They described how their Bargo River excursion met the learning needs of their two classes,
Ian’s older students – a designated Opportunity class – and Kyle’s younger students,
designated as an ‘enrichment’ class containing students Kyle described as “really, really
smart, but … they also get bored very quickly”. Ian said, “the model that we’re looking at, or
that we will be using will be, the kids will work in groups and … my kids will strategically …
be mentoring [in] like a buddy system. So that’s what we want to try … we often do that sort
of thing”. They shared how, with the assistance of Marc, they were explicitly teaching a four-
step inquiry process to encourage students to formulate and research their own questions rather than asking the teachers to transmit facts.

Ian: Our rule yesterday was that teachers are not answering questions. So we [encouraged the students to] write the question down.

Ian was concerned about allowing time for students to take control of the inquiry process.

We’ve got to end up somewhere, so I suppose for me it’s a bit hard to sit back and let them go, there’s got to be a little bit of reigning in … We’ve got more that we’re doing at school than just this.

How to integrate the project into ‘the crowded curriculum’ was a common concern for all the teachers in *Love Your Lagoons*, but particularly for the primary school teachers.

Ian: We’re not just looking at Science outcomes either – literacy outcomes, you’ve got Maths outcomes, you’ve got HSIE outcomes.

Kyle described how his group would use technology to construct a digital documentary:

I’ve got a special group of kids that are very interested in media and that kind of stuff, so taking the Go-Pro [waterproof camera on a stick] down and they film some stuff, and they’ll take photos, and they’ll interview people, so we will do kind of a documentary style approach to recording the whole process … We bought two digital microscopes as well.

**Researcher school visit 31/04/2014**

In the second half of March 2014, severe thunderstorms and flash flooding occurred along much of Australia’s east coast, affecting most of the *Love Your Lagoons* wetlands that flow into the Nepean River. For the Tahmoor students, this meant that the initial flat rock shelves in the Bargo River were under water for the rest of the project.

**Second wetlands visit 08/04/2014**

On 8 April, fine weather permitted the group to make its second field trip to the river bend. It was my first opportunity to participate in a field trip to the river with the students. Their enthusiasm and happiness to be back at the river is evident in the audio recording I made as they poured out of the bus onto the river bank, cheerfully unloaded tarpaulins to sit on, chatted with the visitors and teachers, and helped to organise the space and equipment. This evidence of good relationships and social sustainability in the group made a good impression on the visiting adults.

The students sat attentively through the talk by the visiting Council environmental education officer, who used an interactive technique to elicit students’ thinking about the uniqueness of the river and how it may have been changed right at the research site. He spoke about the large eucalypt tree that had recently been struck by lightning, the road and rail crossings, the impact of land clearing on vegetation, the time it takes for large trees to grow to provide habitats for possums and koalas. He identified the Sydney grey gum and other tree species growing on the site and explained that the area was not a national park but a town reserve. He explained how weeds like privet and blackberry prevent native plants from providing leaves, berries, flowers for nectar, and seeds for animal and bird food. He spoke about the work being done on the site for weed control, pollution and wildlife protection on the Bargo River and in Wollondilly Shire.
Some of the planned investigations into the river itself did not take place due to the water depth. The group made the best of the excursion to explore 1km south along the fire road towards a weir on the river. On this occasion I noted that there was little time for quiet reflection or documentation of the changes in the river but I subsequently found out that students had developed a global interest in dams and weirs and were researching the Aswan Dam.

![Expert talk at the river: Vegetation, habitat and change](image)

**Final visit to the school**

Towards the end of the data collection period, I made a final visit to all the schools with project leader Margaret Somerville, who interviewed the teachers. We asked the students to tell us about their projects.

Four girls were completing a papier-maché scale model map that represented their learning about the question: How long is the Bargo River?

![3-D model of the Bargo River](image)

Two boys explained how they had investigated their question, ‘I wonder how much pollution is in the Bargo River?’ They showed me their water testing kit, field notes and measurements of temperature, pH and turbidity over a four-day period. An excerpt from their notes explained their learnings:

I learnt that pollution to the Bargo River can come from run off from farms. Farms on hills use fertilisers and poisons for their plants and when it rains it washes off down the hill onto the road, then when a car drives on the water the poison can be squired into the river.
Something I would do more of is keep investigating. The Bargo River’s water pollution comes from people dropping rubbish into the river and it affects the animals including the platypus, which eats the rubbish.

Something I learned was rubbish affects everything and everybody.  
Something I enjoyed was going to the Bargo River and investigating. 
Something that I found difficult was finding the key information that I needed.

Two girls shared with me interviews they had conducted with classmates to gauge the depth of the connection the project had enabled them to make with the wetland. They asked each person to name their individual project. Four are listed below.

G: What is the effect of fire on plants and animals around the wetlands? 
K: Our project is based on the animals around the river. 
T: We’re doing profiles of each animal, so we’re doing the common wombat, the black cockatoo, and the platypus. 
R: The one about the frog … near or around Bargo River

The interviewers asked how their classmates felt about their projects. Replies were: “good”; “it’s going really well, we’ve pretty much completed it all”; “I think it’s really helped us connect with the river and understanding all sorts of things”; and “excited, feels like eating chocolate”.

Interviewees agreed that the project had helped to form a relationship with the wetland. They discussed what they would be willing to do to save wetlands from pollution and global warming, and whether they would be willing to donate money to help endangered animals in and around the wetlands and why. Most agreed, and some had suggestions like putting rubbish in the bin, campaigning around the school about the effects of rubbish in rivers, and going into schools to teach kids about what pollution does to the natural environment (“tell all my friends on social media to stop polluting!”).

They said:

It’s important to keep these natural wetlands for future generations; to save the animals from being extinct. Animals are awesome; I don’t want endangered animals to become extinct because animals are part of nature and I love nature.

The student who had planned to compose music explained to me how she had expanded the idea to compose a digital video essay accompanied by her own keyboard composition, featuring images of trees, rocks, ferns, the water surface, and underwater images of the sandy riverbed, rocks and sky filmed from under the water surface.

The final event of that day was a presentation by the whole group of the ‘virtual wetland’ to which they had all contributed.

**Conclusion**

**Emergent transformative curriculum**

The quality of ‘emergence’ as used in this case study is meant to convey responsive relationships. In the case of the Tahmoor School’s involvement in Love Your Lagoons, teachers responded quickly and enthusiastically to the concept of the project and built good relationships with researchers. Responsive relationships to the river meant that students, teachers, researchers and community educators paid attention to features, aspects and changes
in the river. As they discovered more, the topics, inquiry methods and information-seeking techniques of their projects emerged from their relationships with each other and the river. The Bargo River provided a site for the emergence of scientific investigation and explicitly exploring steps of systematic scientific thinking.

Tahmoor students’ learning was transformed in the following ways:

- **Love Your Lagoons** built students’ knowledge and connections to the Bargo River. This is demonstrated by:
  - high levels of engagement in the project, which led to excitement and effort in the design and ownership of their own learning;
  - the broad range of knowledge they developed as a group;
  - the diversity of methods they used to investigate and document their learning;
  - their adoption of a four-step process of meta-thinking about their investigations; and
  - the quality of their final presentation of the ‘virtual wetland’.

- **Love Your Lagoons** transformed teachers’ teaching practices. This is demonstrated by:
  - the enthusiasm, flexibility and effort teachers made to accommodate, adapt their thinking, curriculum planning and teaching processes to the opportunities offered by **Love Your Lagoons**;
  - the teachers’ willingness to risk new and potentially anarchical group classroom processes that stretched them beyond existing teaching habits that have served them well in the current result-driven system; and
  - the relentless drive to performance and focus on achieving set outcomes inherent in current publicly funded primary school teaching in NSW being transformed into excitement and an ability to scaffold students’ sense of engagement and ownership of their own learning.

- **Love Your Lagoons** at Tahmoor enabled place-based sustainability learning across the curriculum. While claiming an impact on long-term wetlands health would be beyond the scope of this one project, it could reasonably be expected that from their deeper connection to the Bargo River, many students will take wetlands awareness and action with them into the future.
Picton High School: Walking the Wetlands

Margaret Somerville and Sandi Ridewood

Introduction
Picton is a small rural town (population 2,900) 80km south west of Sydney in the Wollondilly Shire. At Picton High School, students were offered a choice to join the ‘regeneration group’ of the Love Your Lagoons project as one of ten options for their participation in Physical Education (PE). Sandi – classroom teacher/artist, Master of Special Education, year advisor and sports teacher – facilitated the ‘regeneration group’ on their weekly walk to a nearby creek throughout 2014. The story of the group walk to Redbank Creek is the basis of the chapter. Settings for the story include the stopping places along the way, and the spots where individual and small groups of students became fully immersed in their ongoing creek stories. The students were invited to draw, take photographs and bring items back for drawing in class. A weekly diary was recorded, each student contributing a reflection on his or her walk. This body of data was analysed in order to answer the research questions:

- How can we connect our school to the local wetland within the curriculum?
- How did the students engage with Redbank Creek, how did they represent that engagement and what did they learn?

An evolving pedagogy
The walk, and the participant group, evolved throughout the year as the pedagogy became more refined and group makeup changed when students selected their sport option each term. Sandi explored the walk beforehand, and then changed the route in response to observing the first few walks.

A connection was made with the Sustainability Education Officer from Wollondilly Shire Council, who organised a tour of the local community nursery and advised on planting native plants for the regeneration of the land along the creek. The project had two planting days and one day of cleaning up rubbish from the creek banks. One day, when it was dangerously windy, the participants stayed inside the classroom and did clay modelling.

The group was a mixture of mainstream students and ‘support students’ with special needs. Initially all of the participants were mainstream students. Overall, those who continued to be part of the group all year were not interested in sport; their interests lay elsewhere. The support students were added to the group when it became apparent that ‘regeneration’ was a better option for them than the regular sporting activities. Some of these students are not able to engage well with others; some have behavioural issues and intellectual disabilities that require close supervision. An integration aide from the support unit accompanied the group on their walks as more support students were added to the group. All of the participants ‘buddied up’ with a friend; this encouraged walk-and-talk, with everyone having a partner. The needs of all of the students, but especially the needs of the support students, influenced the nature of the walk.

Narrative of the walk
As the walk has evolved as a pedagogy of place-based sustainability, it has developed its own narrative. The students leave the school grounds, walking in pairs with their buddy out into the suburban streets, along the main road and then a side street. A short way along the side streets they come to the first stopping place, a tree that lost some large branches in a storm. All of the students stop at the tree, just standing there for a few minutes and then “they start mucking around and enjoying each other’s company, and it starts there, really, at the tree”
The teachers stand back and the students interact with fallen branches, sticks, leaves and each other. The tree marks their transition from school mode to creek mode.

A little way further on there is a big ditch in the dirt track that changes from water filled puddle to mud to damp clay depending on the weather. The students stop again here and splash in the puddle, poke their sticks into the mud, complete their entry into the space of the creek. This is followed by a short walk in deep shade along the creek lands where they start to become calm again under the shade of the trees. Here they check on the native plants they have planted, watering them from their drink bottles, propping them up with their stakes if they have fallen over. They are now connected to the place.

Once they enter into the immediate vicinity of the creek that they inhabit each week, they find their particular spots and the ongoing stories recommence. Small groups of children in twos and threes gather and claim their places and stories, first observing exactly what has changed since their last visit. They spread out along an expanse of the creek edge for a stretch of about 150 metres, among the trees and bushes, in the creek bed, among the rocks that form the landscape there. The small groups of children are far enough apart that they structure their own dialogue with the creek and its surroundings, moving only a little as their engagement changes. The teachers stand back and move up and down the length of creek and children, keeping an eye on their safety, their levels of engagement, and occasionally joining in. They bring the clipboards, paper and pencils for drawing so that students can make drawings if they want to. Mostly the students just become completely immersed in the place and its different forms of engagement and ongoing stories.

An interwoven and storied world
The data analysed for this case study is made up of photos and drawings/paintings on paper that were produced by the students in response to their participation in the Regeneration creeklands walk.

In order to make sense of the students’ photographs we asked: how did students experience the world through the lens of a camera? The photographs were organised into six groups according to the major focus: Landscape, Patterns, Bushes, Weeds, Rubbish and Fungi. Sandi chose one example from each of these groups as the focus of our analysis.

Landscape: finding a spot
The photographs in this group portray a larger landscape view of the creeklands. The photo chosen for analysis is taken from a large flat rock that the students have called ‘King Rock’. King Rock marks the central place of their activities at the creek. The lens of the camera is focused on a part of the creek that flows down and around a number of small pools. In the distance you can see the ‘Red Bank’, a story place for some of the boys who have found quartz stone ‘jewels’ there. The creek itself is commonly known as Red Bank Creek after this bank. In the centre of the photo there’s a part of the creek where a collection of logs and sticks have once blocked the flow. The same boys have removed that blockage and placed the sticks on the embankment as chairs for a spot they call ‘Devil’s Hideout’: that is their space. In the foreground there are a couple of rocks and a pool where the students have found yabbies. The water is very still and shows a lovely reflection of the casuarinas that grow along the embankment.
When Sandi looks at this photo she sees that it captures a precise moment in time of a place and story that is dynamic and changing. Although there are no children in the photo, Sandi reads in it their story of interaction with the creek, their naming and belonging there. She recalls that the creek changes with the weather, noting how the pools reflect the light and shade that plays out on the surface of the water throughout the day, and that it is different now because of the rain. The camera, as a technological device, is active in making the place for them: “With the photos, after passing the cameras out, they start to claim their – or recognise this space that they want to be in” (Sandi). This activity relates not only to the moment of taking the photograph, but to the children’s ongoing connection to the place: when they return “they’ll wander through the bush to go and find that place that they’ve taken the photo of”.

**Patterns: water, rock and rain**

The photographs in this group all show close up images of patterns made by the natural elements of the creeklands. A number of the photographs in this group show patterns of foamy bubbles across the surface of the water. Sandi says that on this occasion the students “were intrigued as to why, this particular time, there were bubbles and froth sitting on top of the water”. This phenomenon happened only in one part of the creek where there is an expanse of water after the creek flows over the rocks. It was caused by recent rain: the increased flow of water meeting the rocks that shape the bed of the creek causing a little rapid to emerge. The pattern in the pool beyond the rapid was made by the froth that the rain, water and rock generated. The photographer has pointed the lens of the camera directly down onto the pool of water with its pattern of froth to capture this precise conjunction of time and place. The photograph also shows the reflections that are characteristic of many of the other photos in this group.
There is something very intriguing about the ways that creeks and waterways respond to rain and the increased flows of water. The student has not only captured this fascination in their photo, but has also captured the aesthetic qualities of the surface of the water interacting with the rocks, the recent rains, and the light and shade of sun and trees. Rather than attempting to portray the creeklands as a whole as in the landscape photos, these photos capture a fascination with the natural elements. They do not tell a narrative story of the children’s spots and their naming, but of their engagement with the elements themselves.

Animals: bees, lizards, yabbies, tadpoles
This group of photos shows the animals that the students found in the creeklands. The one selected is part of a series of photos of a lizard that was “quick to dart off and splash in the water” (Sandi).

The first animals that the students identified were bees, and it wasn’t until they settled down and really explored the place that they started to spot the lizards and find their hiding places and be quick enough to snap them before they darted off. They found the larger lizard in a tree, and another one up on the bank sunning on the sewerage pipe.

The students also found yabbies and tadpoles in the quieter parts of the creek.

Bushes: green and thriving
The photographs in this group show the bushes and trees that grow in massed profusion on either side of the creek. The photograph chosen is typical of this group. It is taken looking towards the other side of the creek where there are new homes being built. A stone wall supports the mixture of bushes, weeds and shrubs. The flow of the creek is slowed down through this section and it flows underneath the weeds and bushes. Only a tiny part of the creek is visible in the photo. The weeds and bushes look chaotic, very green, happy and thriving.

This photo captures the very urban location of the creek with its nearby houses, roads and suburban infrastructure. The trees and bushes that flourish along its banks create the creeklands as a discrete place; they are in a sense, the creek’s infrastructure. They provide shade, shelter and privacy for the students who come here, allowing them to create their own worlds and spaces for stories and learning.
Weeds: learning riparian zone regeneration
This group of photographs shows the weeds that the students have learned to identify with the local Council Environmental Education Officer. These photos generally have a single distinctive plant that is categorised as a weed. The photograph selected from this group shows a scotch thistle with other weeds growing around it. The students were very quick to spot the weeds after the Council Officer had had his chat with them. He spoke about how some weeds are very detrimental to trees, how they strangle trees if they are left to grow. He explained to the students that this was actually a regenerated area, but that weeds had popped back up again. He found a shrub with edible red berries for the students to taste, and spoke about the removal of the camphor laurel trees and their replacement with native plants.

In this activity with the local Council Officer, the students learned about the activity named their sport option, regeneration. The Council Officer also manages the community nursery, which produces plants to regenerate the riparian zones of local creeks and waterways. The children learned to identify the harmful weeds that can choke waterways and destroy the native plants that preserve the infrastructure that supports the creek.

Rubbish: visible presence of invisible humans
There were a number of photos of the rubbish the students found at the creeklands. The photo that was selected for analysis shows some man-made material, possibly fibre of some sort, that has become intertwined with natural materials and has actually formed part of the habitat of the creek. It is an example of the creek accommodating the materiality of the rubbish to its own purposes. The students were excited by the amount of rubbish they found, wondering how it made its way to the creek. Feeling annoyed, they decided to clean the embankment. Cleaning it up helped them to feel that it was their space because they were caring for it. Some of the rubbish had become integrated into the creek itself – a sleeve that protected a tree, or an old milk container or shopping bag that had been there for long enough to collect leaves and become part of the habitat. In many of these photos, the rubbish is almost unidentifiable from its surrounds.

Fungi: story plants
This last group of photographs is of different types of fungi growing in the deep shade and rotting wood of the creek bank. The one selected for analysis shows fungi growing up the sides of the remains of a tree trunk. When the students found this, they called it ‘Smurf Steps’ because the little fungal steps up the side of the trunk gave them a sense of fairyland. They identified many other mushrooms and toadstools and the places where they habitually grew, like the fallen wattle trees.

Drawings and paintings: how did students represent what they saw in the creeklands?
Taking the stance of an artist, Sandi sorted the student drawings and paintings into groups according to subject matter (botanical studies, landscape studies and animal studies) and materials (lead pencil, coloured pencil and watercolour). We also analysed one painting that was different from all of the rest and summarises the children’s nature/culture engagements.

