

RIVERINE ENVIRONMENTS: PROCESSES, CHANGE and MANAGEMENT Part 2



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GTANSW
Annual Conference
2017

<https://www.usgs.gov/media/video/s/effects-urbanization-stream-ecosystems-extended-part-i-introduction>

RESOURCES

to study riverine environmental change

PHOTOGRAPHS

INFOGRAPHICS

MAPS

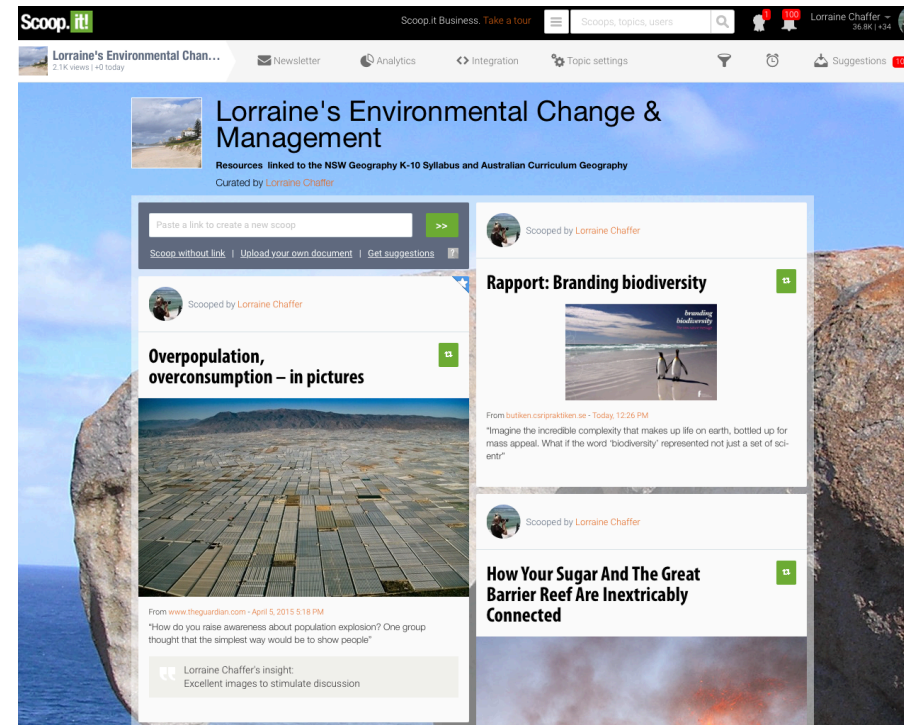
GRAPHS & STATISTICS

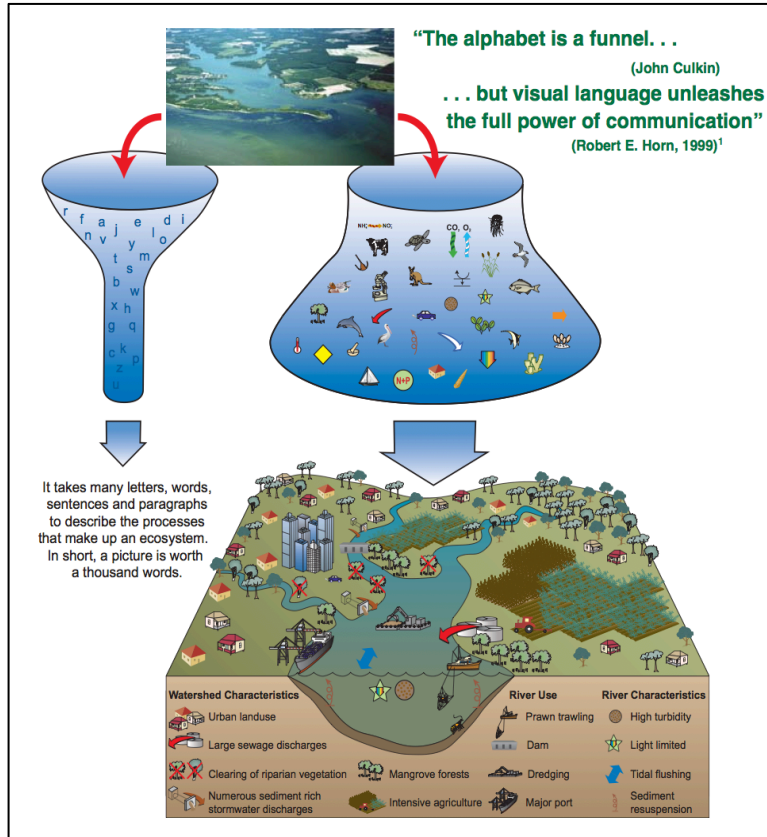
CONCEPTUAL DIAGRAMS – see examples

LORRAINE'S SCOOP.IT WEB- CURATION PAGE
Environmental Change (Media reports)

Apps - Run the River

ICT / Spatial technologies





Conceptual diagrams

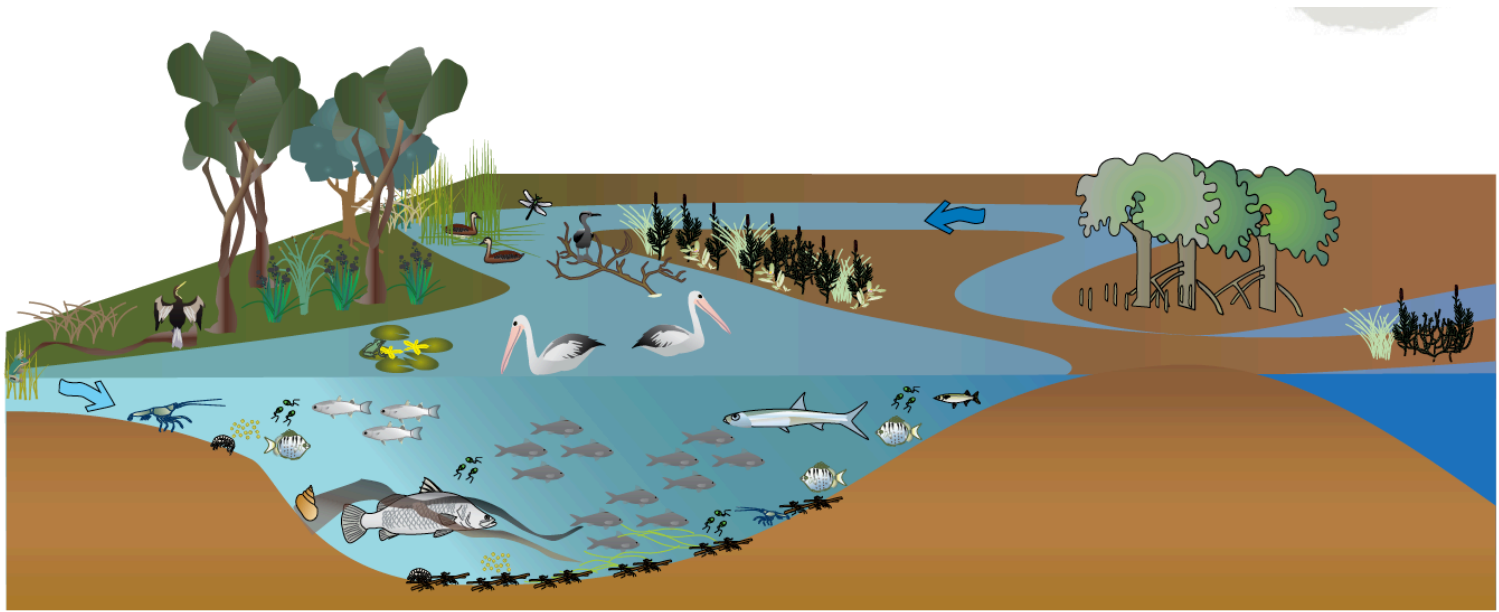
A picture paints a thousand words.