Landscape studies in pencil
The example chosen from this group is a drawing of the creek. The loose freehand drawing views the creek from above, colouring the landscape with blue and green hues, highlighting a memory of the small shrub with red berries. The drawing has an insert in the top right hand corner that shows of a cluster of straight-ish lines where a green insect clutches onto the strands, and text with an arrow that reads: pray mantis in Jasmines hair.
The detail of this drawing is interesting because there are six different bushes drawn on the bank, showing the student’s attention to the shapes of the bushes and their leaves. A large dead tree dominates the drawing, coloured in darker than the rest in lead pencil. It has an imposing shape and size and may be a place the student is drawn to. Rather than draw her friend at the creek, she has drawn only strands of her friend’s hair, noteworthy as a landing place for a praying mantis. The hair belongs in the landscape as a habitat for the praying mantis. The praying mantis is brightly coloured in the exact shade of green and drawn in careful detail. The encounters with animals and insect life at the creek are more significant to the students than those with the humans who share the place.

**Animal studies in pencil**

Students chose to draw birds, lizards and yabbies as part of the creeklands. Where the encounter with the bird or animal is the dominant feature we have grouped them as Animal studies, some of which were in pencil and some in watercolour.

Figure 9: Landscape with praying mantis in Jasmine’s hair

Figure 10: Pencil drawing yabby in hand
The one chosen from this group is a black and white pencil drawing of a human hand holding a yabby. The hand’s wrist and fingers with nails are carefully drawn but the viewer’s attention is really focused on the side-on view of the yabby with its head, eye, feelers, clawed feet and segmented body. Sandi says Paige is the yabby hunter. She’s the explorer of the group who is always looking out for something new to bring back to draw or to write about in the journal. She’s so brave, and this is something that Paige would have done: just pick up the yabby.

This drawing is really about human and animal. When you watch Paige moving the rocks and putting her hands in the water, she’s very gentle. Her hand becomes something else, part of the water, the pool, feeling its way around to find the yabbies.

*Animal studies in watercolour*

The particular painting selected here is a detailed painting of a yellow-tailed black cockatoo on a limb of a tree. The branch is positioned across the middle of the page. The tree’s trunk is down the right hand side of the page. Four clouds float in the background.

![Figure 11: Black cockatoo painting](image)

The black cockatoos stopped at the creek once during our many visits. The artist has the bird as the focal point of her visit; she has placed it in the centre of the page and branch. The painting displays consideration to the structure of the bird and the detailed colouration of its feathers.

The painting is empathetic with the bird. Through painting, the child understands something of the bird’s presence in this place. It’s like child becoming bird – to paint it you have to become the bird. She has looked at it long enough to take on the way it was standing on the branch, and to interpret that in her painting.

*Botanical studies in lead pencil*

There are many detailed close-up drawings of parts of plants in the genre of botanical illustration. This drawing is by an intellectually mildly disabled student who finds it very difficult to focus on an activity for a period of time. He has captured the strength of the stem of the weed. There is a lovely flow as if it has been moved by the wind or attracted by the sun. Each leaf has strength and detail, and at the top of the flower each little bud is just extended
bud on bud on bud. This is a remarkable achievement for this student, showing he was fully present in the moment.

Figure 12: Botanical illustration

Figure 13: Patterns of leaves

**Botanical studies in coloured pencil**

The botanical drawing in colour is by another child who had a distinctive response to the place. Patterns are very strong in this child’s drawing, and her use of colour reinforces the patterns. She has filled the whole page with patterns of leaves. Twelve large green leaves make up most of the pattern, and a rich brown coloured tree branch is drawn diagonally across the centre towards the top, breaking into two fine curly branches with smaller leaves along their length. The leaves are vividly coloured in different shades of green adding to the complexity and variety of the pattern, just as you might see the patterns formed by the mix of leaves of different greens at the creek. The colours and shapes of the leaves form a pattern across the whole page not unlike designer wallpaper patterns. Sandi says this student’s way of drawing is very loose and open but she is also very particular about her work, which reveals a very particular vision of the world.

Figure 14: Botanical study: Toadstool

The main feature in this botanical study in watercolour is a perfectly drawn toadstool with strong black outline and light brown top. Black lines indicate the toadstools gills and outline the stalk, both of which are uncoloured. The toadstool has fine black roots (miccorhiza) that penetrate into the ground indicated by a line of black and another of green. The ground is littered with finely painted green leaves, small grasslike plants, twigs, and what appear to be insects, all typical of the leaf litter on the ground in the shade of tall trees. A quizzical worm pops its head up from the leaf litter, in a truly accurate representation of the habitat of toadstools. The painting blends elements of childhood play and fairytales with an understanding of landscape matter.
This painting is the only one that features a human, albeit an imaginary one from the popular movie Frozen, co-opted to the colours of the creek. The painting of Elsa fills the entire page, with a painted red frame and red painted handwriting with the words ‘Elsa in the colours I saw at the creek’. The figure of Elsa is large and central with long mid-blue hair down one side, a lighter blue full-length dress with a pale green-blue sleeve. The imaginary character has a large bright red mouth and black dots for eyes. Painted in a loose and open style, she is a triumph of convergence of popular culture and the creeklands, so we have called her an example of nature/culture where nature and culture are not separate but recognised as one and the same. The Disneyland Elsa has been reborn through the colours of the creek.

Discussion
There are some important ideas that have emerged from viewing place-based sustainability learning through the experiences of this group of children on their weekly walk to the creeklands.

Time
In The Time of the Clock and Time of the Encounter, Michele Bastian (2012) investigates the difference between the time of the clock and the lived time of experience. We live in a world dominated by the time of the clock, yet many aspects of life have a different rhythm and temporality. In the following, we explore the different rhythms and temporalities of these students and the creeklands. In our Time of the Encounter we identified five ways in which time was differently configured for these students:

• The Time of Transition, when the students left the school grounds and entered into the different time zone of their walk and their time at the creek. The transition happened when they arrived at the tree with fallen branches where they stopped and took time out to play with and on the fallen leafy branches, sticks and logs.
• The Time of the Moment: particular conjunctions of child/place events such as the season when the wattle is flowering and Zac shook wattle and the pollen falling from the wattle flowers covered the surface of the water in its yellow powder.
• The Time of Flow when the children lost their sense of themselves and school time, asking ‘How long have we got?’ so that they could know whether they could get into another activity, another dialogue with the place.
• The Time of No Rules: the framing of the encounter as different from other sports options, and different each week depending on the weather, the season, the children and the creek.
• And, finally, the Time of Unfolding Subjectivities, when children who do not fit with the normal conventions of sport and behaviours at school could learn different ways of being with each other and with the world.

**Place**

Place, as well as time, is reconfigured in the weekly walk to the creeklands. In making the shift from thinking about ‘nature’ as something separate and apart from humans that can therefore be exploited as a resource, Affrica Taylor proposes ‘common worlds’ as the entangled human and more-than-human real local worlds that children inherit and co-inhabit along with other species (Taylor & Guigni, 2013). The concept of common worlds involves a shift from a focus on human–human social relationships to heterogeneous relations between a whole host of living beings and things, non-living and living forces. In this section we consider place as the ‘common worlds’ that children enter into in the creeklands. A common worlds pedagogy of the creeklands involves the teacher’s ability, in Sandi’s words,

> to just stand back and just watch what’s happening, how the students sort of relax into that role, and take ownership of places along the creek, and they love to report to me, ‘Miss, I found a yabby’, or they found a lizard, or ‘I think I saw a snake’.

Common worlds are a place of imagination where the children relax into play and different worlds become possible.

One time when they were down there they found a black snake, and they – I think this is part of the imagination – they flicked it up, and flipped it over the river, but no one saw them. It’s lovely the way they can enter that imaginative space.

Common worlds is also a place where they ‘find their spot’, and part of this involves mainstream students being able to make friends with students from the support unit.

Verity is an explorer and a lover of animals, her family have a property where they walk and hike, and she has experience dealing with special needs and has gathered an understanding of others. She is calm, patient and supportive … Children know their spot, their place. They find their spot in the social groups and they find their spot at the creek.

Finding their spot is as much about finding the physical location at the creek where their play and imagination can be free as finding their place socially within the group of children who participate in the walk. Regeneration in common worlds applies equally to the regeneration activities at the creek and the regeneration of human subjectivities made possible by the encounters there.

In regeneration they’re out there in the environment and its about imagination for them, for a lot of these kids. They pick up a stick and they’ve got a sword, and they’re making their place, their hideout, their King Rock. That’s already passed through a couple of hands, King Rock, and now the big girls are on it today.
Conclusion
Each student was given the opportunity to connect with Redbank Creek, the opportunity to play, enjoy that play, and to develop their own story in that place. It has taken them out of the academic realm of school and more into a backyard. For support students this is incredibly important because academic work means struggle for them. Friendships have formed even though there were just a few regular students who were comfortable initially because they didn’t know the support students: it has allowed the integration of the support students with mainstream students. This has only happened through time and now it is just not an issue. They need this time to venture. The weekly walk to the creeklands became a time and place where young people from Picton High School who chose regeneration as their sporting option could learn to be human differently with the more-than-human world of their very ordinary, everyday local creeklands.
Ways of Knowing, and Not Walking Away

Susanne Gannon with Kirstine Gonnano and Diana Jarrah

Introduction
Campbelltown Performing Arts High School (CPAHS) is located in south western Sydney. Many of its students pursue specialist studies in dance, music, drama, film and television production, and aerial and circus skills. The school has developed a range of innovative student-driven approaches to curriculum design, including project-based learning. For Love your Lagoons, English and Science teachers worked together to design an interdisciplinary program that enabled Year 9 students to take ownership of their learning, and demonstrate responsibility as citizens with the capacity and skills to impact the environment and the community. Students investigated a range of environmental problems in Park Central wetlands, an urban wetland that seemed initially to be entirely enclosed by urban developments including two hospitals, a townhouse development, a shopping centre and a restaurant precinct. However, as student inquiries and collaborations with local Council developed, students discovered the multiple connections and dependencies of this wetland and the plants and animals that live within it to other places and systems. They considered the impact and affordances of the wetlands for human use and how these might be compatible with the natural elements of the wetlands. They designed solutions and communicated these to local Council. Their solutions incorporated a range of modes and products including a dance performance, a rap song, a geo-engineering mechanism, a children’s picture book, playground equipment, letters to politicians, drawings and media campaigns. Students’ understandings of the interconnectedness of social and natural systems and the importance of environmental planning and management grew throughout the project. The project achieved its aim of engaging students in understanding and maintaining sustainability in their local wetland.

Part 1 – Context and background

The school
Campbelltown Performing Arts High School is a specialist performing arts high school with over 1100 students, offering entry via audition to the particular performing arts strands for 40% of enrolments, with the remaining 60% of students entering from schools in the local area. The school has approximately 80 teachers and 14 non-teaching staff. The school has a diverse student population, with 7% Indigenous students, and 26% of students coming from language backgrounds other than English. The school motto ‘Strength through Unity’ is apparent in all the school’s activities. Collaboration and collective responsibility, student centred pedagogies, and real world problem solving are central to the pedagogical approach.

Action learning throughout the school community, led by faculty leaders and teams, has characterised the professional learning of teachers for many years. Teachers from CPAHS who led the Love your Lagoons project – Kirstine Gonano (Deputy Principal/ English) and Diana Jarrah (Science) – had previously had considerable experience in developing project-based learning. The CPAHS model that had been trialed in English and Maths through 2013 required students in small groups to develop critical questions for collaborative inquiry and self-directed learning, which underpinned the approach that was taken to Love your Lagoons. However, the teachers were also mindful of the need to meet the mandated syllabus curriculum outcomes that had been selected for Year 9 in their respective curriculum areas. The project developed with a cross-curriculum focus in English and Science, with students and teachers from both classes brought together whenever possible, both within the school and on the excursions to the wetlands.
The wetland
Campbelltown is one of the fastest growing peri-urban areas in greater western Sydney, and the wetlands area that was selected for investigation – Park Central wetlands – is indicative of this rapid and recent transition from rural to higher density urban use. Park Central is the only wetland within walking distance of the school. Selection of this site brought issues of urban land and water management to the fore, and a focus on the intersections of town planning with sustainability was thought to be appropriate for the year level.

Campbelltown was developed on the lands of the Tharawal and Gandangara peoples, and was first gazetted as a town by Governor Macquarie in 1820. Urbanisation accelerated after the 1960s. Campbelltown LGA is located within the catchments of the Georges River (86%) and Nepean River (14%). Many of the waterways flow into the Georges River via the Bow Bowing/Bunbury Curran Creek system, including the water that flows through the Park Central wetlands.

The land where the lagoon is located is adjacent to the Macarthur Square Shopping Centre which, although originally opened initially in 1979, was expanded in 2005 by Lend Lease into one of the largest shopping centres in Sydney. Park Central was developed from 2003 by Landcom, which markets the development as ‘sustainable living’. The wetlands are described by the developers as a “modified watercourse” with “wetlands, ornamental ponds and cascades” and an exemplar of the “ecological and recreational benefits of creek corridor rehabilitation”. Amenities for human users are described throughout their promotional materials – “walking, joining and cycling tracks, picnic and BBQ facilities, a number of seating areas and a children’s playground”. While human users were important considerations in many of the students’ projects, the non-human users increasingly became the focus of much of the Love Your Lagoons project at CPAHS.

Campbelltown City Council (CCC) has responsibility for maintenance of Park Central wetlands. Current CCC ‘Park Central Enhancement Works’ are entirely focused on traffic management including widening of roads, pedestrian crossings and increased parking. However the CCC website has an extensive section on wetlands – the “soggy superheroes of the catchment” – that clearly situates their importance for the Council and the lands they manage, and the need to educate the wider community about wetlands ecosystems and habitats. As the Love Your Lagoons project progressed, CCC Environmental Education Officer Michael Rhyyderch became crucial to the success of the project.
As well as providing plant and animal habitats, Park Central wetlands has a hydrological function, controlling flooding by absorbing excess water, and a filtration function, removing toxins, nutrients and sediments from the water running through the system. Park Central comprises a storm water treatment wetland and an open water wetland. It runs from an elevated area of thick remnant Cumberland Plains woodlands at its top end, down through a series of connected ponds surrounded by reeds, some of which have waterhen nests in them. The largest particles of sediment from stormwater runoff settle in the deep water of the highest ponds, which also hold a purpose-built natural purification filter. The water is systematically cleaned as it flows through the cells in the system. Water flows through the ponds and shallow waterways to a concrete-rimmed pond at the lower end with a fountain feature in the centre and steps in one corner where ducks gather to be fed. Stormwater runoff comes into the system from the nearby housing development and hospitals precinct. Drains are built under the road at various points, and water is channeled across layers of broken up, chunky sandstone and rocks, flowing on under the bridge and into the pond. There are runoff sites at various points around the whole site and various filtration mechanisms that are designed to clean debris from the water as it moves through. One of these – the Gross Pollutant Trap (GPT) – became the focus of one of the students’ group projects.

We decided that it was best to take four samples from various different sections of the lagoon to be sure that the sample wasn’t depending on the location from which we took it. We discovered something unordinary: the pH levels vary from one end of the lagoon to the other. This is only possible if something is polluting the water upstream, so we decided to go up and look at the Gross Pollutant Trap (GPT) and what we discovered was jaw dropping. The GPT is basically metal bars running vertically two inches apart, stopping any large pieces of rubbish from entering the lagoon, but sadly the GPT was struggling to do so. The GPT was covered in sticks, branches, shopping trolleys, rubbish, soil, leaves, anything you could think of was lying against these bars and the water was just running through them, the water was picking up the rubbish and caring it down through the lagoon, as if the GPT wasn’t even there at all.

Figure 17: Student work sample (excerpt)
Figure 18: The Gross Pollutant Trap (GPT)

Outside the waterways are numerous zones for public use. Along one side of the middle lagoon there are a small rose garden and gazebo popular for wedding photographs, and an installation of outdoor exercise equipment. On the opposite side there is a covered children’s playground. Bench seating, barbecues and garbage bins are scattered across the lawns, and these amenities were also of interest to our groups of students as they investigated the wetland and its environs and affordances.

The Park Central wetland is part of a greater catchment area that reaches from Ambarvale and Bow Bowing Creek to the northern part of the Georges River, and finally into Botany Bay. The water flows out through the bottom end of the wetland along a reedy creek, alongside the dining area, and under the road. From there, it descends down a channel to Lumeah Station, to Macquarie Fields, and through a series of retention basins where it is cleaned before running out to the sea.
Part 2 – Planning and pedagogy

Planning

*Love Your Lagoons* was approached as an interdisciplinary project-based learning collaboration across English and Science. Students were required to complete a number of individual tasks selected from a task matrix, as well as a group project organised around an inquiry question. The overall class inquiry question for the project was: *How can we sustain our wetlands through loving our lagoons now and into future?*

In English, the focus was to be persuasive language. The final products from small groups required students to pitch their projects verbally to an audience of their peers, teachers, university and Council representatives, and to write a persuasive letter to Council, a politician or another appropriate public figure. In Science, the wetlands study with its focus on living ecosystems and the interdependence of human and natural systems was very fitting for the next unit, *The Living World.*

Individual projects were selected by students from activities listed on a matrix of ways of knowing that had been previously developed at CPAHS – the Year 9 *Love Your Lagoons Individual Activity Matrix*. One axis listed ‘Ways of Knowing’, while the other axis was mapped against Bloom’s taxonomy (excerpt below). Students were required to select six tasks from the matrix to complete an individual portfolio of activities. They were able to select and document their decisions, and to clearly articulate how they preferred to learn.
As well as their individualised portfolios, the other major activity in the unit was a group task. This required students to work in small groups to develop their own driving question to guide their research about the lagoon. This was a more specific iteration of the broad inquiry question: *How can we sustain our wetlands through loving our lagoons now and into future?* The questions that guided individual and group investigations spanned a wide range of issues.

### Table 4: Group activity: Driving questions

<table>
<thead>
<tr>
<th>Group driving questions</th>
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<tbody>
<tr>
<td>Why did the bird get hurt?</td>
</tr>
<tr>
<td>Why is the water so dirty?</td>
</tr>
<tr>
<td>How do nature and the built environment interact?</td>
</tr>
<tr>
<td>How can we attract youth to Marsden Park and use it in a sustainable way?</td>
</tr>
<tr>
<td>How can we use the wetlands in an effective way?</td>
</tr>
<tr>
<td>Is there enough shade/shelter in the park?</td>
</tr>
<tr>
<td>Is there enough maintenance in the park?</td>
</tr>
<tr>
<td>How can the elderly use the park?</td>
</tr>
<tr>
<td>How can we improve Park Central for children?</td>
</tr>
</tbody>
</table>

Students used various planning tools, prepared by their teachers, as they developed their inquiries. After forming their groups, they worked through a process of mind mapping using sticky notes and diagramming. This process had started at the initial schools planning day at UWS Campbelltown. Then they developed these into a concept web, onto which they transcribed their inquiry questions and areas for investigation.