Thought drawings – use symbols to convey ecological information

Environmental change
&
Management

Examine & analyse
aquatic environmental
change

“Conceptual diagrams: Tools for science communication”
[http://ian.umces.edu/press/newsletters/publication/4/conceptual diagrams tools for science communication 2003-08-01/](http://ian.umces.edu/press/newsletters/publication/4/conceptual-diagrams-tools-for-science-communication-2003-08-01/)



- | | | | | | | | | | | | | | | | | |
|---------------------------|------------------|-------|----------------|---------------|-------|----------|--|------------|--------|------------------|----------------------------------|------------|---------------|--------|---------|------------|
| Diverse primary producers | | | | Invertebrates | | | Fresh and saltwater detritus-eating fish | | | | Predator species: fish and birds | | | | | |
| | | | | | | | | | | | | | | | | |
| Poolside plants | Saltmarsh plants | Algae | Aquatic plants | Detritus | Prawn | Amphipod | Snail | Bony bream | Mullet | Spot-banded scat | Garfish | Barramundi | Giant herring | Darter | Pelican | Cormorants |

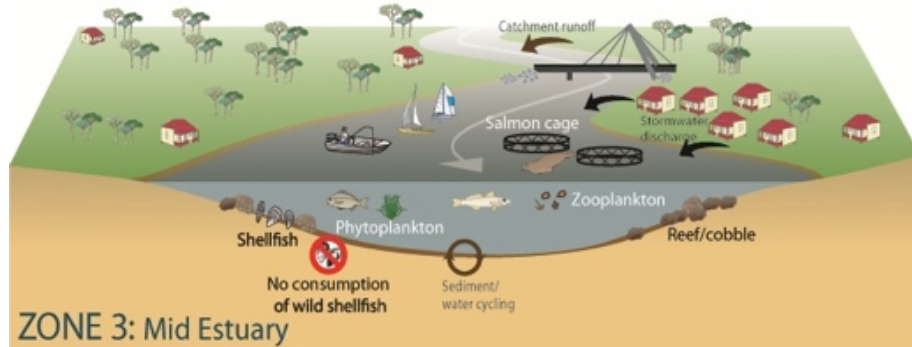
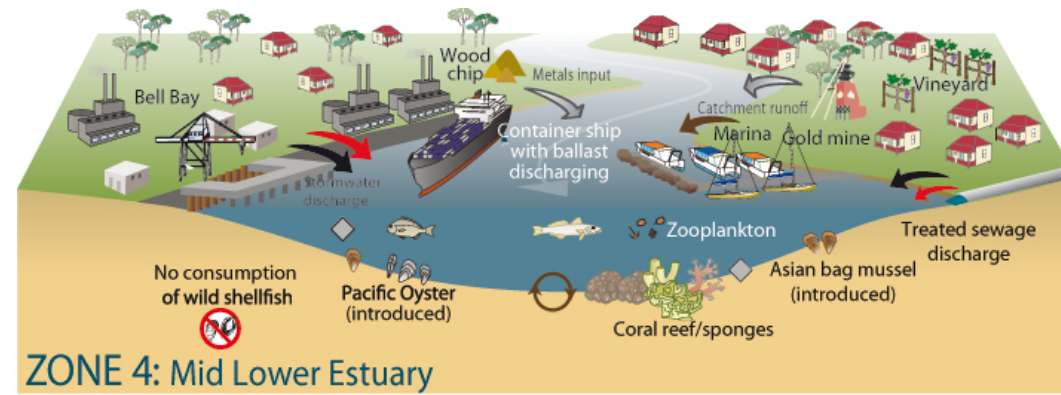
Fitzroy floodplain wetlands—high connection brackish pool

Understanding riverine environments and processes





Conceptual models of the Tamar Estuary
<http://www.nrmnorth.org.au/conceptual-models>

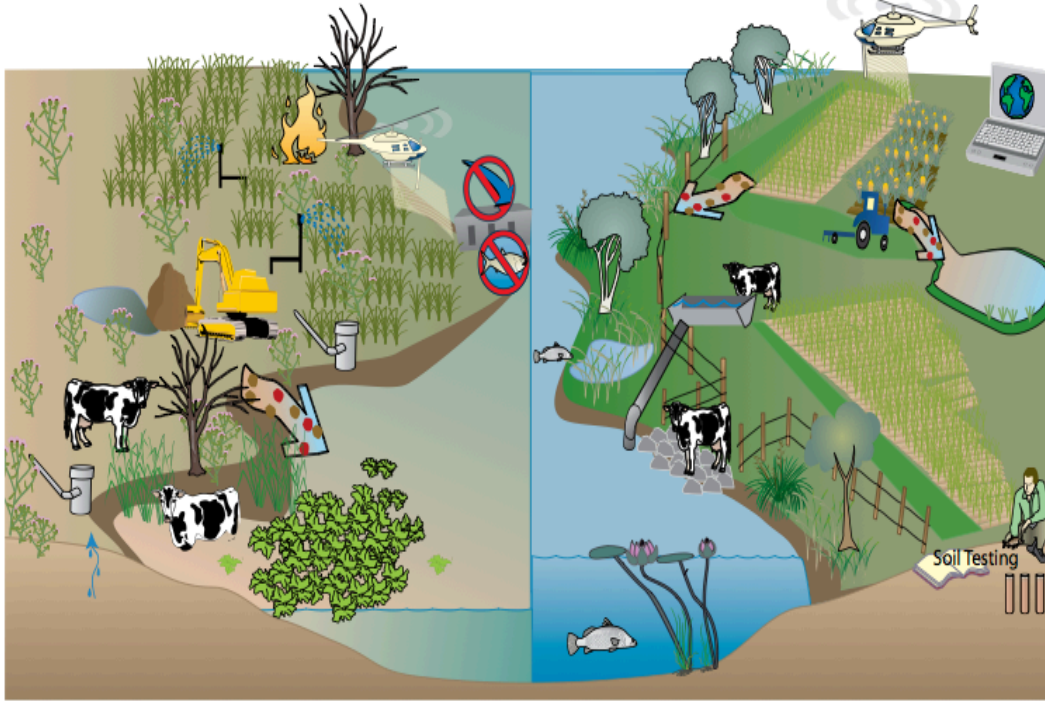


How does human impact change downstream

Suggest strategies

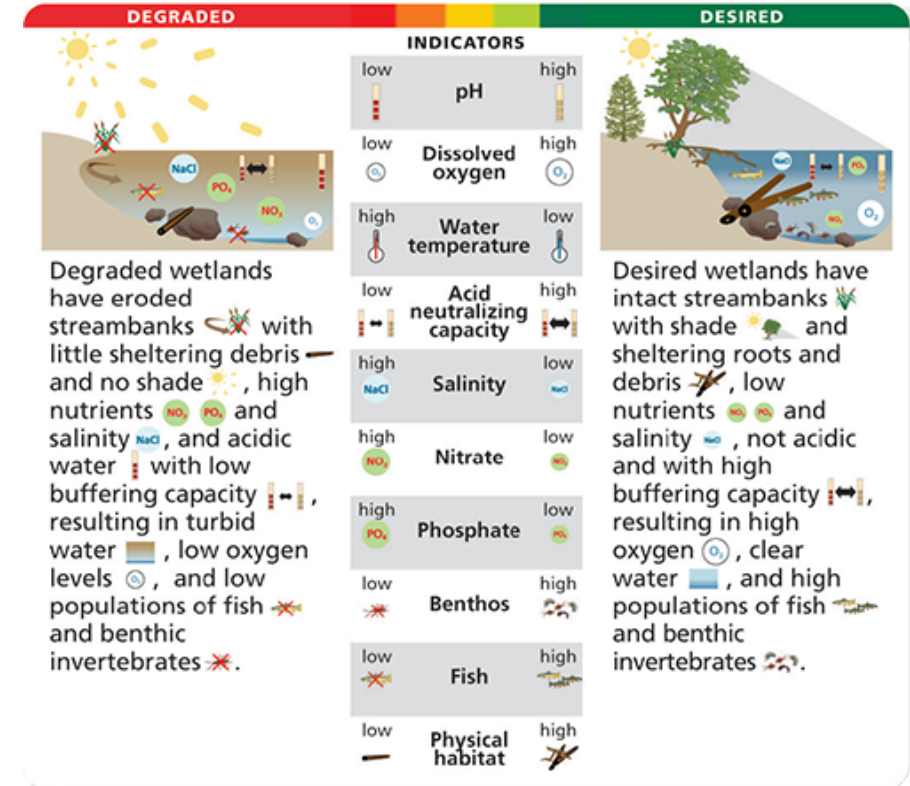
Identifying change

High risk practice



Best practice

MANAGEMENT



Illustrate examples & apply to their study

Draw a diagram of an environment studied using symbols

<http://ian.umces.edu/blog/2013/03/22/top-ten-conceptual-diagrams-seagrasses-streams-eco-rhythms/>

Management

<http://wetlandinfo.ehp.qld.gov.au/wetlands/resources/pictorial-conceptual-models.html>

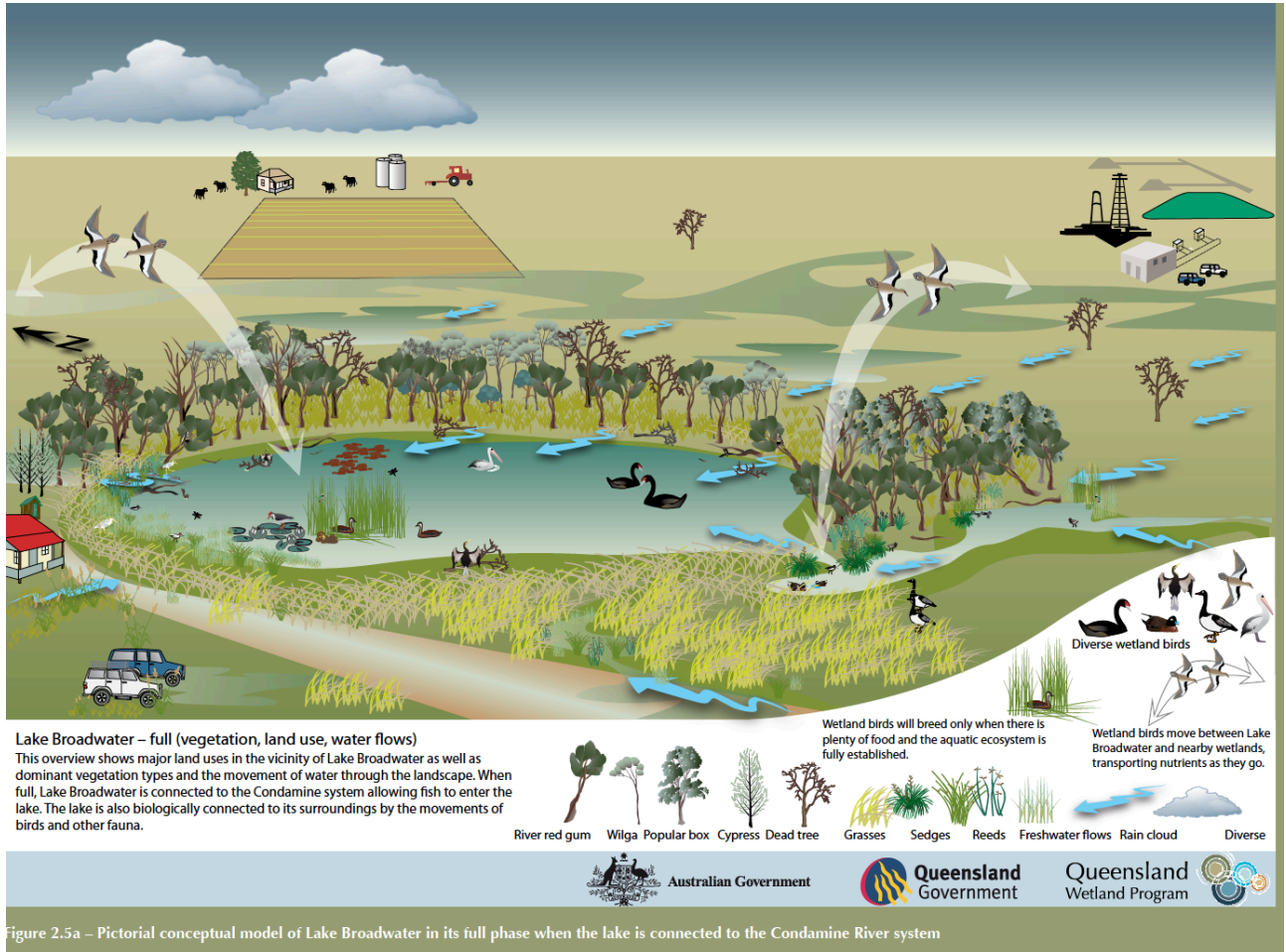


Figure 2.5a – Pictorial conceptual model of Lake Broadwater in its full phase when the lake is connected to the Condamine River system