Finally, the groups completed the details in a *Love Your Lagoons Project Summary* page on which they documented: *Title, Group members, Driving question, Research process* (How did you complete the task? What information did you need? How did you find it out?), *Final product* (What is your final product? How will you evaluate the quality of your final product?), *Audience* (Who is your product intended for? How will you present it to them?), *Completing the task* (What other steps do you need to take to complete the task? Do you need any assistance?). The success of the project relied on the careful and thorough scaffolding that the teachers developed to assist student groups to plan and monitor their learning throughout the unit.
Table 5: Student work sample: Group project summary

<table>
<thead>
<tr>
<th>Project Title</th>
<th>LOVE YOUR LAGOONS PROJECT SUMMARY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group Members</td>
<td>Rukiah, Beunka, Jessica and Liam</td>
</tr>
<tr>
<td>Driving Question</td>
<td>How the natural environment and the built environment co-exist with each other.</td>
</tr>
<tr>
<td>Research Process</td>
<td>We had multiple experiences where we had the chance to visit Campbelltown Park Central where we had seen things for ourselves, rather than a photo of the Park. Whilst we were at the park we had investigated the physical features that take a huge part in maintaining the cleanliness of the park. For example, the fountain helps maintain the water cycle before it goes into the Georges River. We also had the opportunity to meet one of the members of Campbelltown Council. He had informed us on the history of Park Central, how the surrounding buildings are affected and how the animals created their habitats naturally.</td>
</tr>
<tr>
<td>Final Product</td>
<td>Our final product is a flyer. It contains a clear understanding of what Campbelltown Park Central is (Marsden Park). It tells our audience of the activities that take place, the location, and must-know information of Park Central. We also added contact details for any further questions or information he would like to know. We attached the Campbelltown Council’s email, PO box and phone number.</td>
</tr>
<tr>
<td>Audience</td>
<td>Local community, particularly age 20 and older as children would not be able to understand the value of the flyer and the message we are trying to get across. Whereas adults have more interest in information about their local Park as most activities at Park Central draw attention mostly to the adults.</td>
</tr>
<tr>
<td>Completing the task</td>
<td>We need to find a way to make our flyer noticeable to people who live in the local community, to give them an understanding and knowledge of Campbelltown Park Central. Members of the local community don’t know as much as they should about taking care of Park Central. An idea to make our flyer noticeable is to call Mikey, a member of Campbelltown Council and ask him to help us spread the word.</td>
</tr>
</tbody>
</table>

At the end of the unit student work was assessed with a rubric for each of the items in their individual portfolios as well as peer assessment of group projects. As students were working in small groups and on different tasks throughout the unit, teachers were able to give formative advice during the unit and assist students at the point of need. In keeping with the ‘real world contexts’ approach to authentic learning and assessment, opportunities to present their work in front of real life audiences – at school in oral presentations, in writing to council and other authorities, and to primary school audiences at the Macarthur Sustainable Schools Expo - were also opportunities to assess the effectiveness of their work.

The group work Problem-based Learning (PBL) projects were assessed by a rubric with criteria focusing on Purpose, Research Process, Innovation and Creativity, Product and Group Work. The rubric was co-developed with students to increase their understanding of the task, the process, and criteria for assessment. Students were given opportunities to assess each other’s work and provide meaningful feedback, as well as to receive feedback from the teacher. Although the product is important, so is the process of developing, pitching and researching their final product, and the adoption of an original and innovative approach.

Projects
Students worked on a very wide range of projects through the unit. The ‘ways of knowing’ approach meant that many of the projects exceeded the boundaries of Science and English. For example, one student developed a project website which hosted many of other group projects as well as his own individual work, a promotional video for Park Central, audio-
recordings of instrumental music, and other elements. Individual projects ranged from logos and brochures, to a rap song commemorating the rescue of Squawk the juvenile swamphen, to an online Nearpod historical quiz on Park Central wetlands.

I drew a dragonfly and a duck in the logo because ducks are seen everywhere you look in Park Central. A dragonfly because it is a common insect that fly around all wetlands.

**Protect:** The community ends to help the Council by looking after the flora and fauna. If anyone sees any injured animals or algal blooms, they would need to report it to the council. Definitely not to put chemicals down the stormwater drains.

**Respect:** Respect the wetlands and the environment by not chucking your rubbish in the ground and to place it in the bin. Not to ignore signs (Do not feed ducks). To be kind to the animal and plants.

**Connect:** Try and actually listen to the sounds surrounding you. Go bird watching or just relax. Walk around Park Central with your friends.

Figure 21: Student work sample: Logo and rationale

Group projects were complex and had multiple phases, with different levels of expertise being drawn in as required for the project. For example, a children’s picture book *Eric the Eel* began with the visit to the school from the CCC Environmental Education Officer. During his session Michael responded to questions students had generated before he came, and also told them about the origins and life cycle of the eels that live in the lagoons. Students then conducted further research into the lives of the eels. They developed text and planned layouts appropriate for a children’s picture book, and wrote their text onto the pages. As well as the eels’ long journey from New Caledonia up the Georges River and aspects of eel behaviour, they incorporated various details of Park Central’s water management controls including stormwater drains and the GPT, both of which provided points of drama in their narrative as the eel must overcome these obstacles. However, the children ran out of time for illustrations. A talented student artist from another group joined their project and it was completed in time to present to groups of primary school students at the Macarthur Sustainable Schools Expo.

Figure 22: Student work sample: Excerpts from "Eric the Eel" storybook
Another significant group project that drew upon creative arts was a dance choreographed by a group of students after one of them found a dead turtle trapped behind wire at Park Central wetlands. Their dance was intended to focus on the emotions involved; they explained, their voices overlapping:

How you feel when you see it. / Like if you put yourself in its position stressing out and then everything’s changing. / And then the wire. Getting caught in it. / This wire was never here. / And not even understanding it.

The start of the dance is about calmness, and slow, and that’s how they would have felt before they faced the obstacle then everything becomes really rushed and panicked and really like coming up and coming back down to the floor and backfiring all the time.

They considered that this was a sufficiently urgent problem – for turtles and for the other wildlife in the wetlands – that they also wrote a tightly argued and passionate letter of almost 600 words to the Federal Minister for the Environment.

Another significant project was a substantial redesign of the GPT – the Gross Pollutant Trap. As one of the teachers explained, this group of students all had a good understanding of the problems of keeping water clean and healthy because they kept fish tanks in their homes. They measured pH levels in all the pools throughout the wetland, and identified that the filtration problems began with the ineffective design of the GPT. They had to think like engineers and designers, and also take into account the feasibility of their proposal to Council. They developed a sales pitch about how they’d save money for Council and how the people who’d be picking up rubbish and fishing dead ducks out would have these parts of their work reduced. The most important evidence of learning for these students, in their teachers’ words, were “those moments where they can stand up very proudly and talk about their work and not be shy”, and the “left field nature” of their inquiry.

Part 3 – At the lagoon
CPAHS made three separate visits to their wetland. However, their inquiry into wetlands more broadly began prior to these visits, at the UWS Campbelltown campus planning day, where the framework of ‘ways of knowing’ that Aunty Fran Bodkin introduced to them. The framework was discussed by the teachers back at the school, where the teachers stressed its compatibility with elements of the scientific method.

1. What you see, hear and feel (observation)
2. What others see, hear and feel
3. What is (requires talking to others, hypothesis or inference extending first two ways of knowing)
4. Pathways to other truths (investigation, experimenting, wondering, finding alternative answers)
5. Every truth has an end or a consequence; every truth has a history

Lagoon visit one
The first day the students went to the wetland in mid-March was over 30°C and everyone underestimated the distance and the time it would take to walk there. The university researcher, Dr Susanne Gannon, accompanied the excursion. Students trailed in, collapsing in the sparse shade of some small bushes and a picnic table while the teachers handed out ice-creams and cold drinks. Students took nets, scoops and pH testing equipment and completed a
series of activities on worksheets that guided them through scientific observations of water life, food chains and ecosystems and the factors that impact on these.

A small group of students found a heat-distressed juvenile swamphen lying in the weeds at the edge of one of the upper pools and this proved to be a pivot point for the project. With the help of the teacher and researcher, and in consultation with WIRES, the children undertook a wildlife rescue operation and the bird – nicknamed ‘Squawk’ – was delivered back to the school and to a vet. The bird event changed the day completely for them, as one of the students involved in the rescue explained several months later:

At first we thought, ‘we’re just going there to do paperwork’ and they took the nets out and stuff. We were just originally trying to get bigger fish cos everyone was getting the really little ones, so we went to that back lake and we found him. It was just so much more interesting when we found him and Miss explained to us who WIRES was and what they did and the hotlines for animals.

This engaged the students emotionally with the wildlife of the wetlands, in a similar way to the finding of the dead turtle by a different group of students. Finding the distressed bird provoked empathy and compassion, but it also mobilised students into action, as they realised the responsibility that had fallen on them.

Student 2: You could see that he was in pain, like when someone’s in pain, and we could see that he was so much in pain. He was struggling and we felt bad, and when we didn’t have Ms G we didn’t know what to do, whether to pick him up or just leave him and walk away, and it was upsetting and then we realised, like, that it was us that saved him.

Student 1: You couldn’t have walked away and left him.

Student 2: If we’d walked away he would have died…

Students moved from detached scientific observation to an affective engagement that fueled a more activist orientation, not only for the individual bird in that moment but also for the area and the project more broadly. Although the teachers had not planned or insisted on this, students gradually developed a sense of responsibility that infused all their work throughout the project:

Responsibility to take action over each one of those areas, the responsibility to promote appropriate and safe use of the park; the responsibility to do something about the litter; and the responsibility to look after the animals – they [each] had a really strong connection to one of those areas. (Teacher)

**Lagoon visit two**

While the first visit had been for orientation, and initial observation and investigation of the site and the issues and problems that might be evident there, the later excursions were very focused on the small group and individual projects. The difference in the later visits was that, one of the teachers explained, “they knew what they were going to look for, they were going to test that … they were looking for other options, they were surveying people, they were filming, they were … doing what they needed to do”. Thus, students were very engaged and self-directed in their learning. On the second visit, Campbelltown City Council Environmental Education Officer Michael Rydderch also accompanied the classes on their visits to the lagoon and was able to follow through with a number of queries that students had about the wetlands.
**Lagoon visit three**

On the third excursion to the wetlands in early May, the groups used a bus to get there and back and to transport the variety of scientific and recording equipment needed for the students’ investigations. The university-based Project Manager, Dr Kerith Power, accompanied this excursion. Student projects that were evident on the day were the eel migrations to be documented in a story book for primary school children; water animals (some students had an underwater camera); the water quality of the wetlands measured by pH, by clarity and also by collections of animals and water plants; water pollution (sewage); provision of shade in the park via a questionnaire of park users; feral animals; and an investigation of park maintenance triggered by the discovery of turtles trapped in the GPT.

One group of students described to the researcher how they were writing a letter to the Council to ask their questions about park maintenance, and planned to develop a dance expressing their emotions about the deaths of the turtles.

S1: They’ve cut out holes to grow plants, and then the plants have died and no one’s come to look if the plants are actually growing and just left it, and not fixed up the holes and then we found two dead … turtles that have actually fallen through the holes and then tried to get out somewhere else, and then just given up and just died.

S2: Yeah that they should maintain it more often … And the fact that we told them last week on Tuesday and it’s still there…

S1: Like what do you tell a child when they find a dead turtle?

S2: Yeah cause that rotting turtle obviously can probably cause diseases, so then if a little child that’s 4 years old they wouldn’t know, and they might not recognise it to be a turtle … so they could touch it and get probably sick, and then it can pass on to actually humans, so it can actually infect a whole lot of aspects of government.

Another student group looking at shelter and shade in the park had developed a survey for members of the public, which they explained to the researcher:

I: What’s your question?
S3: Why isn’t there enough shade for the plants?
S4: So one of the questions is how often do they visit the park, and then another one that’s like why do or don’t you visit the park, and then do you believe there’s enough shade, do you think it would be a good idea to put more shade in the park, would you want to visit the park more often if there was more shade, do you think it’s a good or a bad idea to put more shade in the park, and do you think other people would want to visit the park more often if there was shade…

S3: We’re going around asking people if they’d like to be videoed first, and then we’re going to ask them questions… Also we printed out surveys that they can fill out.

**Part 4 – Outcomes / Findings**

**Pedagogy**

Project-based inquiry learning enabled students to develop ownership of their investigations and a strong sense of individual and group responsibility and commitment. Developing a clear sense of an authentic audience for their final products was an important part of their active engagement: “Once they identified that authentic audience, that’s when their projects really
started to gain momentum” (Teacher). Student driven inquiry learning may have been relatively messy, compared to teacher driven pedagogy, but the students were highly motivated.

They’re working, they’re discussing, they’re getting bits of resources … They’re active, it’s really active engagement. Or at other stages, it was quite heated debate about what should be the next step that they’re doing. It’s chaotic. But it’s chaos with a purpose.

Project-based learning gave students a choice and therefore ownership for their learning, and capacity to develop organisational skills as they worked independently and collaboratively. The design of the activities gave scope for responses that students were able to modify or adapt to their own interests, preferences and skills. Finally, the mind maps, planners and reflection worksheets were essential to assist students to organise their learning effectively.

The cross-curricular nature of the project design was also very important, particularly in a system where disciplines and key learning areas are rigidly separated in secondary schools by curriculum cultures, timetabling and syllabus requirements. The project was an ideal opportunity for teachers to demonstrate that required outcomes could be met and enhanced by this approach.

**Sustainability education**

Students realised that everything is connected to everything else in the wetland – that the health and wellbeing of wetland animals and plants is as much dependent on the effectiveness of local government processes and town planning decisions as it is on natural systems and events. They learned about the importance of water quality and the range of systems and practices that monitor and contribute to human and non-human wellbeing. They also recognised the crucial role that the wetland has in sustaining human communities and connections: providing important open spaces for elderly residents in retirement homes, playspaces for children and families, contemplative spaces for visitors and patients at the nearby hospitals and a community space where different groups of people can meet.

Students developed a strong sense of their own capacities for community activism around the wetlands area and their awareness that looking after the environment is everyone’s responsibility. The close connection that they made with CCC via the Environmental Education Officer will continue into the future. The culmination of this is a convening of a special meeting of Council at which students will present their work.

Though initially the neighbourhood lagoon in the middle of a new housing development seemed to be a tenuous, degraded and domesticated wetland, the students and their teachers began an inquiry into the deep interconnectedness of the site with natural waterways, the animals that move through them, and themselves. Open-ended interdisciplinary inquiries enabled students to choose a range of modes of learning. The pedagogy for sustainability that was developed by the teachers became an opening up of possibilities, inquiry and imagination.
‘Curiosity Killed the Cat’: A Story of Sustainability Education

Carol Birrell and Tonia Gray

Introduction – the science of curiosity
There is a vision of science commonly known and passed down through the generations – science as the ‘great inventor’, the discovery of the new, the original breakthrough, the brilliant insight, the invention that changes the way we view the world. The scientist, herself or himself, embodies the quest for new knowledge. There is a suspicion that within every science teacher, in every primary or secondary school, lies that quest, burning away ever since childhood discoveries revealed a world of mysterious unknowing. The quest remains basically the same into adulthood, but now incorporates the question, ‘Is it possible to infect my students with an insatiable desire for the knowing of a new world?’

Mt Annan High School in south western Sydney takes steps in that direction. Take four Science classes in Year 7, the first year in high school, and bring together four avid science teachers at a lake adjoining the school, Lake Annan. Researchers enlist the aforementioned teachers to sign on for a project, Love Your Lagoons (LYL). Enthusiasm is thrown in. Ideas for activities are chewed over at length: wonderful and inspiring ideas for researching the lake, and others that are not so inspiring – to all, that is. There is some agreement but each scientist has a particular vision and holds to it strongly. This is the way of science. Eventually it is decided that four individual approaches can be accommodated by allowing all students to rotate through the four separate groupings of tasks – all to be conducted outdoors at the lake, on the lake and in the lake, and all to involve hands-on learning.

The thread that holds the diverse activities in place is an investigation into what is actually there in the lake, a type of environmental inventory, done by the students themselves. There is also a link to a broader question concerning whether the lake is susceptible to a number of environmental factors and whether it is an ecosystem in its own right. This is a question that may take years to unravel, but the quest has begun; that is all that matters. Preliminary data will be assembled. Meaning will emerge.

Igniting the flame of curiosity
What the teachers do not know at this stage is if such a project can catalyse interest on the part of the young students who are, in this day and age, inundated by a million daily digital distractions. How can they be captivated by sheer curiosity? Will this whole enterprise end up as a futile recapitulation to PowerPoint pedagogy?

The team of intrepid science teachers tread carefully. Very important at this stage not to oversell the whole idea, so that it seems unattainable, insurmountable, or just plain stupid to the students. And not to undersell it also, so that it does not seem to be VERY IMPORTANT work that is worth doing, worth sharing, worth spreading the word and, most of all, Making a Contribution to New Knowledge. The scientists know that this project demands a back to basics approach, the old experiential model of nets, bug catchers, microscopes, measuring devices, hand held cameras, and pencils with paper on clipboards for recording and observing. Radical! Many of these devices are antique, locked away in dusty cupboards, away from the far-flung gaze of the spotless interactive whiteboard. Will students have their curiosity piqued? And just in case, a caveat is added to the whole project: let’s see what may emerge through the students themselves. The scientists are grinning!
So what happened?
One group, seen in Figure 23 hanging precariously over the lake with nets in hand, are collecting bugs and animals, the ‘biotic and abiotic’ data to the uninitiated. Now the newly initiated students are keen to spout the new vocabulary, of which they even understand the meaning.

Figure 23: Lake Annan: Pond dipping

And what does the teacher observe about them, right here, right now?

Yes, they’re engaged! They’re looking, their heads are down, tails up; scooping in the murky water; looking for an array of bugs in anticipation of the ‘don’t know what’. It’s the unknown that they’re going to find here. It’s the unknown because they don’t know what’s going to be there! What can I find? What can I show? What can I show, Sir? Sir, this, this, this … What’s here? What’s here? In other words, what have I discovered? I have discovered this!

The teacher seems to be surprised by this onslaught of enthusiasm, almost as much as the students themselves. What has happened in our schools to deflate the bubble of excitement in learning? Where are the original outbursts of scientific discovery to which each child (and teacher) has a right? Does sustainability education offer hope for a revitalised curriculum?

The teacher cannot contain his amazement at this incredible sight before his eyes and continues to exclaim:

They are absorbed, or, if not mesmerised by “what can I find from the unknown that visits here? It’s new to me” … “New to science!’ … “Just totally new!”

The traditional classroom does not relate in a dynamic way to the life the child feels in his or her body. It is not just that students may enjoy the change of scene, from indoors to outdoors, but that they are able to use their bodies in engaging with their surrounds through multi-sensory learning (Green, 2012).

Listen to the sound of the student, the one who digs her hands in the watery grey mud scooping to touch the slippery feel of the tadpole? And feels and feels again. We enter here the tactile domain of touched and being touched through the hands, indicative of whole body contact or what Casey refers to as “embodied emplacement” (1993, p. xvi). It links with the Norwegian concept of Friluftsliv that has informed healthy outdoor Scandinavian life for decades and is known as “touching and being touched by free Nature” (Faarlund, Dahle &
Jensen, 2007, p. 395). Hultman and Lenz Taguchi (2010) remind us that the actions of a body within its material surroundings are being acted upon by those surroundings as much as acting on them.

Notice the boy who finds a water skink and draws it, oblivious to everyone and everything around him in this one task. When you look at his drawing, you can almost feel the reptilian skin as if it was rubbing against your own.

Figure 24: Student drawing: Water skink

One child says,

> We had this little black and white disc that we had to see how deep the water was. I found that fun. And then we were testing the water and how dirty it was, and how clean it was.

There is an ‘aliveness’ in these explorations, a sense of vitality, of that rarity nowadays – ‘fun’ in learning. This is the new scientist speaking. The Madame Curie, the Einstein, the Darwin, with whetted appetite for the unknown.

**The place of curiosity**

It is certainly obvious that these forays into the local environs comprise place-based education. “Place, the relationship between people and their geographic locations, is best understood through the settings and situations we live in, know and experience directly in our daily lives” (Green, Somerville & Potts, 2013, p. 12). Local places, often ignored, can become sites for the staging of models of pedagogy that are more student focused, encouraging independent learning outside the framework of planned teacher directed activities.

Take a look at one of the 3-D models made by one student: the ibis being held by this young boy looks alive and needing to be held close, by its belly, as if it were his own beloved chook.
Why does he have such tenderness towards a bird often treated as the scourge of Sydney rubbish dumps? He clearly has a relationship with this bird with its an extraordinary sized beak. This is no inanimate, dead world the boy inhabits!

Notice the swan on the lake, the poignancy of that neck and its shadow in the rippling waters. One student says he knows this swan:

Her name’s Bella, I named her. So she’s always there? Yeah. There’s two black swans and there was a little baby swan but I think the baby died, because you don’t see it anymore. Oh, how long ago? Probably a month ago I suppose. Oh yeah, there’s usually two.

Almost all of the students said in interviews that they loved catching the bugs. Why wouldn’t they? A body of water, dull and dirty, yields a veritable treasure trove of unnamed beings and, even more intriguing, a thousand wriggling micro-organisms when seen under a microscope. The holding of one’s breath as each monster reveals itself from a previously invisible persona. One science teacher declares:
It’s definitely allowed them to see the lake in a different perspective and look at things. I know, with the other classes, when we did the testing and things like that, [they loved] to be able to see what’s going on in the water. Things that they normally can’t visualise.

And realising there’s even fish in there! Kids were astounded that there’s fish in there. They didn’t realise that before…

And there was the odd insight into the implication of this lake, Lake Annan, as part of the broader world that humans have ravaged:

I feel like the … like nature’s part of the world and you have to take care of it more than what we have, otherwise it’s not going to look that pretty anymore.

A small body of significant research adds some heft to the argument that teaching outdoors in a natural environment promotes an appreciation and lifelong connectedness to the environment. If students like the one quoted above are able to draw connections between their own localised wetland study and a broader vision of the planet and sustainability, then the research begun by Mt Annan High School may yield long term effects. Of course, ‘appreciation’ is a somewhat ambiguous term that may fall short of the notion of ‘love’ expressed in the title of the overall LYL research project, however it is obvious that this student is showing care and concern for the role of the human species in the world.

A cognitive understanding of environmental issues has little influence upon behaviour. Herbert (2008, p. 63) states: “simply knowing about environmental issues has little impact upon behaviour. Knowing is not enough; children have to care enough to create harmonious relationships with the Earth and with fellow human beings”.

**Keeping curiosity well watered**

So, do our science teachers manage to move their students beyond knowledge acquisition into the affective domain of learning, that neglected, if not ignored, area of research that has increasingly been shown to be crucial in all aspects of learning? Do the students actually express care for Lake Annan or for planet Earth?

Let us return to the 3-D models, the signature of one particular class. The process of spotting, photographing, drawing, and researching animals/birds/ducks/fish/reptiles in the field seems to morph, back in the classroom, into something else. The teacher explains:

So what I decided to do with my kids was actually create the animals that they find down there, because my kids are very hands-on. So I thought, well, making them kind of works a bit better than just talking about them…

They love it. Everyday we’re making our animals and I’m, “oh yeah we’re making our animals”. So they – yeah they really, really enjoy it and they like that hands-on thing and I think it kind of resonates a bit more, that these are the animals but now you get to make it. So I think it kind of fits in a little bit better.

Researchers have found that the integration of the arts increases student engagement, imagination and achievement, not only amongst mainstream demographics, but also with youth from both low and high socioeconomic backgrounds. Evoking the emotions, the arts are
a powerful tool for engaging students in cross-curriculum learning. Graham (2007; 2009; 2014) has argued that the arts encourage reflection; when linked to direct, immersive experience in nature and the environment, they become a potent vehicle for learning and transformation.

This science teacher knows exactly what has been provided to her students:

The opportunity to understand the lake. Either they didn’t know it existed or they just didn’t understand what goes on down there. And everything involved and all the different aspects of it … It’s just been able to make them see it in a whole new way rather than – it’s just this great big pond with ibises in the middle that have taken over. And the plovers that chase them on the way home from school.

How might that understanding be expressed? And what exactly is being implied by the teacher about understanding the lake? Here is one female student speaking about her commitment to the lake near home:

Well, we’ve taken a lot of care cleaning the waters and stuff around the lake. Well, me, my mum, we’ve gone down there a few times. Yeah, but we haven’t done it at school but me and my mum we go down there sometimes and clean around it.

And another has this to say when asked about the lake:

I knew it was there. I just didn’t really, like, pay much thorough attention to it. So now that we know it’s there and what’s in it, and what’s been endangered and the amount of things that are actually in there, and that we have to take care of, it’s definitely something you’d want to look at more.

Another says:

It’s good to look after it because there’s things in there that are going to keep it good and not … and, yeah, not wreck it.

Our final (male) student has this to say on the topic:

If you don’t take care of your natural environment, you could make the world go more polluted. So if you make that, then everyone in the world might die, so you should take care of the nature.

This is certainly a type of ‘understanding’ that the lake has to be sustainable, that the whole planet has to be sustainable. And that we humans are responsible for taking care of it. We can choose to look after it, or continue to damage it. However, these are not just fatalistic statements, but insightful words and emotions being expressed born of the overall learning experiences and the deeper engagement that has occurred in class.

**Spreading the curiosity**

The spark ignited out beside the lake manages to be held alive by the ongoing activities of the students and the science teachers. Again, each class does its own thing, but each group also moves toward a distinctive creative response that will be integrated as a whole interactive group presentation in the Science Fair, a public event involving another school, parents,
teachers, school Principals and other interested people. In the integrated display of all the work by Year 7 Science, boundaries between the distinctive class approaches become blurred. A masked lapwing plover feeds on lab-grown snow peas, nibbles on leaves and plucks out feathers on the photo collage. A caterpillar traverses a hand drawn map of the lake showing temperature differentials; it shivers in the colder shadier sections. The skink attempts to climb up onto the PowerPoint, recognising its local habitat. The water hen scrambles up the turbidity chart, seeking cleaner vegetation.

A hive of fascinating creatures and noteworthy facts engage the audience, and mumblings spread through the room of the transformation of the humble local lake into a veritable, living, amazing scientific discovery! The scientists, all 80 of them, are beaming!

**Conclusion**
Proverbs are generally warnings to us about our behaviour. By ‘curiosity killed the cat’ we are being warned not to be excessive with our curiosity, nor to investigate or experiment unnecessarily. Mt Annan High School has demonstrated that, far from killing the cat, curiosity leads to more curiosity which leads to more vitalised learning spaces. *Love Your Lagoons*, an integrated learning community developed around a wetland, is a project that has been place-based, one that shows the promise of an ongoing and perhaps even lifelong attachment to this local place. It also provides a model of how to embed school Science with sustainability education issues that are globally relevant and pressing. Experiential learning, a hands-on approach to real live investigations, creative explorations to further the outdoor knowledge gained, in depth understanding based on personal knowledge bases, and the incorporation of a more public realm to disseminate the results, all seem to be implicated in a school sustainability curriculum.
Moving off the Bike Path: Studying Birds in a Local Wetland

Lin Brown with Colin Mountfort and Sharyn Lee

Abstract
Camden Public School is within walking distance of a section of the Nepean River where a parallel walk and bike path attracts community members for recreation. Utilising this local resource, two upper primary classes integrated the Love Your Lagoons project into their Science and Creative and Practical Arts programs. Over two terms students visited the wetlands twice, collecting data by moving off the bike path and keenly observing the birdlife supported by the wetland system. The science-focused class was guided by worksheets and produced reports and PowerPoints of their engagement with the birdlife in the wetlands, whereas the class with an arts-based orientation produced pencil drawings and an interpretive dance sequence. After the study the teachers reported that the children commented on their attachment to this local wetland in terms of the habitat it provided for many local and migratory birds, not just a ‘cool’ place to ride their bikes.

Background
Camden is located 65km south west of the Sydney CBD, in the southern corner of the 201km square which makes up the Camden Local Government Area. The township is part of the Matahil Creek sub-catchment that feeds into the Upper Nepean River. Camden Public School was established in 1849 and has a reputation for providing quality public education to the children of the local township and surrounding peri-urban district.

The teaching staff is considered ‘stable’, with several teachers having been on staff for over 20 years, and one teacher-researcher in this project having spent 25 years as a staff member at Camden. In 2013 there were 18 full time equivalent teaching staff. The student population numbers 309 and is predominantly Anglo Celtic. Staff at Camden Public School also speak about teaching second generation family members, indicative of the satisfaction of families with the area and the school.

Project implementation
Joining the project
Two teachers of Stage 3 students (Year 5/6 classes – aged 11 and 12 years) became the project’s teacher-researchers with their 50 students. The two Stage 3 classes were different in that the school espouses streaming. One class comprised the gifted and talented students whilst the other class was a mainstream group. In this way, the teachers differently catered for individual children. This was reflected in their curriculum responses to Love Your Lagoons.

During the planning day the classes attended two different workshops. Colin and his class (5/6C) were inspired by the presentation by Eaton Gorge (a dance and theatre group), and by the end of the day they thought that the wetlands would provide the inspiration for a curriculum response involving drama and creative dance with soundscapes. Sharyn’s class (5/6S) found that the Museum in a Box workshop sparked their interest in the adaptation of birds and animals, and planned that the local wetland would provide a resource for a Science unit on ‘Bird Adaptation’. The school agreed that it would apply for project funding to purchase a class set of binoculars to allow the children to gather important data through close observation of the birdlife at the wetlands.

Curriculum development and the wetlands activities
Sharyn adapted a teaching resource called ‘Environment Matters and Beaks and Feathers Teaching Resource’ as part of the Stage 3 Science and Technology unit ‘Birds’, which was
planned for Semester 1, 2014. Curriculum development for Stage 3 students at Camden follows a 2-year cycle (in order that all Key Learning Area themes are covered and not repeated for Year 5 as they progress to Year 6). The wetland-based activities for the students of 5/6C and 5/6S were integrated into this broader unit of work. It was timely for the classes to participate in *Love Your Lagoons*.

The following diagram represents how the wetland activities connected to the ‘Birds’ unit.

![Figure 27: Camden: Teacher plan](image)

**Stage 3 – Science And Technology – Birds**
Under the umbrella of the unit on birds, the wetlands provided a local observation and comparison point for the bird study activities across the three locations of home backyard, school playground and wetlands. Both 5/6C and 5/6S were able to progress their overall bird study unit by visiting their wetlands twice over two terms. The students were provided with a worksheet (see Figure 28) on each visit that guided their observations and allowed the science-focused group (5/6S) to structure their report writing, and the creative and practical arts class to observe, photograph and draw the birds as inspiration for drama, dance and further drawing.
At the wetlands
The wetland within walking distance of Camden Public School is a creek/gully emptying into Matahil Creek, a tributary of the Nepean River. The wetland runs almost parallel to a concrete walking/bike track through Onslow Park which continues on a circuit back into Camden’s main street.

Visit 1
The children walked to the wetlands in May and spent an hour there. They were organised into groups and had clipboards to hold their worksheets and pencils. They shared a set of binoculars within their small group of two or three students. The worksheet guided their movements along the 300m of the wetland by having an observational task at each of the three 100m points. The children worked independently and were accompanied by three
teachers and three members of the research team.

**Visit 2**
The second wetland visit took place in late June and again the students were guided by a worksheet. The children were now familiar with the length of the wetland and moved more easily along its length. They again had clipboards holding their worksheet, paper and pencils. During the second visit the students were more mindful of their observational strategies, and the arts-based class made preliminary drawings of the birds they observed, as well as looking for the texture, movement and shadows of the birds’ environment.

**Data collection**
The following data were collected from the children and the teachers.

**Children**
- 3 worksheets from Visits 1 and 2; worksheet examples from Visit 2 from the science-based activities; reports written by children after Visit 1
- PowerPoint presentation developed by 5/6S
- Pencil drawings of the ducks at the wetland from the creative and practical arts-oriented class 5/6C

**Teacher-researchers and research team**
- Photographs taken by researchers during Visit 1
- Transcription of interview with teachers after Visit 2
- Transcription of the collaborative data analysis conversations

**Evidence of children’s learning**
Two teachers from 5/6C and 5/6S attended the collaborative data analysis day. Each of the visual data sets was individually laid out for analysis and categorised into identifiable themes or patterns that were representative (or outliers) of children’s learning. The teacher-researchers discussed and justified the categories chosen, including how the children’s data fitted into the analysed sub-sets. One example from each category was then selected and discussed as to its representativeness within that category.

**Worksheets – Visits 1 and 2**
Regarding the first visit to the wetland, the teacher-researchers discussed how the individual children varied in their responses to the directly asked questions, and in the detail of the observations they recorded. Colin’s analysis of one student’s response was:

*She … lists the living and non-living things, and look what she’s written – rocks, concrete slabs, Red Bull can. She’s really looked at the entire environment and … she’s focused on how much pollution there is in the environment. She’s really looked at all of the litter in the environment, and then looked at the living things. The birds that she’s seen are as a secondary thing, almost. Whereas [Name 2] has done the association of living and non-living, and she’s put bird, high fence – things that you might expect to see in the environment and she hasn’t focused on any of the pollution at all.*

The children’s interpretation of what they had observed was also recorded and provided examples for the teachers’ discussions. One child wrote:

*I could see black ducks and one purple swamp hen. I think the purple swamp hen was scaring the other ducks away to get some food.*
Colin noted:

This is where she’s making some sort of prediction or some sort of guess about the interaction of the birds. But [Name2] has just written what she’s seen. She didn’t make any interpretations.

The children’s presentation of observational data also varied, most notably in presenting the number of birds observed. Both tallying and description were methods used by the children. Teachers made two final comments from the first planned visit to the wetland. The first was that, “even though the worksheet is quite structured, it still allowed the children to respond in a range of ways”. Secondly they commented that discussing with the children at various points in time may have yielded more data on their sheets. Colin suggested, regarding one child’s comment (“It’s dry. It doesn’t look like a wetland. It also felt like a swamp”):

But they really needed another step there … and lots of talk about, ‘Well why do you think it looked like this?’. I think, even if you have to lead that discussion a bit…

During Visit 2, the children’s Activity Sheet directed them to observe the water, ecosystem activity and birds present on the day, and to compare these to their previous observations of the wetland during Visit 1, one month earlier. The Activity Sheet also prompted the children to compare their observations with and without the binoculars in the same section of the wetland. The children were asked to be unobtrusive in observing and drawing the birdlife. They compared their observations of the birdlife with the species shown on the identification board that listed information relating to all possible birdlife in this section of the wetland. The final question asked the children to nominated three birds for their team to research during follow up classroom lessons. Again, the responses recorded by the children on their worksheets showed various thinking processes and details in observation drawings and note taking. The drawings of the birdlife during this visit provided 5/6C with the first attempts for their creative art works.

**PowerPoint**

Another outcome for class 5/6S was the development of a class PowerPoint. This presentation provided a summary debrief for the children on the reasons for their visits to the wetland and the specific knowledge they gained in relation to birds in their local areas of home, school and the wetland at Kings Reserve.

The slides in the PowerPoint were organised around the following topics:

- How we Started our Study of Birds
- Playground Observations
- Local Wetland Observations
- Comparing the Playground to the Wetlands
- Birds in our Local Wetland

For each slide the information provided was a photograph of the bird, and text under the headings Description, Habitat, Location, Diet, Breeding, and Unusual Behaviour. The birds were categorised as to whether they had seen them at the wetlands or not.

- Crimson Rosella – seen at the Camden wetlands
- Galah – seen at the Camden wetlands
- Purple Swamphen – seen at the Camden wetlands
• Pacific Black Duck – seen at the Camden wetlands
• Black Swan – not seen at the Camden wetlands
• Dusky Moorhen – seen at the Camden wetlands
• Superb Blue Wren – seen at the Camden wetlands
• Grey Butcherbird – seen at the Camden wetlands
• Bell Miner – seen at the Camden wetlands
• Sacred Ibis – not seen at the Camden wetlands
• Royal Spoonbill – not seen at the Camden wetlands
• Noisy Miner – seen at the Camden wetlands

This scientific identification and investigation of the adaptation of birds to wetlands was complemented by the arts-based responses of the second class.

Duck Drawings
The students in class 5/6C produced 28 pencil drawings of the ducks observed at the Camden wetlands. During the second visit to the wetland, the children had their worksheet and their clipboards, but were inspired to draw and take photographs of the birds. Colin says:

They talked about – at that time that there were a lot of ducks, and not too many other birds that they’d taken [photographs of] … and I don’t know whether that was a result of that heavy rain that we’d had at that time, and so, there were probably only the ducks to draw. They didn’t see many other birds that would come close.

The teachers decided that they could identify four main categories in the children’s artworks.

Category 1: Intricate feathers
There were five drawings allocated to this category.

He’s thought about those tiny feathers, the bigger feathers, the way the wings make those small lumps, and I think that’s very clever. (Colin)

In the drawing below, chosen as representative of this category, the teachers were impressed by the amount of observed information shown.

Figure 29: Category 1: Drawings with intricate feathers

So what I think he’s trying to do here is … he really is trying to look at some idea of tone and colour, so he’s trying to get something that indicates the
colour of the feathering here in using pencil. He’s trying to look at the relative size of feathers from around the neck and these larger feathers towards the tail. There is some attempt at showing how the water moves, and the duck’s shadow there … He’s got the shape in here to show the wing that’s folded in underneath the bird as its swimming. So, I think probably what he’s trying to do there is showing a lot of observation. (Colin)

**Category 2: The shape of the duck**
There were six drawings allocated to this category. Whilst some attempts had been made to show feathers, in general the outline and shape of the duck was most important in these drawings.