Natural processes and change over time in riverine environments

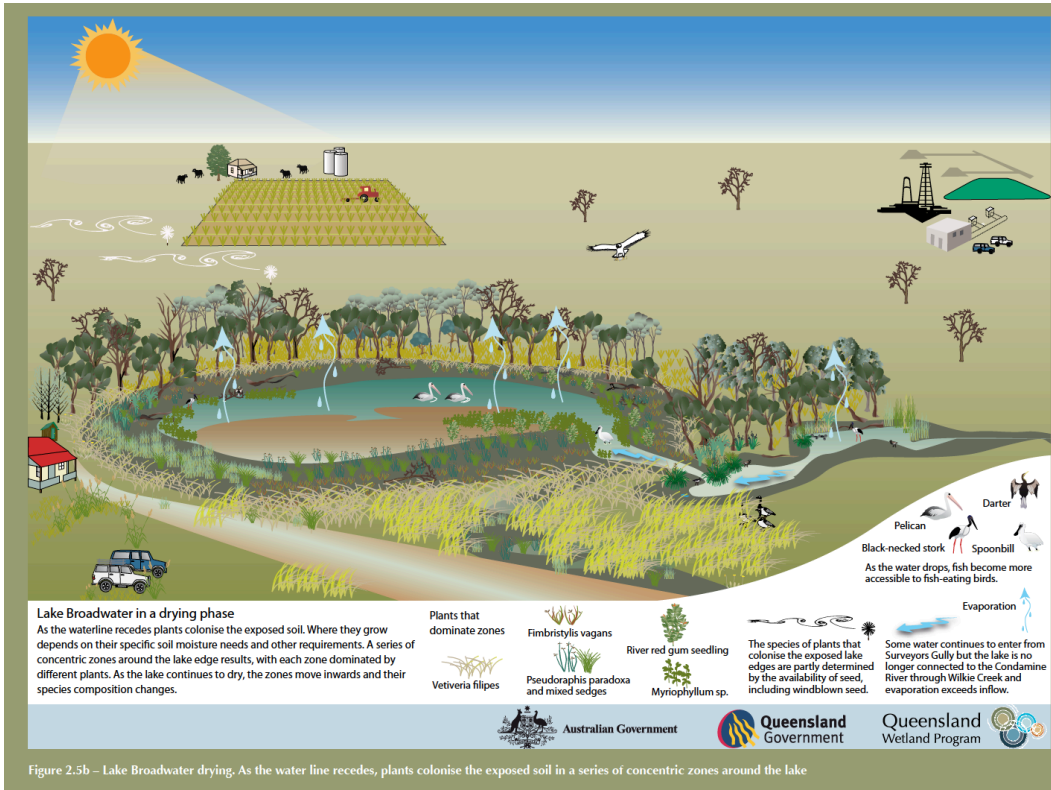


Figure 2.5b – Lake Broadwater drying. As the water line recedes, plants colonise the exposed soil in a series of concentric zones around the lake

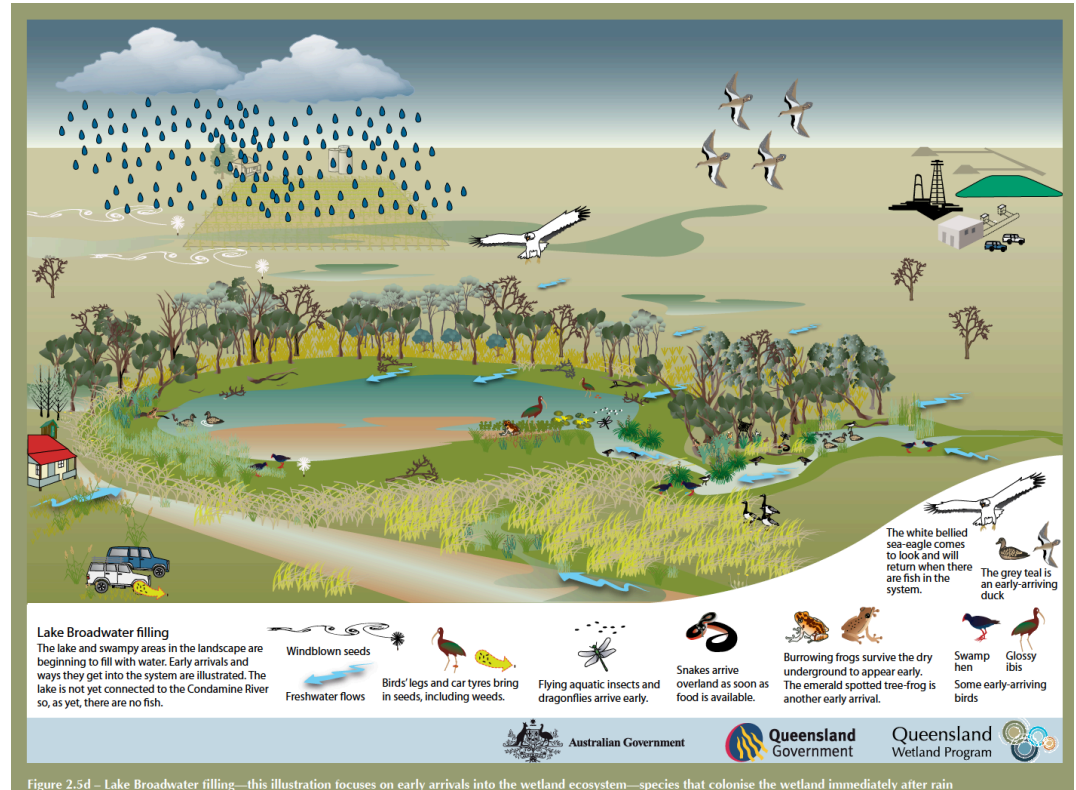


Figure 2.5d – Lake Broadwater filling—this illustration focuses on early arrivals into the wetland ecosystem—species that colonise the wetland immediately after rain

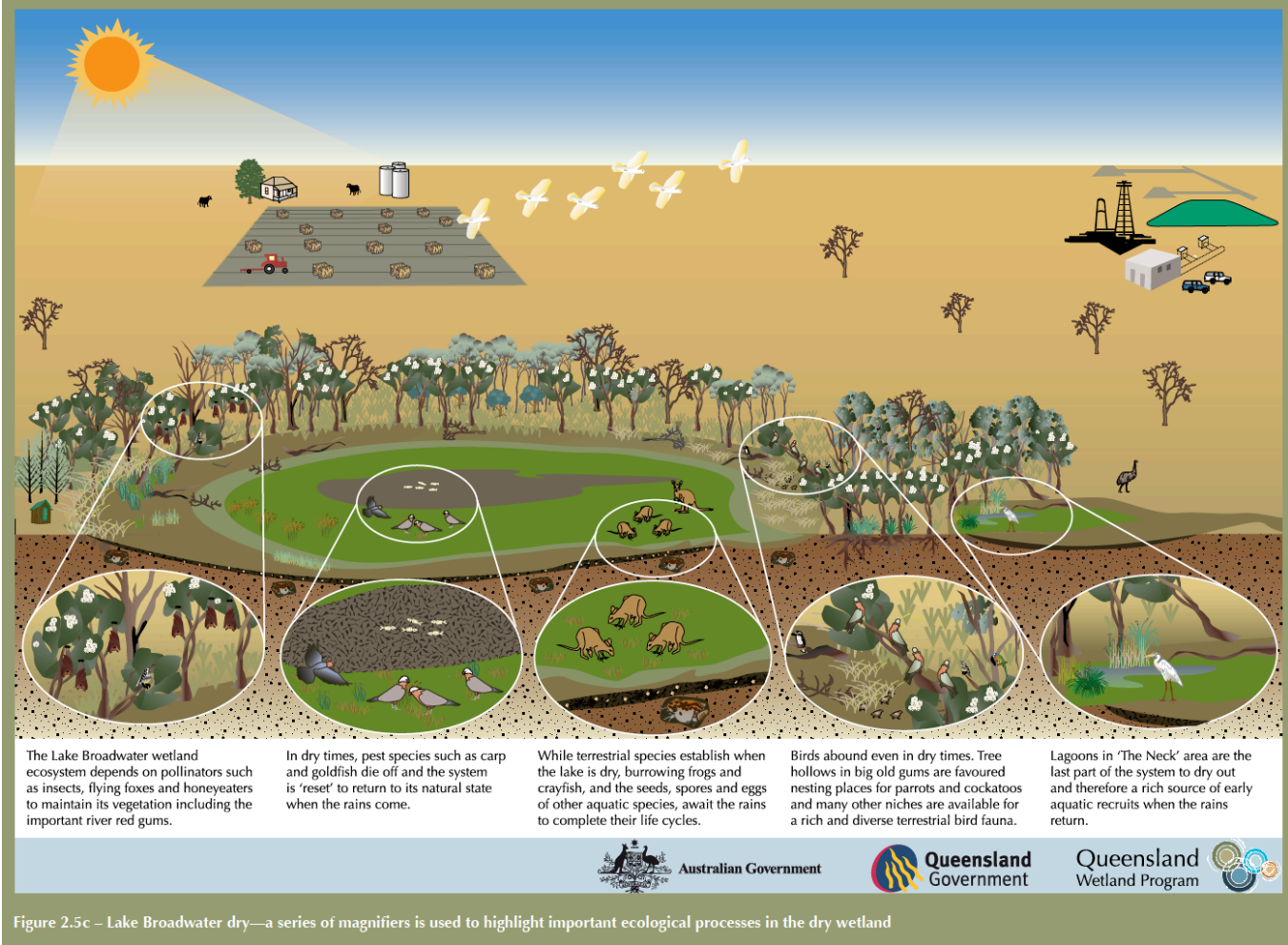
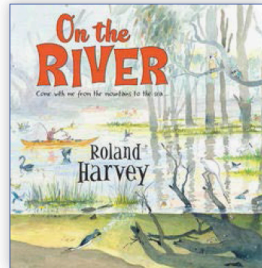


Figure 2.5c – Lake Broadwater dry—a series of magnifiers is used to highlight important ecological processes in the dry wetland

PICTURE BOOKS & WEBSITES

3. Story / picture book: *On the River* by Roland Harvey. Published 2016

A book full of geographical information about the River Murray as it flows from its source to its mouth. Beautiful illustrations reveal a wealth of information about people, their activities, places and environments presented in an engaging cartoon style format against a backdrop of beautiful landscape drawings.



"Roland takes us on a journey as he travels from the top at the headwaters, through many a small riverside town, showing us what may be found and all the ways that the river is utilised, right on through to the Murray Mouth."

We see waterskiing, canoes, cricket, walking, fishing, paddle-steemers, windsurfers, houseboats and a glorious range of native animals. Roland briefly educates on the ecology, the history and the wildlife of the mighty Murray River. There is also a short note from the Murray to the Darling about how to look after river health.

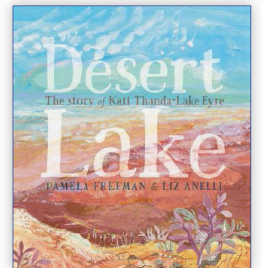
The tone of the story is light and witty, with both text and pictures that will engage audiences of every age"

<http://bookgirl.beautyandlace.net/book-club-on-the-river>

Read more: <http://bookgirl.beautyandlace.net/book-club-on-the-river#kzz4RUJURg8>
Follow us: @beautyandlace on Twitter | BeautyandLaceOnline on Facebook

4. Story / picture book: *Desert Lake the story of Kati Thanda Lake Eyre* by Pamela Freeman and Liz Aneli (Illustrator). Published 2016

This book covers the key geographical concepts of place, space, environment, change and interconnection and can be used when studying places through stages 1 – 3. The emphasis is on the cycles of change in Australia's natural environments.



Through a beautiful combination of text and illustration, we are shown the beauty and harshness of the environment, the transience of much of the animal population and the evolutionary features that allow both plants and animals to survive in this unique place.

Whether close ups of flora and fauna or distant landscapes, the illustrations by Liz Aneli are delightful. Colour, texture and movement across large sections of sky and earth highlight the changing states of the landscape that somehow draw you into feeling the place. These images are the perfect complement to Freeman's storytelling and both emit a strong sense of constant change.

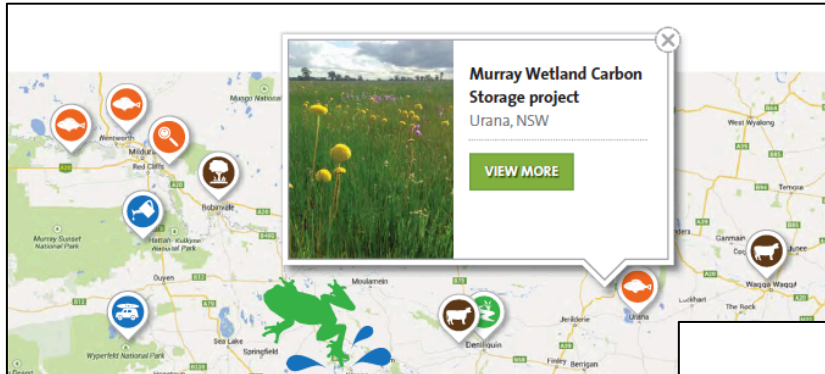
This is essentially an older children's informative picture book – simple enough to be accessible to junior primary grades but with enough detail, facts and related environmental issues as to extend even mature readers.

<http://readingtime.com.au/desert-lake-story-kati-thanda-lake-eyre/>

Riverspace project categories: Biodiversity, Community involvement, Environmental watering, Food and wine, In-stream habitat, Managing livestock, Riparian rehabilitation, River research and management, Tourism — is one of these part of your space?

... a place for wetlands, rivers and people

Riverspace is dynamic and designed to grow. Riverspace is for everyone and we hope that



RIVERSPACE

Australia's rivers, creeks, wetlands and billabongs are highly valued for the range of environmental, recreational and social benefits they provide. All of us love being near water, and across our country there are communities and organisations working hard to protect, restore and revitalise those waterways that need a helping hand.

Riverspace is a new interactive website that brings together the latest river and wetland projects, so that anyone with an interest in our waterways can find out about what is happening in their region, or in other parts of Australia.

Riverspace also features a range of tourism and recreation ventures that link to rivers and wetlands so people can learn about experiences that connect them to these wonderful parts of our world. Whether it be kayaking or house-boating, dining or fishing, **Riverspace** brings research, practice and our enjoyment of rivers and wetlands together in the one place—truly being ... a place for wetlands, rivers and people...

Riverspace is the brainchild of Siwan Lovett and Deborah Nias, who have worked in the river management sector for many years, and who have formed a great friendship and respect for the organisations each manages. The Australian River Restoration Centre (Siwan) and Murray Darling Wetlands Working Group Ltd (Deborah) are both not-for-profit organisations passionate about restoring, supporting and inspiring people to care for their rivers and wetlands.

Why Riverspace?

Many different groups across Australia are looking after wetlands and rivers, and there is a need to be able to go to one place to find out about all of this great work. **Riverspace** provides a 'place' where everyone can share the work they are doing within the broader context of community life.