These are the focus on the bird without anything in the background. But what I see from this one is someone looking at an overall shape, so it’s the use of that contouring line. See how it’s not straight? But rather than looking at anything, this is just filled in with the same texture [feathers]. That’s got a few feathers on it, but … mostly it’s the outline. (Colin)

The representative drawing below shows some detail in the face (with the lines for “that little mask” and the nostrils) and also the wing, showing the most attention to the shape of the duck.

![Figure 30: Category 2: The shape of the duck](image)

**Category 3: Duck in its environment**
Eight drawings were allocated to the category of the duck in its environment. The children used various techniques such as feathering, zig-zagging, rounded leaves on stalks, plain lines for thicker branches, and shading to illustrate that the duck was part of its surroundings. In each case the children were connecting the duck to its habitat. The substitute teacher thought that the vegetation in some of the drawings was very lifelike and the result of keen observation, whereas in others it seemed as if the student had made a symbolic attempt at the vegetation (“I’ll just draw what I think it might look like”). The drawing below shows close observation of the duck and its habitat.

He’s shown a taller layer of vegetation, so it’s showing that things are actually dangling. They have to touch the water. His sole focus has not been the duck. He’s attempted to show when the plants fell in the water and where they
touched the water, it’s made the ripple. So there’s rippling in the water where the plants are touching the water and the duck looks nestled … and when he saw it, it was probably hiding because the children were all really noisy. (Mary Lou)

Figure 31: Category 3: Duck in its environment

Category 4: Duck in water
The final category of drawings depicted ducks in water. The children used shading, concentric circles, smudging and rippling to indicate that a duck was in water. The representative drawing in this category was described as, not a “pretty picture”, but one where the student had undertaken “real observation” and been diligent to get that on paper.

This person is trying to make some attempt at showing how the water ripples as the duck moves … He’s attempting to show something that is a real observation. He hasn’t been making a pretty picture. He’s had a different focus in his whole outlook. He wanted to show the duck was swimming and he wanted to show that the feathers actually had some sort of substance and body, some texture. (Colin)

Colin asked the student artist about the drawing. The boy felt he had not been successful, “I don’t think I did a very good job”. Colin analysed the student’s concern as, “How do you interpret something that’s tactile as something visual?”.
Photographs

Careful observation
Student learning was also evident in the photos taken at the wetland. The teacher-researchers found the photos for which the children had become engaged in careful observation most evident of children’s learning. Colin noted:

She’s got the worksheet [as] maybe the starting point for her where she’s looked at the questions, I’m guessing, and then … the observation of what she’s seeing there has taken over from actually recording.

The substitute teacher felt that the children’s careful observations of the photos they took at the wetland provided them with primary evidence, which then informed the drawings that were completed back in class.

You see here, how all these shadows are under these ducks, and your children actually took these photos. That’s why I think they’ve represented all those shadows … that’s the first thing I noticed. They took that photo [and] obviously noticed that … All the shadowing has been really relevant, hasn’t it? Because it does stand out when you look at it. (Mary Lou)

An unanticipated opportunity
During the second visit to the wetland, the students and teachers met a volunteer from Landcare who happened to be weeding the area adjacent to the bike path at the edge of the watercourse. The children became quite interested in watching her and likewise she questioned the children about their activities in the area. Colin explained that after the children spoke to the Landcare volunteer their focus for their photographs changed.

[The children’s] initial focus was on the birds, but we met the lady who was weeding the area and they spoke to her for a while and she was very interested in their drawing and what they were doing and why they were drawing. She asked me if it was all right if she spoke to them about what she was doing and the reason why she was doing it … That’s when they started to take photos of trees, which I thought was probably to record what else was there besides the birdlife.
Teachers’ reflections
After the second visit to the wetland, the two teachers shared their reflections in an audio-recorded interview. They reported that their participation in the project was constrained by the time, pace and structure of the two-year curriculum cycle, which was necessary for the multi-age classrooms of Year 5 and 6 students to successfully achieve curriculum objectives that need to be covered to be ready for transition to High School. These pressures to complete in-class and other school-based curriculum imperatives were a limiting factor for implementing ‘open ended’ pedagogic projects like Love Your Lagoons.

If I go on this walk to do this observation, which will take me most of the afternoon, what else ‘has to go’ to do that, and how am I going to get that caught up? So it’s very nice to go for that lovely walk and to sit down and to draw and to talk about your drawings. But you also have to balance that out with, “What did I not do, and how am I ever going to get that part caught up?”

An open-ended pedagogy
For both the teachers Love Your Lagoons was an open-ended initiative which they initially found did not link easily to the school’s ‘set’ curriculum focus across the year levels: for example, the whole school scope and sequence plan for spelling.

We are very locked into making sure that we’re covering content and covering outcomes. And if something like Love Your Lagoons comes along it’s much more open-ended. We have to try to think, “How does that fit in? What does it replace so I’m still going to cover outcomes?”

Asked if they would consider integrating the wetlands into their curriculum, Sharyn noted that the next opportunity for a unit of work in environmental studies would be in two years’ time. Colin thought that a second implementation would be more successful than the first.

I was trying to do open-ended things with the children, but for us things are close-ended. You know, “I’ve got to do this, this and this to get to this goal; and this is where it’s headed and this is what my outcome has to be”. All of a sudden [Love Your Lagoons] was something where I felt I didn’t know where I was going. Until I felt, “Okay I know what I want to do! I can tie it in with something else I’m doing and still achieve an outcome”. And for teachers I think probably we like to know where we’re headed. In the second time around we’d know where we were headed.

Children’s learning
Sharyn (the 5/6S teacher) was most positive about the facts the children learnt in the unit she developed which incorporated the bird study and the effects of human activities on the environment.

They learnt lots of facts about birds … We’ll go out in the playground and they’ll say, “Oh that bird’s got a hooky beak so it must mean it’s a meat eater”. So their knowledge is there … analysing why a bird may look the way it does.

Both teachers believed an important contribution Love Your Lagoons made in supporting the children’s learning was providing access to resources. Being able to borrow the Museum Box which featured the adaptation features of birds, feathers, beaks and claws was a significant
resource, as was the purchased class set of binoculars which allowed the children to make close-up detailed observations of birds in the school grounds and at the wetlands.

The Expo
At the Macarthur Sustainability Expo Day, the students from Camden Public School wrote a script based on the safe use of binoculars in the field. The student representatives from 5/6S and 5/6C organised themselves into teams and presented their information to each of seven groups of local school children attending the Expo. This final activity entailed a writing task to prepare the script, a speaking activity in delivering the information to each of the groups who came to listen, and subsequent communication and interaction of small groups of children as they had the ‘hands-on’ experience of using the binoculars.

Conclusion
The teachers and students who participated in Love Your Lagoons may have often strolled or ridden bikes along the path that parallels the relevant section of the wetland. After visits to the wetland during which they were given the opportunity to move off the bike path and spend time observing and interacting with this place they showed, in their drawings and observations, a different connection.

Most notably, they became familiar with the wetland as the habitat for many birds, predominantly the ducks. Some children were alerted to the quality and level of the water within the wetland system and that rubbish was causing pollution along its banks. They also became aware that volunteers cared for the wetland and, in clearing the weeds along the banks, made more open spaces under the trees where the birds could congregate.

For the teachers, the project served as a reminder about using the outdoors in local places as a learning environment. Colin noted:

We don’t realise how important it is to actually get away from the classroom. You think, “Well, I’ve got the interactive whiteboard. I’ve got all these computers. I’ve got all these things.” … But it’s not quite the same as being there and touching it. And a lot of their life is lived by computers … and you need to get out there and experience … I guess on our part it’s always an effort … By the time you get notes, and organise playground duties, and all those things, and you think, “I could just show this on the whiteboard”, but it’s not the same.
Enduring Relationships: A Pedagogy of the Local Wetland

_Tonia Gray and Carol Birrell with Katrina Ha and Anna Rhodes_

**Introduction**

Increasingly, scientists and educators accept that the survival of humanity rests on the degree to which we can live harmoniously with the natural world. A push has begun to produce programs that can create a balance between the rational or scientific and the intuitive, creative dimensions of education. Fägerstam and Blom (2013, p. 57) highlight the need for “a closer connection with the places we inhabit and extending the use of out-of-school experiences, both as a way to increase content knowledge, interest and motivation and to improve social and ecological accountability”. Sustainability education requires not just increased awareness of our ecological reality, but also greater curiosity about and attachment to, perhaps even love for, the dynamics of the natural world.

Often, classrooms do not relate in a dynamic way to the life the child feels in his or her body. An ‘ethically responsible pedagogy’ is one that connects the lives of children and communities and is an “inherently relational, emergent and non-linear process that is unpredictable and therefore unknowable in advance” (Sellar cited in Somerville et al., 2011, p. 3). Is it possible that ‘love’ of the natural world, of animals, of plants, or of specific wetlands, can be taught through a school-based curriculum?

This paper will explore how a felt connection with the natural world may be enhanced through a place-based approach. We also examine how the concept of ‘love’ and ‘attachment’ may be considered as a component, both in the short term relationships of humans with the Earth, and in our longer term human responsibility towards planet Earth.

**The context: School setting**

Macarthur Anglican School is a K-12 private school located on 96 acres of rural land abutted by rapidly encroaching urban development. Two linked projects were undertaken at this site: one in the junior school and the other with senior school students in the Earth and Environmental Science (E&ES) co-curricular club. The school’s foundations are in Christian faith, and are designed to inspire students to use their minds, to be critical and discerning thinkers, and to develop as lifelong learners and global citizens.

**Year 2 – Love Your Lagoons (LYL) one day intensive learning**

Year 2 students were involved in the study of a wetland on the school site within 200m of their classroom. The aim of the project was to deepen students’ understanding of their local environment using a cross-curricular, inquiry based approach. Using Stage 1 syllabus outcomes as a basis, one intensive, stand-alone day was implemented. The project consisted of a number of learning experiences requiring students to engage with each other and the local environment. Areas of the curriculum that were addressed include: English, Mathematics, Science, Geography, Dance and Visual Arts. The timetable is depicted in Table 6 below.
### Activity 1: Movement
Students learnt about the water cycle through movement and creative dance. Prior learning included the vocabulary of evaporation, precipitation and condensation. Students had also discussed diagrams and animations of the water cycle. The use of ‘Water Cycle Song’ from ‘Have Fun Teaching’ enabled students to memorise the facts through the melody and lyrics. The choreographed dance movements depicting evaporation, precipitation and condensation were sequentially embedded into the dance routine (see Figure 33). The classroom teacher commented:

I think it was their connection to the concept … The sense that condensation moves together and then becomes precipitation. They’ve made that connection between what actually happens that we can’t see in the air … To that dance and then they can actually talk about that so they’ve got a shared language now.

![Figure 33: Dancing the water cycle](image)
Activity 2: Storytelling
People have long been fascinated with the origins of Earth and its elements. Myths, legends and stories inform us and open perspectives on far-away worlds and their beliefs and customs. In English, the Aboriginal Dreaming story Tiddalick the Frog and the Creation story from the Bible were used. Students listened to, discussed and made connections between these texts exploring the origin and future of water. Their teacher reflected:

The connection they’ve made there is just how important Earth is and how important it is for us to look after it. So when I did a culminating activity using the six hats, in the big ideas section, which is the blue hat, a lot of them wrote it’s really important that we look after water, it’s important that we look after our environment, that people need to be careful – those sorts of responses.

Activity 3: Sensory exploration of the wetland
With this background understanding, students were given an opportunity to sit and ‘be still’ at the school’s onsite ‘lagoon’. They were invited to use their senses to observe this place in the local environment. Following this activity, the students walked around the lagoon in small groups taking photographs using iPads, which they were able to use for other activities later in the classroom (see picture collage Figure 35). They shared and explored with great enthusiasm. The teacher recalled:

(They) just sat still enough to see and hear and smell and to take it in. I think that in our busyness in schools and in life we lose that sense of being still and observing what’s around you, knowing where you are, what place you’re in … We are constrained by time, but thinking time is really important for all of us. It’s allowing the idea to be in your mind and thinking it through and then acting on it … The same goes for when children are writing. For any activity they’re doing they need time to just ‘be’.

Activity 4: Monsters in the microscope
The most profound learning on the day occurred when students were viewing water samples from the lagoon which they had spent the previous session exploring. Using microscopes and a ‘dinoscope’ the students located, identified and observed microscopic water animals. A cockroach-like water creature moving across the screen on the digital projector caused gasps around the room. One student commented that they didn’t know that there was “another world under there”. Students became researchers, striving to make close observations and accurately record their observations.
The teacher commented:

The big thing for them — and I think it’s because of that fabulous microscope that we could put on the projector — is that things were alive in the water. We couldn’t see them with our own eyes but they’re alive and therefore that’s opened their thinking up to the fact that there are worlds that we can’t see but we still need to look after.

**Activity 5: Collage and painting**

After lunch, students used the images they had taken earlier to create ‘pic collage’ of pictures featuring the lagoon and surrounding area (see Figure 35). It was interesting to note that some students had focused on the landscape while others had used the zoom to focus on detail and features in the water, flora and fauna. Following this activity, students selected one of their images and painted it using watercolours (lower right, Figure 35). This enabled students to form a connection with the landscape as they strived to replicate it.

The teacher reflected:

By the end of the day the children were really tired. They’d done a lot of thinking … We haven’t actually used watercolours a lot so that was a new experience for them … I think that taking the photo gives a great connection for the children because they can look at the photo and think, “That’s about the same size as my picture, and therefore I need to put the fence in the
middle, or the fence at the bottom”, and it gives them that sense of being able to create perspective.

After a very busy day this gave students an opportunity to process their learning, make connections with prior knowledge and understanding and reflect upon the day. At the end, when getting into her car, one student was heard telling her father that is was “the best day ever”.

The teacher stated:

I think part of it was just that the day was so busy. And on reflection, that day was really probably the six or seven great things we were doing per term, but put into one day. And I think that was part of it – I think it was just such an intense day for them to do [with] lots of different things … There was time to sit and think and be, and just think about what they were doing; [this] probably made it a best day too … They were sharing in new learning together because we hadn’t prior taught [that way, and the enthusiastic student] just obviously really connected with it.

Activity 6: Reflection and evaluation

A week later students were asked to reflect on two questions: ‘What is place?’ and ‘How am I connected to place?’. They also used the Six Thinking Hats to evaluate the day (see Table 7).
<table>
<thead>
<tr>
<th>Thinking Hat</th>
<th>Focus</th>
<th>Responses</th>
</tr>
</thead>
</table>
| ![Hat Image](image1.png) | The facts. List some things you learnt from the day. | • The water cycle  
• That microscopes make things bigger  
• Water has small animals in it  
• Water is very important  
• “There’s a whole little world down there”  
• Never drink dam water  
• A leech is a water creature  
• Water is very important because it keeps everything alive  
• Insects live in dams  
• Some things are bigger than you think  
• Rain rises from the earth  
• Birds come near the dam  
• Learning about water |
| ![Hat Image](image2.png) | Feelings. How did you feel during the day? | • Very good  
• I had fun  
• Happy and excited that I learnt new things  
• Interested  
• Surprised  
• Awesome – best day ever  
• I well and truly, absolutely loved it  
• Excited because we got to learn new things  
• Tired |
| ![Hat Image](image3.png) | The negatives. What problems occurred? What didn’t you like? | • None  
• That someone might break a microscope (this didn’t happen)  
• That I didn’t know the name of the water creatures |
| ![Hat Image](image4.png) | The positives. What were the best things about the day? What did you like? | • The water dance  
• Teaming up and taking photos  
• Going to the dam  
• Seeing the little creatures  
• Looking through the microscopes  
• The show bag and booklet  
• The sandwiches  
• Looking, listening and smelling what was around  
• The awesome art in the afternoon  
• Doing the art |
| ![Hat Image](image5.png) | Creativity. How could you change the day to make it work better? | • We could go in the dam to look at the creatures  
• The high schoolers could pick up their rubbish  
• The animals in the dam could be bigger  
• Make our own dam and fill it with dam water, then look at it under the microscope  
• We should have ice-cream  
• We should go for a swim |
This evaluation indicated that students had become more closely connected to their local environment. Interviews were conducted with six students and the teacher, three weeks after the event, to ascertain the impact upon their learning and understanding of their local environment. The narratives, along with the artifacts collected, convey the impact of these immersive experiences. Some of the student responses are collated below.

**Place-based learning responses**

**What is a place?**
- A home for people and animals
- Where people and animals live
- Where people and animals can go to
- It can be public or private
- Where people and animals are allowed to go

**How are people connected to their place and other places?**
- Through their learning
- Through memories
- If you have been there a lot
- If you’ve been there for ever and ever
- Having fun
- They look after you there
- Spending a of time there

**What factors affect my connections to places?**
- Where you were born
- If you like it
- If you like the people there
- If I stop going there
- Opportunities
- Adventures

Place-based pedagogy fostered a deeper understanding of sustainability and connectivity to the local wetland whilst also developing a deeper attachment. The teacher remarked:

> There are various aspects of belonging. I think one of the aspects here in an Anglican school is the sense of [student’s] gifts and talents that are God given.
We all have a place in not only our community but the world. Our school motto is enter to learn, go out to serve. So in the classroom everyone belongs; I refer to my class as a team. We’re team 2H cause we all do things together, we all help each other out. I think that this sense of belonging and learning at a young age, how to get on with others, is important because that’s what life is about. We’re all going to work in learning communities through our lives.

And then when we get to ‘being’, which is who you are and your perception of how you fit here. Part of our school philosophy is everyone is on a learning journey. It doesn’t matter how young or old you are, and all the children from Kindergarten set learning goals. We have academic goals as well as co-curricular goals; they can be sporting, creative, but we focus in the classroom on our academic goals, so we look at what we’re good at, what we’re not so good at, where we want to be, and put a time frame on that.

**Follow up activity: Tree planting**

The following term students planted native plants around a section of the lagoon for Planet Ark’s National Tree Planting Day. The children continue to take an interest in their local environment since undertaking this study. According to the teacher:

> We put some bird attracting plants around the dam. We’ve actually got the senior students here tidying it up, and we’ve got a parent from the class again … who’s involved with the Botanic Gardens and he put together a planting list.

**Planet Ark tree planting: Classroom teacher Ms Ha and two students**

**Senior School extra curricular activities**

The second project strand involved Year 7–11 students in the Earth and Environmental Science (E&ES) co-curricular club. They gave freely of their own time outside normal class hours. At the forefront of the project’s implementation were the varied interests of the students. Firstly, the students attended a full day planning program run by the researchers at UWS. Topics covered were ‘sense of place’ map making, reed and basket weaving using natural fibres from the dams, and experiential learning activities using iPads and other forms of visual stimulus.