- **Riverspace** provides organisations with an independently managed website, staffed by a professional and experienced science communication team, who can advise and assist on the best way to feature the work they are doing, in ways that make it relevant and meaningful for anyone.
- **Riverspace** is fully funded by the Australian River Restoration Centre and the Murray Darling Wetlands Working Group Ltd. This means it is truly independent because it is outside many bureaucratic and political constraints other agencies must operate within.
- **Riverspace** uses a sophisticated, yet well-known Google map interface, allowing users to zoom in and out, and discover a wealth of information at a range of scales. Beautiful images are combined with text, video and audio to give a user experience that is varied, interesting and caters for different people's learning and knowledge-searching preferences.

The Murray Carbon Storage project is shown above on Riverspace article in the RIPRAP.



Explore beautiful stories on Riverspace... select a category below:



BIODIVERSITY



COMMUNITY INVOLVEMENT



CULTURAL HERITAGE



ENVIRONMENTAL WATERING



FOOD AND WINE



INSTREAM HABITAT



MANAGING LIVESTOCK



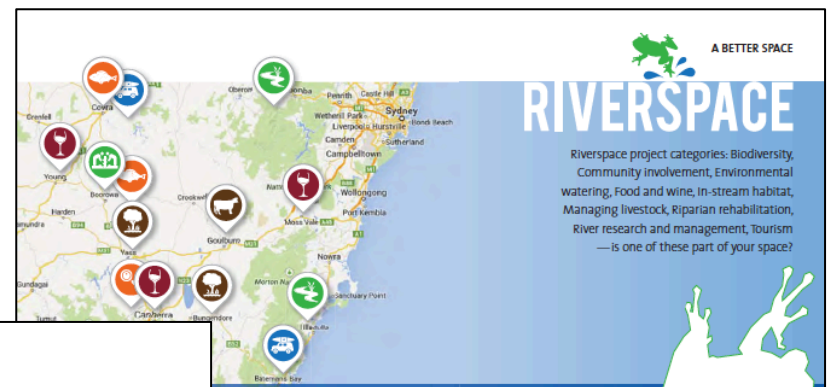
RIPARIAN REVEGETATION



RIVER RESEARCH AND MANAGEMENT



TOURISM



Riverspace project categories: Biodiversity, Community involvement, Environmental watering, Food and wine, In-stream habitat, Managing livestock, Riparian rehabilitation, River research and management, Tourism — is one of these part of your space?

... a place for wetlands, rivers and people

mic and designed to grow. ent website in Australia combines and presents ical information on rivers gside other waterway e for expansion beyond zes management sector he arts community, rism and education ples of potential sers of **Riverspace**. sive and excellent value for eriment, non-government agencies by an annual or ption service.

Riverspace is for everyone, and we hope that organisations like yours, or others, will want to become a part of this exciting, collaborative, knowledge-sharing adventure.

To become a part of **Riverspace** please visit the website where you will be presented with a range of options. The packages we have developed offer multiple solutions (and start as low as \$350) for how you could display your project on the website and manage your pages. For organisations that would like us to manage their account, including creating, uploading and updating project content, we can tailor a package just for you. —Siwan and Deborah

Visit the website for great early bird deals. Hop right to it!

www.riverspace.com.au



At the Australian River Restoration Centre we believe in sharing knowledge, restoring and protecting our rivers for all to enjoy and valuing people and the work they do. We do this by:



Inspiring and supporting people passionate about rivers



Creating and distributing *RipRap* magazine



Sharing knowledge in multiple ways



Collaborating and networking with a range of organisations



Managing on-ground and science communication projects

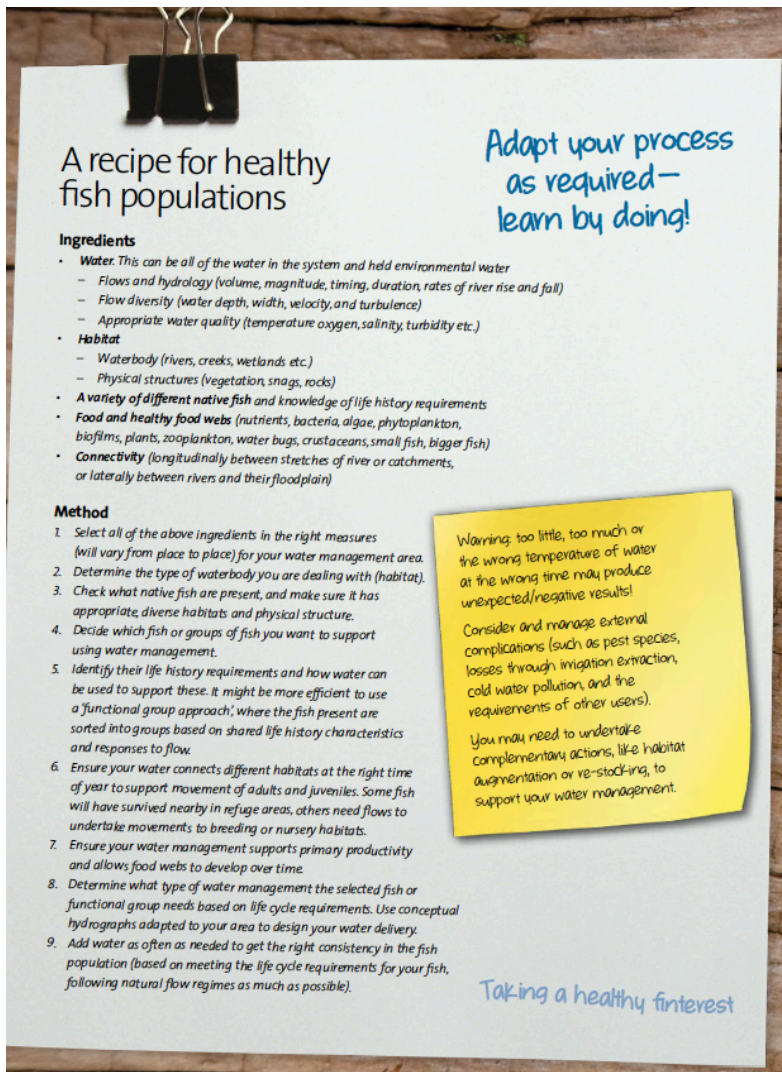
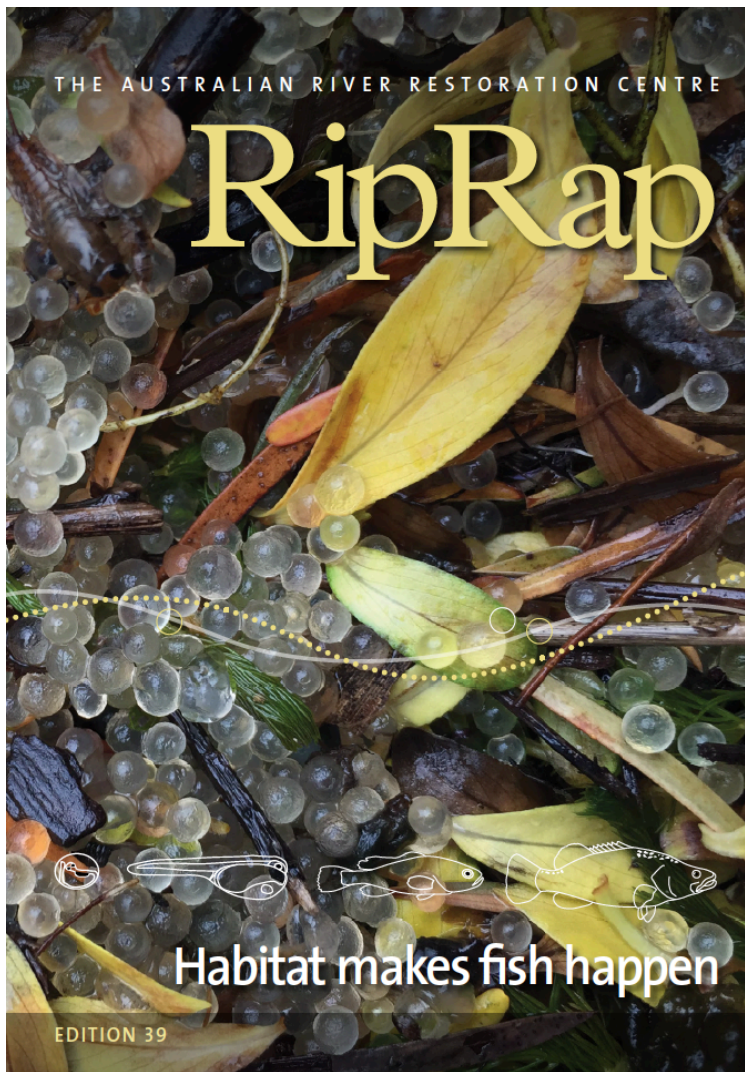
www.rrc.com.au

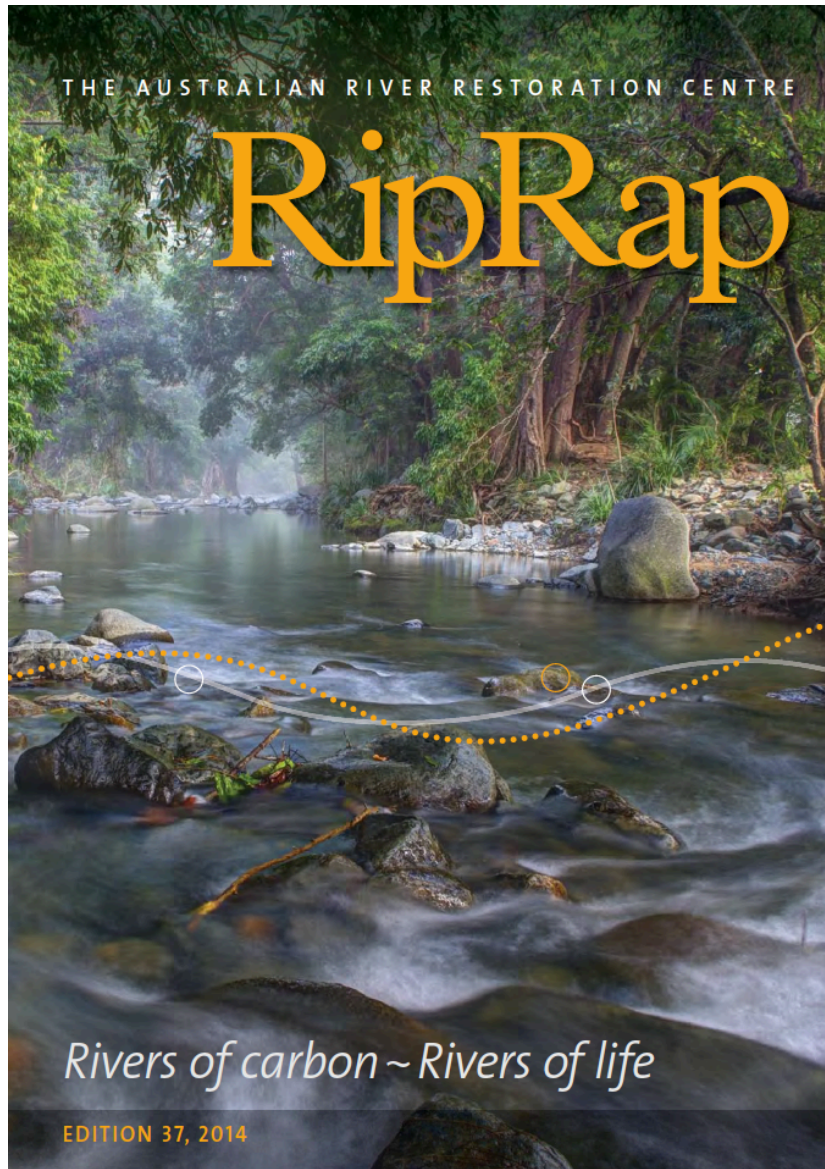


“The key achievement of the project from our perspective is how quickly the natives have started to generate naturally when not having to compete with noxious weeds. It was very exciting and reassuring that the action we had taken was beneficial. This is magnified by the rest of landholders who have signed up to the Fish River Project—our efforts will improve the health of the Fish River and return it to having more native flora regenerating and providing habitat for native fauna.”

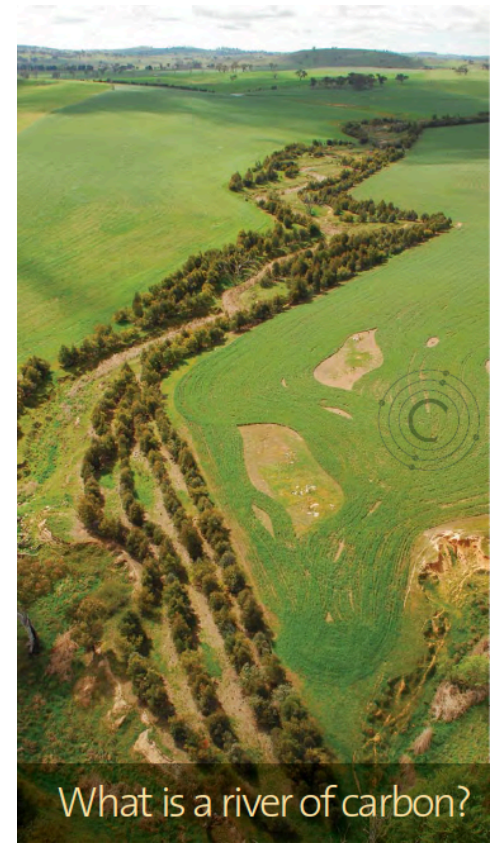
REBECCA WELSH, FISH RIVER PROJECT PARTICIPANT