Students then voted on their preferred Earth and Environmental Science activities for the remainder of the LYL project. The resulting action plan incorporated three facets: 1) water quality testing, 2) bush regeneration and 3) artistic reed work. The project culminated in weed clearing, revegetation, bank stabilisation and overall regeneration of the largest on-site dam. Data was collected on consistent water quality testing and the re-use of natural resources, such as the local reeds that had been earmarked for disposal by local development companies. Students demonstrated a heightened understanding of the changes evident in the environment in which they live and learn, and the abilities to implement an environmental audit, draw valid conclusions from data, and network with local environmental organisations. Above all else, the students developed a deeper connection to the local environment and a previously unexplored sense of ownership.

**1. Water quality testing**

Students tested the water from the front dam of the school’s property once a week (Wednesday 8:30am) for two months. Testing used the vernier data loggers and incorporated
six sensors: 1) Temperature, 2) Salinity, 3) pH, 4) Turbidity, 5) Nitrates and 6) Dissolved O2. The students learnt important ways of working with scientific instrumentation.

Two Year 11 students (studying E&ES) were able to use this study to develop valuable curriculum skills. Students utilised the computer read-out data from their screens, created tables for the data, then graphed the findings to show change and fluctuation. There were clear relationships between some of the tested components, for instance a nitrates and temperature link, and links between turbidity, nitrates and stability of pH. The visual graphing made the experiment more real, tangible and authentic for the students, and was also the impetus for discussion and analysis. This activity was followed by students referring to Streamwatch and their textbook to make inferences and connect ideas from various sources. Final reports were written at the culmination of the student activities. Increased levels of student engagement have been reflected in their meta-cognitive thought processes and improvement in assessment tasks. As a natural corollary, marks have improved beyond the teacher’s expectations.

![Figure 36: Water quality testing results](image)

2. **Bush regeneration**

The school used funds to purchase a soil moisture sensor to assist maintenance of plantings, for instance in measuring the precise amount of water for each planting. Community links were established with a bush regenerator and his company Ecological Australia (http://www.ecoaus.com.au), who conducted pro bono work outside their normal work hours. Over the course of two months, Ecological Australia supplied approximately 15 staff to work on the project, and donated around $9,000 to the LYL project.

Tools were also purchased with funding, e.g. secateurs, buckets, shovels and mulch forks. The practice of bush regeneration started with students looking at the dam and assessing the weeds and chemistry, and with E&ES water quality testing. They then proceeded with clearing the dam’s edge starting at the fence line first, thus improving access to the waterway and returning it to Cumberland plain status. Students undertook a working bee during their holidays removing weeds. They absolutely loved it.
The clearing activity led to interest in the water quality, mainly due to the fact that the view into the waterway was now unobstructed. They also found frogs, which amplified student curiosity: “What type of frog is that?”. With regard to the reeds, initially the students wanted to pull them out, but then they remembered the discussion about reeds on the first professional development day workshop (run by the UWS staff), and recalled the importance of their role in the ecosystem.

One Year 11 student was so enthused by the LYL project that he wants to do work experience in the field, continuing his engagement with the E&ES subject. Similarly, eight students regularly go up to the wetlands site to use water sensor to monitor changes. Students are also suggesting that funds should be raised to order a commemorative plaque to mark the significance of the restoration work. LYL has proven to be a positive step forward in taking ownership and stewardship of the wetlands.
3. Artistic reed work
Following on from the project planning day, when students learnt how to do artistic reed work, eight students from Years 7, 8 and 11 wanted to make lily pads made of reeds and float them into the dam. Sadly, when the group reduced in size this was too hard. However reeds collected from the adjacent housing estate were used to create the weaving works. Students used their initiative and built a scale model of the dam by air drying clay. Most were working at lunchtime, making lots of rope and string and exploring the weight and strength of the string/ropes. They used the ropes as a decoration for the presentation day.

![Photograph of artistic reed work](image)

Figure 39: Photograph of artistic reed work

Developing a relationship with the wetlands
There has been a shift in the students’ environmental awareness over the duration of the LYL project. They’ve taken notice of something that was “a big puddle as you drive in the front gate” as a site that they have grown to admire and cherish. Students have taken ownership of the dam and become more aware of the critical impact of the housing development near the school. In part, this impact manifests as a problem of snakes on the school’s property, that have been displaced by the rapidly encroaching urbanisation at the back gate of the school. The school is located on 96 acres. Largely untouched thick dense bush used to grow outside the school gate. Over the past few years, the trees have been removed and the school users are noticing the rapid advancement of the built environment. They are confronted with what it means to lose a natural habitat, but they also feel conflicted because people have to live somewhere. For the most part, students are angry that their environment is changing so drastically.

As a result of the LYL project, enthusiasm for the E&ES subject has grown and it is now the largest Year 11 class, expanding program options for the subject area. Another important aspect for the new scheme teacher charged with the LYL project was that she felt it has ‘picked her up’ professionally, and engaged her practically within the broader community.

The LYL project was a landmark event as the dam clearing led to the establishment of a visual connection with the wetlands. Students became more observant and the subject area became increasingly tangible and real. They could feel the water; they could see the detail and connect with the waterway itself. Ownership was triggered when they realised they had made a significant difference to the site. The plastic ducks (found in the dam) have become the mascot for the Environmental Club.
Concluding remarks: What the data tells us about the research question

Students became increasingly aware of the importance of wetlands in providing a service to the environment in terms of being cleansing filters, and a rich resource for plant and animal life. Natural habitats and wetlands are being threatened by urban encroachment upon rural and wilderness areas, such as that being experienced at the school site. The system of waterways of the upper Nepean River (which feeds into Sydney’s water supply at Warragamba Dam) is important to ecological health and well-being, and yet creeks and wetlands are abused as dumping grounds for rubbish.

‘Place-based learning’ fostered an attachment between students and the wetlands within and near their school grounds. In partnership with community organisations such as the Catchment Management Authority, Australian Botanic Garden Mount Annan and a private regeneration company, students and teachers instituted care for their wetlands in an interdisciplinary curriculum approach. With mounting community interest in local environmental issues and the need to educate young students, this project provides valuable information for curriculum development.

Some research findings claim a direct causal relationship between pro-environmental activities and a personal link to the natural environment, especially that made in the early developmental years (Carson, 1956; Dunlap & Kellert, 2012; Lloyd & Gray, 2014; Perkins, 2010). The authors suggest that a necessary precursor to environmental stewardship consists...
of experiences that engender love, attachment and affinity. Although love itself is a complex emotion, highly subjective, elusive and difficult to analyse, our research encourages educators not to shy away from such complexity.

In the end, we will conserve only what we love.
We will love only what we understand.
We will understand only what we are taught.

– Baba Dioum
Ripples across Sweetwater Country: Building Cross-sectoral Partnerships for Wetland Wellbeing

Jen Dollin

The project was designed to involve the three local councils and a number of community partners who would be linked with participating schools to support their wetlands curriculum activities.

Local council officers and educators, government instrumentalities and non-government organisations all have substantial sustainability and environmental expertise and resources. In all instances these community educators are working towards similar visions and goals for the region in terms of wetland education and ecosystem conservation, and yet their expertise was relatively untapped by all the local school education networks. The process of building cross-sectoral educational partnerships and mapping the direct impacts and ongoing ‘ripples’ is documented in this Love your Lagoons (LYL) case study. The questions asked were:

- How are school–community cross-sectoral partnerships best made?
- What are the impacts? and
- How can they best be sustained?

Planning platforms for success

The initial invitation to all participants was simple: to connect community and schools via a sustainability curriculum-based program underpinned by a guided inquiry-based learning framework. From the outset it was made clear that LYL would need participating school students to be within walking distance of a water body and that external community partners were invited on the understanding that the key emphasis for the program was on student exploration and inquiry learning. This was an attractive option for some external community partners in that this was not a program with a premeditated outcome minutely focused on water science and reductionist management, but rather a vision of what could happen within the wide sphere of sustainability education using outdoor wet spaces as a living classroom.

We probably didn’t have the best understanding of the objectives of the day in its entirety, but maybe we didn’t need to either. By the end of the day obviously we did, and I thought that was a good tool to get the groups together. (Principal, Camden Environmental Education Centre, NSW DEC)

It wasn’t a literature focused event but you take the opportunity and that actually for me also bears out our philosophy – that we want to embed literature into other arts organisations, community organisations, environmental organisations. There’s actually been a lot of really successful environment and writing projects with young people. (Project Officer, Westwords)

In total, 14 external educator organisations and instrumentalities were briefed about the Love Your Lagoons initiative and invited to participate in the Love your Lagoons Conference and Planning Day at the UWS Campbelltown Campus as a way to connect with local schools. Contacts for the relevant Councils were obtained via a number of avenues including the UWS Office of Engagement and the Local Land Services Regional Landcare facilitator. As the funding mechanism the AGL enforceable undertaking for the project was widely publicised locally all Council contacts were aware that UWS had been successful in gaining this funding for the project. Initial introductory phone calls were made in all cases to introduce the project,
and a series of face to face meetings were scheduled in November 2013 to further discuss participation in the Planning Day scheduled for February 2014.

Starting with something special
Based on prior experience in its the scoping and delivery, the Love Your Lagoons Planning Day at UWS Campbelltown Campus for participating schools, teachers, students and external community educators was a fundamental mechanism for launching the program, gaining early engagement and generating enthusiasm. The day was set up as a carnival atmosphere utilising the substantial indoor and outdoor amenities of the UWS Campbelltown campus, including a series of artificially constructed wetlands at the front of the campus. The aims of the Planning Day were to introduce a range of possibilities for schools to consider pursuing without being prescriptive, and to simultaneously connect with community educators and resource support.

Attending teachers and students were provided with an introduction to the importance of wetlands, an overview of a project planning framework and approach, a ‘taster’ session from likely community partners, and free time to enjoy the external partner marquees, music and activities. Attending external partners were given marquee and lecture theatre space as required, IT access and support, and session times. Nine external educators were involved in the LYL Planning Day (Table 7) – this does not include the UWS School of Science and Health staff (who provided a reptile display), or community organisation observers. Three organisations were not able to participate for a range of reasons (Table 8).

Table 8: Participating external educators

<table>
<thead>
<tr>
<th>Organisation**</th>
<th>Role</th>
<th>Thematic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australian Museum</td>
<td>Manager, Museum Outreach</td>
<td>Session and stall: Catchment management – Orthinology</td>
</tr>
<tr>
<td>Bundanon Trust*</td>
<td>Education Manager</td>
<td>In class: Weaving and arts</td>
</tr>
<tr>
<td>Camden Park Environmental Education Centre</td>
<td>Principal and Teacher</td>
<td>Session: Eco-drama and dip netting</td>
</tr>
<tr>
<td>Dharawal Elder</td>
<td>Aboriginal Educator</td>
<td>Session: Traditional knowledge</td>
</tr>
<tr>
<td>Eaton Gorge Theatre Company</td>
<td>Directors</td>
<td>Session: Eco-drama – dance</td>
</tr>
<tr>
<td>Macarthur Centre for Sustainable Living</td>
<td>Centre Coordinator</td>
<td>Session and stall: Wetland regeneration, eco-arts</td>
</tr>
<tr>
<td>SWSi TAFE</td>
<td>Leader, Environmental Sustainability Head Teacher in Environmental Technology</td>
<td>Session: Water quality assessment and macro invertebrates</td>
</tr>
<tr>
<td>Red Room Company</td>
<td>Education Manager</td>
<td>Session: Eco-poetry</td>
</tr>
<tr>
<td>University of Western Sydney</td>
<td>School of Health and Science-Technical Officer</td>
<td>Stall: Reptile display</td>
</tr>
<tr>
<td>Westwords</td>
<td>Project Officer</td>
<td>Stall: Literacy</td>
</tr>
<tr>
<td>Wollondilly Shire Council</td>
<td>Environmental Education Officer</td>
<td>Session and stall: Bush regeneration; Heritage; Drumming</td>
</tr>
</tbody>
</table>

* Bundanon Trust delivered a workshop in situ to one of the primary schools, as the classes were unable to participate in the planning day. ** Wooglemai Environmental Education Centre and Camden City Council participated as observers.
**Table 9: Non-participating external educators**

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Contact</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birdlife Australia</td>
<td>The Birds in Backyards Program Manager sent a request for volunteer</td>
<td>• Keen to participate however was unable to do so due to lack of resources.</td>
</tr>
<tr>
<td></td>
<td>participation via the Birdlife Southern NSW network.</td>
<td>• Birds in Backyard Program main focus on urban birds.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Birdlife Southern NSW were already involved in the Birds in Schools Program</td>
</tr>
<tr>
<td>Cumberland Bird Observers Club – Illawarra Branch</td>
<td>CBOC Wetland Officer</td>
<td>• Interested but out of area for relevant wetland specialists</td>
</tr>
<tr>
<td>Greater Sydney Local Land Services</td>
<td>An invite addressed to south western Sydney local Landcare groups</td>
<td>• No uptake</td>
</tr>
<tr>
<td></td>
<td>was circulated by the LLS Regional Landcare Facilitator.</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 41:** Photographs of the Planning Day, left to right: UWS Campbelltown Campus, Eaton Gorge Theatre Company and Aunty Fran Bodkin; Wollondilly Shire Council Outdoor Marquee

**Mixing it up for sustainability: Taster sessions from science to eco-arts**

The project team was meticulous in ensuring that the ‘taster sessions’ reflected a range of disciplines and learning opportunities for the participating schools. They included: water science; catchment management; heritage, aboriginal cultural knowledge; literacy; art; drama; and bush regeneration. These sessions were 45 minutes long and each student class attended one session throughout the day (Appendix 1). Students were allocated these sessions based on previous discussions with teachers on subject preferences and were accommodated where possible. The mode of delivery for these sessions varied widely and was determined primarily by the partners, the Planning Day simply providing an opportunity for connection. The feedback from the external participants regarding the scheduling and delivery of the Planning Day was strongly positive, and the substantial resources of UWS including the access to wetlands were of obvious benefit.
We just sat down and had a chat with the kids and it worked really well. It was a very nice informal workshop and it was really nice to have a conversation about what they were interested in. From my perspective, having it open worked really well – saying, “What do you want to know from me?”

(Outreach Manager, Australian Museum)

The weather was favourable on the day and enabled a range of outdoor activities as well as the more traditional lecture theatre presentations necessary to accommodate the 300+ participants. The Red Room Company was contacted via Westwords and provided an outdoor session on haiku stone poetry. At the conclusion of this session, the students took one stone home and ‘planted’ another stone around the University wetlands for posterity. The D’harawhal cultural knowledge sessions with Aunty Fran Bodkin were held entirely outdoors in a casual setting, with a ‘walk and let’s see what we can find’ approach. Similarly, the Wollondilly Shire Council presented two sessions on bush regeneration concepts focused around riparian areas in the ‘outdoor lab’. The marquee was set up with a range of wetland and riparian plants from the nursery for giveaways as well as photographic examples of riparian impacts, before and after shots from bush regeneration activities, and historical profiles of the sites including previous Streamwatch and macro invertebrate sampling results.

It was good that we had that big Planning Day because that did provide an opportunity for me to meet the schools and they did follow up of their own accord. (Environmental Education Officer, Wollondilly Shire Council)

![Figure 42: Haiku stones created by students in the Red Room Company session](image)

The Macarthur Centre for Sustainable Living (MCSL) session was delivered in a lecture theatre via a PowerPoint presentation that gave an overall introduction of MCSL and their programs, and an outline of their local wetland and how it connected with the Nepean River. For the primary school audience, MCSL demonstrated eco-art in terms of small, manageable projects such as wind chimes, mandalas, nesting boxes and holiday houses for animals. Secondary students were encouraged to do science experiments, Hebel brick art, tyre art, painting of old logs, nesting boxes and animal holiday houses.
From when we got there it was organised really well. We had a little stall at lunchtime and the kids came over and they had loads of fun carving frogs and the ducks and all that sort of thing over Hebel brick. And that was really great. We had loads of information that we gave to the local teachers. (Coordinator, Macarthur Centre for Sustainable Living)

Eaton Gorge Theatre Company delivered eco-drama workshop in a flat room space, providing an insight into various aspects of acting including the use of improvisation to explore character development, scene building and basic stagecraft. A science-focused Water Quality Assessment and Macro Invertebrates session was delivered to senior students by SWSi TAFE, and the Camden Environmental Education Centre team delivered a Who Lives Here? eco-drama and dip netting session for primary students.

Were there any benefits and impacts for the partners?

It was an opportunity to be there on the day and we’re always looking for opportunities to raise the profile of Westwords, and you never know what kind of partnerships relationships can emerge from that. (Project Officer, Westwords)

Data about what emerged over the year from the external community educator perspective was collected in a recorded individual debrief session and also in follow-up emails. The recorded interviews all commenced with the open-ended questions:

- Can you tell me about your experience with the Love Your Lagoons program?
- What (if anything) happened after the Planning Day? and
- What worked for you? What didn’t work?

The connections, activities (if any) and impacts that emerged over the course of the program varied enormously. However, all external community educators interviewed reported that creating further local connections, networking and gaining an introduction to the schools via the Planning Day was of great value and a major benefit of participating in LYL. In addition, Campbelltown City Council and Woogelma Environmental Education Centre came on board after the Planning Day and extended the reach of the program in different ways.

That day was absolutely fantastic and we did two lectures to two local schools and then the schools were going to go off and figure out how they could fit in with us. And then we heard nothing else from that. So the schools actually didn’t fit in with us whatsoever and the project didn’t get done. (Coordinator, Macarthur Centre for Sustainable Living)
### Figure 43: Summary of LYL impacts and benefits

*Campbelltown City Council were also actively involved in LYL but were contacted directly by Campbelltown Performing Arts High School.

<table>
<thead>
<tr>
<th>Creating connections and networking</th>
<th>• 100% of community educators reported that they participated in the LYL program to create further connections and to network and that this was a major benefit.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Providing access to schools</td>
<td>• 100% of community educators reported that LYL delivered access to the local schools network.</td>
</tr>
<tr>
<td>Direct LYL Involvement</td>
<td>• 36% of community educators directly participated in the ongoing LYL program in schools: Australian Museum; Camden EEC; Campbelltown City Council and Wollondilly Shire Council.*</td>
</tr>
<tr>
<td>Extra Dimensions &quot;Ripples&quot;</td>
<td>• 10 additional outcomes and impacts were created between the community educators and the schools networks (Diagram 2).</td>
</tr>
</tbody>
</table>

### The value of creating connections

All external community participants recognised the importance of networking and creating connections as a major benefit of seeking to participate in LYL.

Okay, well, when I was first contacted I was pretty keen to work with UWS. I was pretty keen to make a connection there and form a relationship so it was a welcome phone call. We were keen to be involved just from that perspective without hearing much of the detail of the project, but the project sounded like a good one. I thought it was well thought out; it was well explained.

(Principal, Camden Environmental Education Centre, NSW DEC)

The benefits for us were definitely exposure and creating connections – we did speak to other people doing displays. We have had the Councils interested in general in Streamwatch. I gave my card out but there was not a lot of follow-up there as yet. However, this reinforces connections.

(Outreach Manager, Australian Museum)

Sometimes you get short-term payoff from those things and sometimes it’s just a case of continuing to raise the profile. And I’ve seen it happen over the years that, well the project’s been running just by simply trying to have a presence and in about 5 years I stopped having to tell people who, where I was calling from.

(Project Officer, Westwords)

### Access to schools – the golden ticket is legitimacy and getting past the gatekeeper

Interestingly, all participants commented on the challenges of gaining access to schools, and it is evident that this is a key barrier to encouraging, creating and sustaining cross-sectoral collaborations.
Normally we just have the general contact for the school. Very rarely does the information get filtered down to the appropriate teachers. So I was finding it very difficult to get activities running with individual schools – and consequently to build an ongoing working relationship. (Environmental Education Officer, Wollondilly Shire Council Council)

I think because schools get bombarded by so many things, sending an email to the front office … it’s a one way road and a lot of the time it’s a dead end road. (Environment Officer, Campbelltown City Council)

I’ve been a teacher and I’ve worked in schools and sometimes you can’t get past the front office, the number. It really, it really varies enormously … Sometimes you ring up and they say, “Oh look, our Head Teacher English’s name is and I’ll just put you through”. And it’s astounding to me that they might actually be willing to do that and then you’ll say, “Could I check their personal email, their direct email address”. “Oh we don’t have that information” … and they genuinely don’t. I’ve spoken to Principals and Deputy Principals who’ve said, “I probably should have a list of those here in the Front Office” … In some respects, of course, many schools are right on top of technology and all of that and others are still obviously not. (Project Officer, Westwords)

A couple of years ago we just didn’t use email and when we asked a teacher for their email they would invariably give us .yahoo or something like that … It’s part of being a professional teacher to check your professional email and they just haven’t been doing it, but more recently they are. Principals do, that’s for sure, every day – but teachers, yeah, not so much. (Principal, Camden Environmental Education Centre, NSW DEC)

Another common discussion theme was how linkages and further collaborations were made once external community educators gained access into the school network. The oldest and simplest way of communication still appears to be the most effective: word of mouth and peer-to-peer endorsement:

My contact has been spread throughout the whole high school … So it’s good. So whenever they’re looking for environmental activities now, they give me a bell. (Environmental Education Officer, Wollondilly Shire Council)

The main thing was that the schools did go [to the Planning Day] then went back to their schools … and the word of mouth got around of that we were here, and I didn’t realise that they didn’t know that we were here! (Coordinator, Macarthur Centre for Sustainable Living)

**Direct LYL action**

I did note that the schools were quite autonomous and that they were very comfortable and sort of moving ahead and developing their ideas and what activities that they wanted to do. (Environmental Education Officer, Wollondilly Shire Council)
Outreach extension – Macarthur gains access to Museum in a Box

Museum in a Box is a national outreach program for educational institutions administrated by the Australian Museum. There are over 30 different boxes containing real museum specimens, casts, artefacts, dioramas, images, DVDs, CDs, books and resources. The Australian Museum reported that uptake on access to Museum in a Box resources was strong: Mt Annan High School accessed the free offers for both February and September (Birds and Freshwater), Camden Public School accessed the Birds box, and the Catchment box was also accessed.

We did get a lot of traction, and I offered them for free which is something we are more than happy to do. Again, it is great marketing for us and adds an extra element to programs that are already running, and we are more than happy to do that to component, and it added to LYL. (Outreach Manager, Australian Museum)

Figure 44: Museum in a Box session resources: Birds and Freshwater Catchments

Wetland management: Questions and actions

Campbelltown City Council was approached after the Planning Day by Campbelltown Performing Arts High School, initially to answer some questions the participating classes had about LYL and Park Central, a constructed wetlands in the centre of Campbelltown. The Environmental Education Officer became actively involved in supporting the school and discussing options for ongoing management of the wetlands.

I think it helps us to connect to the community a lot more if they feel like they can email us. I really wanted to put in a good response, so I was able to do a bit of research into Park Central, read the plan of management and just answer the questions. I said, “I’m happy to come out to the school and chat about it if you’d like”, and they said “yes”, and that’s when I learned about the Love Your Lagoons project which was really great. I was able to see all the different projects that the students were doing or wanted to do in Park Central and I guess it really inspired me to help them and get on board. (Environment Officer, Campbelltown City Council)

Hands-on learning by planting and walking the wetlands

Wollondilly Shire Council connected with Picton High School for two bush regeneration planting days at Redbank Creek including interpretive walks and talks. The Wollondilly Shire Council Environmental Education Officer also worked with Tahmoor Public School on the Bargo River, providing an overview of its history and Council management, and the importance of its wildlife corridors.
**Macarthur Sustainability Expo: LYL thematic**
Camden Environmental Education Centre hosted the LYL Celebration Day on 12 September 2014 as part of their regional Sustainability Expo with Macarthur Schools. This is an annual event supported financially by the three local Councils and has been part of the regional schools environment and sustainability calendar for ten years. The incorporation of LYL into the 2014 event introduced ‘something new’ into the Expo, and also extended the reach of the program to other schools in the region.

**The extra dimensions of LYL: Ripples and splashes across the region**
An array of additional impacts occurred as a result of the LYL program that can loosely be grouped into three categories: events and network extensions, projects, and ongoing programs.

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**A two-way learning exchange?**
The feedback from community participants regarding their personal learning experiences with the program via observing the students involvement provided an insight into the value of the program as a two-way learning exchange. As this was very much a broad sustainability learning program based on an inquiry learning framework, the scope of responses developed by participating students was extremely varied across a range of media and disciplines. This breadth was commented upon by the external educators and is an area for further exploration and research.

I think the great thing that the teachers did out there was actually really use a lot of different methods to engage the children, not just writing [or] doing an assignment but that practical thing of – I think one child wrote a rap song about the lagoon! And a lot of filming, going out there and filming and making videos and making websites about it and all that sort of different level of engagement, and I think really … doing a dance, an interpretive dance. (Environmental Officer, Campbelltown City Council)
Lessons learnt about creating and sustaining school – community connections

The importance of external funding to support such a large regional agenda should not be underestimated. The resources - both in-kind and financial and time needed to deliver this program was significant however the investment has yielded a rich diversity of action and learning outcomes that would not have been possible across three LGAs and the schools and partners involved. Consequently the LYL program has provided many useful insights into how to create and sustain school - community connections. There are four main groupings to these:

1. **Provide legitimate access and focused intent**
   It has been noted that a major barrier to creating school – community collaborations in the LYL experience has been the difficulty for external educators in gaining access to the school via the gatekeepers at the front office. If there are no pre-existing relationships with the school to network through this was reported to be a difficult challenge. Due to its regional spread and the level of funding support the LYL program was able to negotiate this access for external educators firstly by the UWS research team undertaking the ‘cold doorknocking’ in approaching schools for participation in LYL and secondly by the ‘bringing together’ of these schools at the LYL Planning Day. The delivery of a successful Planning Day as a method to introduce potential partners and identify opportunities was a vital milestone in brokering legitimate access with focussed intent for external educators. LYL was a clearly a systemic means to provide opportunity and access and for this to take place as evidenced by the variety of rich outcomes that have emerged.

2. **Nurture as opposed to “owning” learning and action linked to curriculum**
   The intent of the LYL was to link school networks and external educators in a collaborative, curriculum based learning and action framework for local wetland health. The non-didactic approach meant that there was room for the schools and external partners to mutually explore synergetic agendas on the understanding that school learning and action had to be embedded within the curriculum. It must be noted that the way in which action and collaboration unfolded after the Planning Day was entirely at the behest of the school networks and external educators and that this was a deliberate methodology to ensure ‘ownership’ of the projects were with the collaborators not the research team. The results demonstrate how effective this can be when linked to the school curriculum instead of an ‘add-on’ extra curricula activity and when relationships are nurtured and supported both in kind and financially by a large regional agenda.

3. **Quality engagement counts as teachers are the best source of referrals**
   Another lesson about creating strong networks seems highly dependent on the individual quality of engagement and delivery. LYL analysis has demonstrated that teachers talk and that word of mouth is still the most effective way to promote activities and organisations within the school networks. One of the most interesting examples of this is the case of Macarthur Centre for Sustainable Living. The centre reported no ongoing activity or engagement with LYL however a range of new and exciting collaborations were created by simply providing access, word of mouth and quality delivery with repeat performance. This implies the importance of quality screening and selection for future work.

4. **Sustaining learning and action by linking and leveraging**
   The plethora of existing programs available and the various ways which these have been accessed implies that there are ample opportunities for schools to access support and networks to sustain their activities and work. The following programs and networks have been linked to the Macarthur LYL schools and external educators: Museum2you and Museum in a Box; Adopt and Environment; Youth Leading the World; VET Primary Industries Placements and
the RCE-GWS network. The extent to which these program and opportunities are accessed however is firstly due to the individual participant knowledge of these opportunities and then ability and desire to access and act in a collaborative manner.

Figure 46: Scaffolding and Sustaining Action – A case study in Wollondilly LGA

Conclusion
The experience of each community partner of how and on what basis (if any) they connected to schools in the Macarthur LGA was very different. Several common themes emerged, however, a key theme being the legitimacy barrier, and the importance of a legitimised introduction process to broker entry into the school system. Once the ‘golden ticket’ was granted to external community educators, they created their own opportunities and outcomes depending on resources, time and agendas. The impacts varied for each partner, but all welcomed the opportunity to participate in the LYL program and well understood and valued the importance of creating networks and connections as a first step in laying the foundations for future and ongoing collaborations. The unexpected but welcome ‘ripples’ and ‘splashes’ have added a rich diversity to the LYL program successes. It should be recognised that supporting and nurturing community and school educators via the LYL process has enabled participants to develop and own their collaborations, and that this is foundational to creating and sustaining real and meaningful school–community connections.
OVERALL PROJECT FINDINGS

Recruitment
Recruitment of participants in this project was initially challenging due to the pressures on schools and the responsibility of office staff to protect the time of Principals and teachers. Once connections were made with Principals or Deputy Principals, however, the project was overwhelmed with schools wishing to participate, and several schools were turned away. The challenge of managing the numbers came to a head for planning day, because it was limited to a total of 340 participants (the amount who could fit into the large university auditorium). An overflow measure was put in place, with an onsite planning day repeated at Macarthur Anglican School. The reason for the positive response was that teachers were keen to access the professional learning associated with the focus on the cross-curriculum priority of Sustainability introduced in the Australian Curriculum in 2014. Recruitment of community-based organisations had its own complexities, including the very different briefs of the organisations (from sustainable living to community arts, and from NGOs to government instrumentalities). None of the local Councils wished to participate initially due to their issues with coal seam gas.

Planning day
Planning day was highly successful, with all students and teachers participating in experiential learning, information sessions and a community partner workshop relevant to their potential planning. Students and their teachers experienced inquiry-based learning in practice at the campus lagoons. One of the unexpected outcomes of planning day was the excitement and significance for the students of visiting the university campus. Two primary schools dropped out after planning day, one because the children were disappointed in some misinformation about their choice of wetland, the other because the teachers thought it was beyond their capacity. Seven schools remained in the project with a total of three primary schools and four secondary schools including Macarthur Anglican College representing both junior and senior schools. Six of the remaining schools participated fully until the end of the project; in the seventh, the junior science teacher was unable to gain traction among other teachers in the school.

Professional learning days
The first professional learning event for teachers was the planning day, but on this day the teachers were so preoccupied with looking after their students that their learning was more to do with observing students. The second and third professional learning days successfully inducted teachers into the methods of the project through hands-on experiential learning in a highly sympathetic environment of the Bowden Educational Centre at the Australian Botanic Garden Mount Annan. The venue and catering were much appreciated by teachers, as was the opportunity to learn new processes of teaching and research. Teachers benefited by taking part in a group sharing their interest, enthusiasm and approaches to the project. The third and final professional learning day was a highlight because the teachers were very much engaged in the project by this time, and were able to assist with the analysis of project data. We focused on data produced by students and the teacher was able to inform the development of the case studies. The aim of producing case studies was to involve the schools in the final reporting of the project. A small number of the teachers were unable to attend all three days due to long service leave, illness, job changes or other commitments, and the timing of the professional learning days and expected activities in the project was crucial in the busy schedules of schools.
School participation in wetlands integration
Each of the schools took up the opportunities offered in *Love Your Lagoons* in entirely different ways, offering a broad spectrum of possibilities for integrating sustainability into the school curriculum. Camden Primary School included two Year 5/6 classes with a very fixed two-year cycle of curricula, which made it difficult for them to find enough flexibility to fully engage in the project. Their students, however, produced the most extraordinary series of black and white pencil drawings of ducks, analysed in the case study as a real testament to student learning. Tahmoor Public School, on the other hand, were able to fully embrace the challenges of incorporating inquiry learning in relation to the Bargo River, and produced spectacular results with a gifted and talented Year 5/6 class and an enrichment stream Year 3/4 class. The process was especially challenging for the senior teacher at Tahmoor, however, who said he experienced a major and initially very disorienting transformation of his teaching that he believed would be permanent. A master teacher at the junior school at Macarthur Anglican College introduced the project to Year 2 children in a very intense one-day experience in which they experienced all subject areas and performed at a very high level. Although they only devoted one day to the actual wetlands curriculum, the children remained involved in planting trees at their wetland and other units of study were linked to this work.

Macarthur Anglican Senior School was led by a new teacher who gained enthusiastic support from a group of senior students to engage with the wetlands outside of their normal class time. Their project was transformative for some of these students, leading to a change in the numbers of students studying Earth Sciences to such an extent that it became possible to offer it as a full curriculum subject. Picton High School allocated the wetlands experience to the Physical Education curriculum, and students were offered a choice of ‘Regeneration’ as a weekly sporting option. This strategy, interestingly, as well as attracting those who were not interested in conventional competitive sports, served support unit students who were usually excluded or unable to participate in sport. The Picton program achieved significant gains in the integration of mainstream and support unit students and generated outstanding arts-based outcomes. Mt Annan High School adapted *Love Your Lagoons* for their four Year 7 Science classes under the leadership of an enthusiastic head teacher. Each of the four classes took up the opportunity completely differently, integrating a range of arts-based, practical and experiential approaches into the learning of science. Finally, Campbelltown Performing Arts High School integrated the wetlands program into their Year 9 Maths and English classes, drawing on the high level expertise of teachers who were highly experienced in inquiry based learning. The necessity for students to address an authentic audience provided an opportunity to engage directly with the local Council and for the young people to have the excitement of some of their ideas being taken up to further develop the Park Central wetlands into an improved public amenity.

Developing school–community partnerships
Fostering relationships between community partners and schools was perhaps the most challenging aspect of the project as each has their own cultural practices and processes of engagement. The fact that all schools were introduced to community partners led to unexpected links and outcomes. The most productive relationships, however, and perhaps the most surprising, were those with local Councils who were initially opposed to the project because of its notional connection to coal seam gas. The Sustainability Education Officers from all three local Councils developed relationships with the schools about their engagement with local wetlands. In particular, the final celebration of *Love Your Lagoons* outcomes, integrated into the Macarthur Sustainability Expo, forged ongoing relations between the Councils and the schools. The involvement of *Love Your Lagoons* schools was welcomed and provided an excellent opportunity for the students to share what they had learned with their peers from schools throughout the region.
CONCLUSIONS AND RECOMMENDATIONS

The innovative project design of connecting schools with a local wetland within walking distance and requiring them to engage with that wetland was fundamental to the success of the project.

The very wide range of ways that schools engaged with their local wetlands in relation to where it was positioned in subject areas and grade levels extends the possibilities for achieving place-based sustainability in ways not previously considered.

Including projects such as these in school planning during the year previous to the project is desirable because it enhances schools’ capacity to engage. However, experienced teachers and innovative schools do find ways to incorporate new learning experiences for their students.

The integration of wetlands into the curriculum is a process that takes time and resources and it is important to recognise and accept that each school and teacher is at a different beginning point in their ability to integrate their local wetlands into their school curriculum. The diversity of the implementation and outcomes at each site is a testament to their commitment to the project.

The level of funding and resources in this project was critical to its success, especially in supporting teachers’ release from regular duties to enable their participation in professional learning and collaborative research.

Forming partnerships between schools and community-based organisations is one way to leverage resources for both partners, but there are significant barriers to overcome in cultural differences and time pressures in schools.

All of the schools in this study expressed a wish to continue with this project and felt that they had only just begun to scratch the surface of its possibilities; other schools both within this region and beyond have expressed a wish to join the project, and further funding is being sought to extend this valuable work.
LIST OF REFERENCES


APPENDIX ONE:
Human Research Ethics Committee – Project Approval

Locked Bag 1797
Penrith NSW 2751 Australia
Office of Research Services
ORS Reference: H10412 13/017628

University of
Western Sydney

HUMAN RESEARCH ETHICS COMMITTEE

13 June 2014

Professor Margaret Somerville

Dear Margaret,

I wish to formally advise you that the Human Research Ethics Committee has approved your research proposal H10412 "Love Your Lagoons: Place based learning and environmental action in South Western Sydney", until 31 December 2014 with the provision of a progress report annually if over 12 months and a final report on completion.

Conditions of Approval

1. A progress report will be due annually on the anniversary of your approval date.

2. A final report will be due at the expiration of your approval period as detailed in the approval letter.

3. Any amendments to the project must be approved by the Human Research Ethics Committee prior to the project continuing. Amendments must be requested using the HREC Amendment Request Form: http://www.uws.edu.au/...data/assets/pdf_file/0018/491130/HREC_Amendment_Request_Form.pdf

4. Any serious or unexpected adverse events on participants must be reported to the Human Ethics Committee as a matter of priority.

5. Any unforeseen events that might affect continued ethical acceptability of the project should also be reported to the Committee as a matter of priority.

6. Consent forms are to be retained within the archives of the School or Research Institute and made available to the Committee upon request.

Please quote the registration number and title as indicated above in the subject line on all future correspondence related to this project. All correspondence should be sent to the email address humanethics@uws.edu.au.

This protocol covers the following researchers:
Margaret Somerville, Yvonne Gatt, Jen Dollin, Tonia Gray, Carol Birrell

Yours sincerely,

[Signature]

Professor Elizabeth Deane
Presiding Member,
Human Researcher Ethics Committee
APPENDIX TWO:
State Education Research Applications Process (SERAP) – Project Approval

Professor Margaret Somerville
Director, Centre for Educational Research
School of Education
University of Western Sydney
Locked Bag 1797
PENRITH SOUTH DC NSW 2751

Dear Professor Somerville

I refer to your application to conduct a research project in NSW government schools entitled *Love Your Lagoons: Place based learning and environmental action in south-western Sydney*. I am pleased to inform you that your application has been approved. You may contact principals of the nominated schools to seek their participation. You should include a copy of this letter with the documents you send to schools.

This approval will remain valid until 31 December 2014.

The following researchers or research assistants have fulfilled the Working with Children screening requirements to interact with or observe children for the purposes of this research for the period indicated:

<table>
<thead>
<tr>
<th>Name</th>
<th>Approval expires</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kerith Power</td>
<td>17/10/2014</td>
</tr>
<tr>
<td>Tonia Gray</td>
<td>17/10/2014</td>
</tr>
</tbody>
</table>

I draw your attention to the following requirements for all researchers in NSW government schools:

- School principals have the right to withdraw the school from the study at any time. The approval of the principal for the specific method of gathering information must also be sought.
- The privacy of the school and the students is to be protected.
- The participation of teachers and students must be voluntary and must be at the school’s convenience.
- Any proposal to publish the outcomes of the study should be discussed with the research approvals officer before publication proceeds.

When your study is completed please forward your report to: Manager, Quality Assurance/Research, Department of Education and Communities, Locked Bag 53, Darlington, NSW 1300.

You may also be asked to present on the findings of your research.

I wish you every success with your research.

Yours sincerely

Dr Susan Harriman
Leader, Quality Assurance
10 December 2013

Policy, Planning and Reporting Directorate
NSW Department of Education and Communities
Level 1, 1 Oxford Street, Darlington NSW 2010 – Locked Bag 53, Darlington NSW 1300
Telephone: 02 9644 5000 – Email: pedbo@det.nsw.edu.au
## LOVE YOUR LAGOONS MILESTONE REPORT

### DRAFT PROJECT PLAN August – December 2013

<table>
<thead>
<tr>
<th>Milestones</th>
<th>Milestone and task name</th>
<th>Date (finish)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milestone 1</td>
<td>Project establishment: Recruitment of personnel, schools and sites</td>
<td>Sept–Dec 2013</td>
</tr>
<tr>
<td>Task 1.1</td>
<td>Recruit UWS research team</td>
<td>September 2013</td>
</tr>
<tr>
<td>Task 1.2</td>
<td>Develop Local Govt partnerships, identify key people and select wetland sites</td>
<td>September 2013</td>
</tr>
<tr>
<td>Task 1.3</td>
<td>Obtain UWS and DEC ethics clearances</td>
<td>October 2013</td>
</tr>
<tr>
<td>Task 1.4</td>
<td>Identify participant schools, teachers and classes, introduce project</td>
<td>November 2013</td>
</tr>
<tr>
<td>Task 1.5</td>
<td>Meet with school and community educators and develop conference workshops</td>
<td>Nov–Dec 2013</td>
</tr>
</tbody>
</table>

### Task 1.1
A five member project team has been established including two community partnership researchers: Ms Jen Dollin and Ms Yvonne Gatt; and three school based researchers: Associate Professor Tonia Gray, Dr Carol Birrell and Dr Kerith Power (Project Officer). Professor Margaret Somerville will provide overall project leadership and co-ordination.

### Task 1.2
Fieldwork was conducted on 27, 28 and 29 August to meet with community partners and to identity possible wetlands sites within walking distance of local schools.

Shire Councils: Meetings were held with Camden, Campbelltown and Wollondilly Shire Councils.

Community partners: Meetings were held with the following community and government organisations, all of whom were all keen to be involved:

- UWS Campbelltown Campus, Assess rooms for Planning Conference
- Australian Botanical Gardens, Mt Annan, educators and community liaison
- Macarthur Centre for Sustainable Living
- Belgenny Farm Environmental Education Centre
- Camden Park Environmental Education Centre
- Aunty Fran Bodkin, D’harawul Elder, UWS Campbelltown
- Wollondilly City Council, Community nursery
Wetlands were assessed as possible sites for connecting with schools within walking distance:

- The Oaks – Werri Berri Creek
- Cowpasture Road Reserve, Camden
- Camden Town Farm Lagoon
- Stonequarry Creek
- Urban Creeks, Picton
- Creek at Macarthur Sustainable Living Centre

AGL Steering Committee: Meeting was held with AGL to confirm project initiation.

**Task 1.3**
Comprehensive ethics documentation was prepared for the UWS Human Research Ethics Committee and for the Department of Education and Communities ethics committee. This included: completion of online forms for assessment; completion of draft of letter to Principals; information sheets for Principals, teachers and community participants; consent forms for Principals, teachers and community participants; completion of Working with Children checks for researchers Gray, Birrell and Power; submission of all documents for assessment; and completion of all amendments.

These documents are located at Appendix 1 (UWS HREC) and Appendix 2 (DEC SERAP). The project has received approval from the UWS HREC (see letter attached at Appendix 3), and approval from DEC SERAP (see letter attached at Appendix 4).

**Task 1.4**
Initial contact has been made with schools by phone, emails and face to face meetings. The following schools will participate in the project:

- Campbelltown School of Performing Arts
- Camden Primary School
- Camden High School
- Macarthur Anglican School (4 classes: 2 primary and 2 HS)
- Mount Annan High School
- Mt Annan Primary School
- The Oaks Public School
- Elizabeth Macarthur High School
- Picton High School
- St Anthony’s School Picton

**Task 1.5**
Meetings have been held with community educators to develop a draft program (attached at Appendix 5. Further meetings will be held on Monday 16 December.

Margaret Somerville
Professor of Education
Director Centre for Educational Research
University of Western Sydney
LOVE YOUR LAGOONS MILESTONE REPORT

DRAFT PROJECT PLAN January - February 2014

<table>
<thead>
<tr>
<th>Milestone 2</th>
<th>Love Your Lagoon Conference and Planning Day – UWS Campbelltown</th>
<th>Jan-Feb 2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task 2.1</td>
<td>Plan conference and professional development workshops</td>
<td>Jan-Feb 2014</td>
</tr>
<tr>
<td>Task 2.2</td>
<td>Conduct conference and workshops, plan school projects</td>
<td>20-25 February 2014</td>
</tr>
<tr>
<td>Task 2.3</td>
<td>Conduct teacher professional development workshops</td>
<td>20-25 February 2014</td>
</tr>
<tr>
<td>Task 2.4</td>
<td>Schedule wetlands activities</td>
<td>February 2014</td>
</tr>
</tbody>
</table>

Task 2.1: Plan conference and professional development workshops
The following community educator partners were contacted, developed and delivered conference workshops at the project planning day on Tuesday 18 February:

D’harawal Elder Aunty Fran Bodkin; Australian Museum: Karen Player, Manager Museum Outreach; Bundanon Trust: Mary Preece, Education Manager; Camden Park Environmental Education Centre: Brian Trench, Principal and Nathan Mathews, Teacher; Eaton Gorge Theatre Company; Macarthur Centre for Sustainable Living: Helen Byfield-Fleming, Centre Coordinator; SWSi TAFE: Wendy Hird, Leader, Environmental Sustainability and Dianne Werden, Head Teacher in Environmental Technology; The Red Room Company: Dr Tamryn Bennett, Education Manager; University of Western Sydney: Murray Austin, Technical Officer; Wollondilly Shire Council: Damion Stirling, Community Nursery Co-ordinator/Environmental Education Officer

Those attending but not presenting included:
Camden Council: Denise Franovich; Westwords: Judith Ridge, Project Officer, Western Sydney Young People’s Literature Development Project; Wooglemai Environmental Education Centre: Peter Nicoll, Principal and Frank Calabria, Teacher

Apologies were received from:
Campbelltown City Council: David Henry, Senior Environmental Officer (Environment Protection and Management); Cumberland Bird Observers Club/Illawarra Bird Club/BirdLife Australia: Holly Parsons, Birds in Backyards Program Manager; Local Land Services: Vanessa Keyzer, Regional Landcare Facilitator

Task 2.2 Conduct conference and workshops, plan school projects
The project Planning Day took place at Campbelltown campus on Tuesday 18 February 2014, attended by 320 children, 20 teachers, 5 researchers, 2 UWS research administration staff and 12 community partner organisations.
Task 2.3 Conduct teacher professional development workshops
The Planning Day was designed as a full day professional development workshop for teachers with their students. Teachers from the following schools participated:
- Mt Annan, Camden, Picton, Macarthur Anglican, and Campbelltown Performing Arts High Schools; and Macarthur Anglican, Camden, Mt Annan, St Anthony’s, and Tahmoor Primary Schools

Task 2.4 Schedule wetlands activities
Researchers have been allocated to each of the participating schools and will be working with them in their scheduled wetlands activities. The following activities are scheduled:
(a) Experiential professional learning for teachers in *Love Your Lagoons* scheduled for 14 March at the Bowden Centre, Australian Botanic Garden Mount Annan
(b) Schools have scheduled visits to their local wetlands on 13, 14 and 21 February, and 4, 7, 11, 12 and 21 March

Margaret Somerville
Professor of Education, Director Centre for Educational Research
University of Western Sydney
APPENDIX FIVE:
Love Your Lagoons Milestone Report – March–August 2014

LOVE YOUR LAGOONS MILESTONE REPORT
March–August 2014

Summary
This report covers the implementation of the Love Your Lagoons project in schools from the beginning of March to the end of August 2014. The project has been successfully implemented in 7 schools. Many connections were made with community agencies, including both those we originally identified and more. Some schools have made direct and productive relationships with local councils in relation to their Love Your Lagoons project work. The project has been acclaimed both in Australia and overseas. The project leader joined the committee for the organisation of the Macarthur Sustainability Expo, which includes representatives of each of the local shire Councils and local schools. Love Your Lagoons schools will present at the Macarthur Sustainability Expo to other schools from the region.

Activities
Researcher visits to wetlands and schools
Each school was allocated a lead researcher to support them in the implementation of their wetlands projects. The researchers visited the schools to participate in their wetlands activities and to observe the integration of wetlands into the school curriculum. Data was collected during these visits; these are itemised in Table 1. The data from all 7 schools were complied and collated in a Dropbox for sharing with researchers and schools in preparation for a collaborative analysis activity.

Lead researcher schools visits
The lead researcher visited all schools in the final two weeks of July, visiting classrooms, documenting student activity and interviewing each teacher. These interviews included qualitative questions about the schools’ intentions to conduct ongoing wetlands education and curriculum development, which will be analysed and integrated into the final report as one of the outcomes of the project.

Community partners
Community partner interviews have been scheduled by researcher Ms Jen Dollin from UWS Hawkesbury Discovery Centre. Interviews will be completed by October and reported on in December in relation to Task 4.3.

Collaborative analysis day
Teachers from each participating school attended a professional learning day on Friday 29 August.
- Data from each school were analysed in depth
- Chapter outlines were developed for a case study of LYL at each school
- Final preparations took place for each school’s contribution to the Macarthur Sustainable Schools Expo to be held on 10 September 2014.

The following Tables address the specific activities in relation to Tasks 3.1, 3.2 and 3.3 of the Milestone Report.
MILESTONE 3: PROJECT DELIVERY: WETLANDS ON-SITE EDUCATION – Overview

<table>
<thead>
<tr>
<th>Milestone 3</th>
<th>Project delivery: Wetlands on-site education</th>
<th>March-August 2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task 3.1</td>
<td>Implement and document on-site wetlands education activities</td>
<td>March-August 2014</td>
</tr>
<tr>
<td>Task 3.2</td>
<td>Integrate wetlands activities into school curriculum</td>
<td>March-August 2014</td>
</tr>
<tr>
<td>Task 3.3</td>
<td>Record ongoing school based wetlands education and curriculum development</td>
<td>March-August 2014</td>
</tr>
</tbody>
</table>

TASK 3.1: Implementation and Document on-site wetlands education activities

Table 1: School and wetlands visits, documentation

<table>
<thead>
<tr>
<th>School</th>
<th>Allocated researcher</th>
<th>Wetlands visits</th>
<th>Focus of education</th>
<th>Documentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Campbelltown Performing Arts High School</td>
<td>Dr Susanne Gannon</td>
<td>Campbelltown</td>
<td>Year 9 Maths and English</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Visited 8/7, 7/8</td>
<td>Park central</td>
<td>Maths and English</td>
<td>Field notes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>wetland</td>
<td></td>
<td>Site photographs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4/3, 11/4, 8/7</td>
<td></td>
<td>Students work samples</td>
</tr>
<tr>
<td>Tahmoor Public School</td>
<td>Dr Kerith Power</td>
<td>Bargo River</td>
<td>Years 5/6 Science</td>
<td>Field notes</td>
</tr>
<tr>
<td></td>
<td>Visited 31/3,</td>
<td>31/3, 14/4</td>
<td>and Humanities,</td>
<td>Site photographs</td>
</tr>
<tr>
<td></td>
<td>14/4</td>
<td></td>
<td>the process of</td>
<td>Students work samples</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>enquiry</td>
<td>Teacher and student interviews</td>
</tr>
<tr>
<td>Camden Public School</td>
<td>Dr Carol Birrell,</td>
<td>Nepean River</td>
<td>Years 4, 5, 6</td>
<td>Field notes</td>
</tr>
<tr>
<td></td>
<td>Prof. Margaret</td>
<td>Walk 2/4, 21/</td>
<td>Wetlands birds,</td>
<td>Site photographs</td>
</tr>
<tr>
<td></td>
<td>Somerville Visited</td>
<td></td>
<td>dance</td>
<td>Students work samples</td>
</tr>
<tr>
<td></td>
<td>2/4, 21/</td>
<td></td>
<td></td>
<td>Teacher and student interviews</td>
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<tr>
<td>Macarthur Anglican School</td>
<td>Assoc. Prof. Tonia</td>
<td>School dam</td>
<td>‘Enviro Club’</td>
<td>Site photographs</td>
</tr>
<tr>
<td></td>
<td>Gray (sec); Dr Carol</td>
<td>(Cobbity Ck</td>
<td>Years 2 and 11</td>
<td>Students work samples</td>
</tr>
<tr>
<td></td>
<td>Birrell (prim)</td>
<td>wetland)</td>
<td>Science, art/drama,</td>
<td>Teacher and student interviews</td>
</tr>
<tr>
<td></td>
<td>Visited 26/3, 3/6</td>
<td>3/6, 16/7, 25/7</td>
<td>regeneration</td>
<td></td>
</tr>
<tr>
<td>Mt Annan High School</td>
<td>Assoc. Prof. Tonia</td>
<td>Lake Annan</td>
<td>Year 7 Science:</td>
<td>Site photographs</td>
</tr>
<tr>
<td></td>
<td>Gray Visited 26/6,</td>
<td>26/2, 21/3, 27/3,</td>
<td>ecology, design</td>
<td>Students work samples</td>
</tr>
<tr>
<td></td>
<td>14/7, 27/3, 14/7</td>
<td></td>
<td></td>
<td>Teacher and student interviews</td>
</tr>
<tr>
<td>Picton High School</td>
<td>Assoc. Prof. Tonia</td>
<td>Redbank Creek</td>
<td>Phys Ed: Walk and</td>
<td>Site photographs</td>
</tr>
<tr>
<td></td>
<td>Gray, Dr Carol</td>
<td>26/3, 28/4, 28/5</td>
<td>regeneration</td>
<td>Students work samples</td>
</tr>
<tr>
<td></td>
<td>Birrell, Prof.</td>
<td></td>
<td>Across year levels</td>
<td>Teacher and student interviews</td>
</tr>
<tr>
<td></td>
<td>Margaret Somerville</td>
<td></td>
<td>with integration</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Visited 28/5, 30/7</td>
<td></td>
<td>of special needs</td>
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<td></td>
<td></td>
<td></td>
<td>and mainstream</td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>students</td>
<td></td>
</tr>
</tbody>
</table>

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### TASK 3.2: Integrate Wetlands Activity into School Curriculum

Table 2: Summary of data catalogued in Dropbox available for analysis

<table>
<thead>
<tr>
<th>Format of data</th>
<th>Type of data</th>
<th>Number of samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Photos of sites and fieldwork</td>
<td>Site photographs</td>
<td>134</td>
</tr>
<tr>
<td></td>
<td>Non-identifiable photos of fieldwork</td>
<td>101</td>
</tr>
<tr>
<td>Video clips</td>
<td></td>
<td>123</td>
</tr>
<tr>
<td>Student work samples</td>
<td>Drawings and paintings</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Student photographs</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td>3-D models and constructions</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Poems on rocks</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Student group website</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Student worksheets, concept maps</td>
<td>12</td>
</tr>
<tr>
<td>Transcripts of focus groups and interviews</td>
<td>With teachers</td>
<td>34</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>Teachers’ programming material</td>
<td></td>
<td>6</td>
</tr>
</tbody>
</table>
**Table 3: Collaborative analysis professional learning day with teachers and researchers**

<table>
<thead>
<tr>
<th>School</th>
<th>Allocated researcher</th>
<th>Wetlands visits</th>
<th>Focus of case study</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Campbelltown Performing Arts High School</td>
<td>Dr Susanne Gannon</td>
<td>Campbelltown Park central wetland</td>
<td>Interdisciplinary integrated Maths and English Yr 9 through inquiry learning political engagement in urban wetland</td>
<td>Field notes, Site photographs, Students’ work samples, Teacher and student interviews</td>
</tr>
<tr>
<td>Tahmoor Public School</td>
<td>Dr Kerith Power</td>
<td>Bargo River</td>
<td>Process of student inquiry re Bargo River leads to extraordinary outcomes in Yr 4/5, 5/6 Gifted and Talented classes</td>
<td>Field notes, Site photographs, Students’ work samples, Teacher and student interviews</td>
</tr>
<tr>
<td>Camden Public School</td>
<td>Ms Lin Brown</td>
<td>Camden Town Wetlands</td>
<td>Intense focus on birds with 55 Yr 5/6 students yields series of detailed drawings, dance and science outcomes</td>
<td>Field notes, Site photographs, Students’ work samples, Teacher and student interviews</td>
</tr>
<tr>
<td>Macarthur Anglican Senior School</td>
<td>Ms Mary Preece</td>
<td>School dam/wetlands</td>
<td>Senior years ‘Enviro Club’ regenerates local dam/wetland with science, art and action</td>
<td>Site photographs, Students’ work samples, Teacher and student interviews</td>
</tr>
<tr>
<td>Macarthur Anglican Junior School</td>
<td>Associate Professor Tonia Gray</td>
<td>School dam/wetlands</td>
<td>Integrated wetlands curriculum for Yr 2 developed including literature, dance, science, technology and visual arts</td>
<td>Site photographs, Students’ work samples, Teacher and student interviews</td>
</tr>
<tr>
<td>Mt Annan High School</td>
<td>Dr Carol Birrell</td>
<td>Lake Annan</td>
<td>Integrated science activities across Yr 7 incorporating photography, 3-D models, seed collection and water testing</td>
<td>Site photographs, Students’ work samples, Teacher and student interviews</td>
</tr>
<tr>
<td>Picton High School</td>
<td>Professor Margaret Somerville</td>
<td>Redbank Creek</td>
<td>Integrated mainstream and special needs students in weekly wetlands walk</td>
<td>Site photographs, Students’ work samples, Teacher and student interviews</td>
</tr>
</tbody>
</table>

Margaret Somerville  
Professor of Education, Director Centre for Educational Research  
University of Western Sydney