<https://arrc.com.au/portfolio/riprap/>






<https://arrc.com.au/portfolio/riprap/>

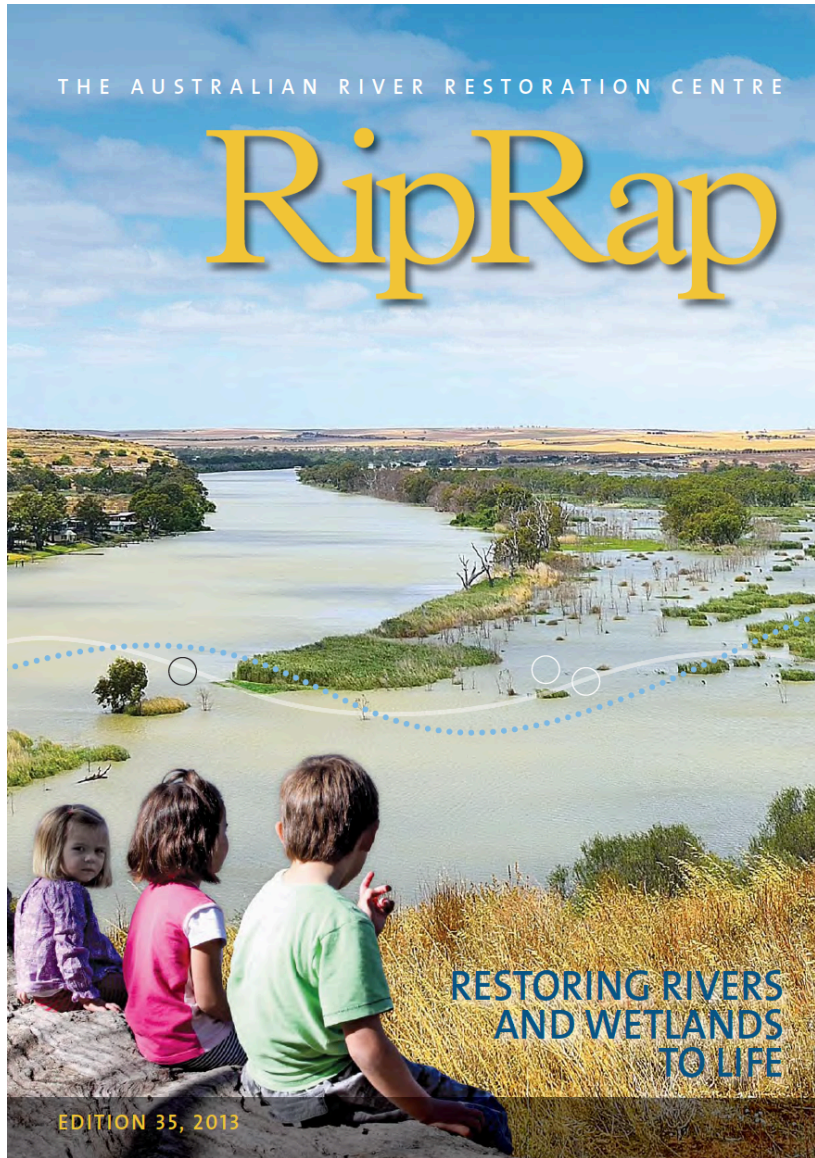


What is a river of carbon?

“...the most important area of work to mitigate climate change impacts and protect and conserve biodiversity, is to plant diverse, resilient native vegetation linking existing patches of remnant vegetation to create living corridors.”
(Bradshaw et al., Biological Conservation, 161, 2013)



TITLE PHOTO COX ELLIS, RIGHT: EUCALYPTUS GONIOCARDYX, BOTH PHOTOS COURTESY OF GREENING AUSTRALIA CAPITAL REGION. TUBESTOCK ON OPPOSITE PAGE ALLISON MORTLOCK.



The theory behind the Basin Plan

BILL JOHNSON FROM THE MURRAY-DARLING BASIN AUTHORITY EXPLAINS THE THEORY OF ADAPTIVE MANAGEMENT AND HOW IT HAS BEEN INCORPORATED INTO THE MURRAY-DARLING BASIN PLAN.

During implementation of the *Murray-Darling Basin Plan*, the Murray-Darling Basin Authority, along with other water and river managers, will have the opportunity and requirement to manage adaptively. Adaptive management is defined in the Basin Plan, and principles of adaptive management, including consultation, communication, and monitoring and evaluation are key components of the Plan.

Focus on people

People and political processes are central to adaptive management. One of the reasons adaptive management is difficult to apply, is that attempts to manage adaptively focus too much on technical and process features, and give insufficient attention to people and politics. Managed systems are complex social-ecological systems, requiring understanding and integration of social and political sciences, economics, and ecology. Adaptive management is most likely to be effective when the technical features are carried out in an environment of strong institutional, social and political support.



GREG RINGWOOD ENCOURAGES US TO ACCEPT FLOODS, BUT USE RIPARIAN VEGETATION TO 'BUFFER' THE BUMPS.

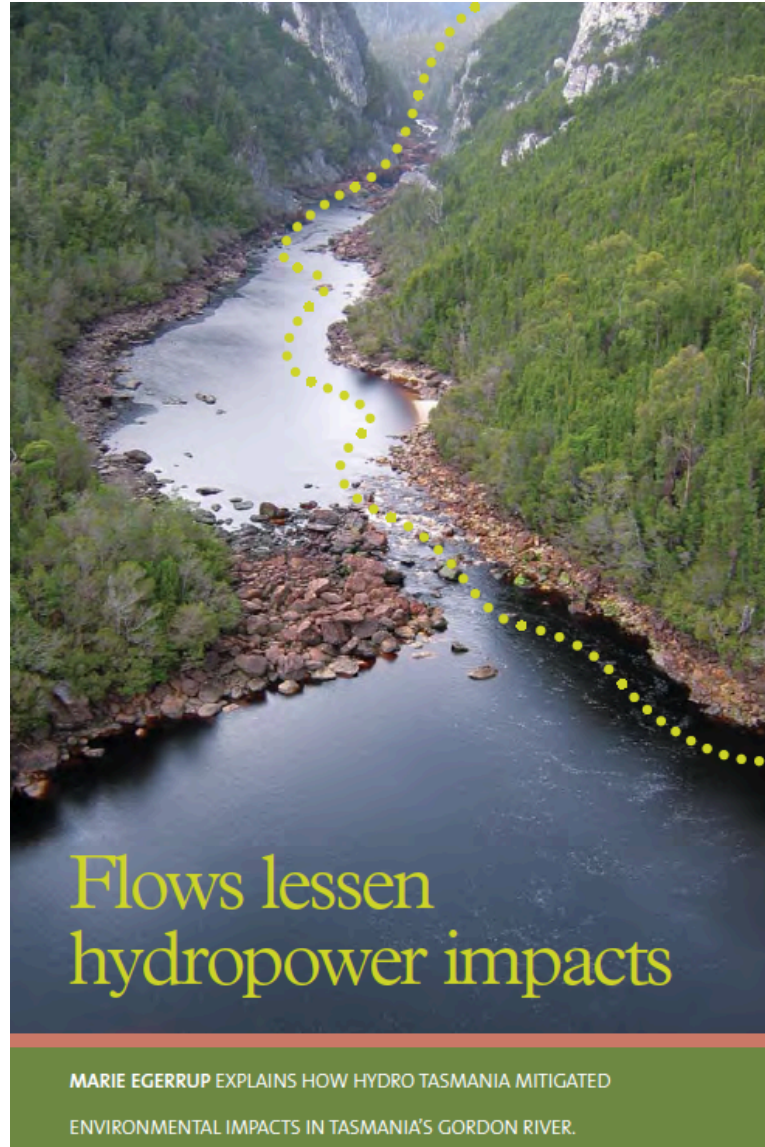


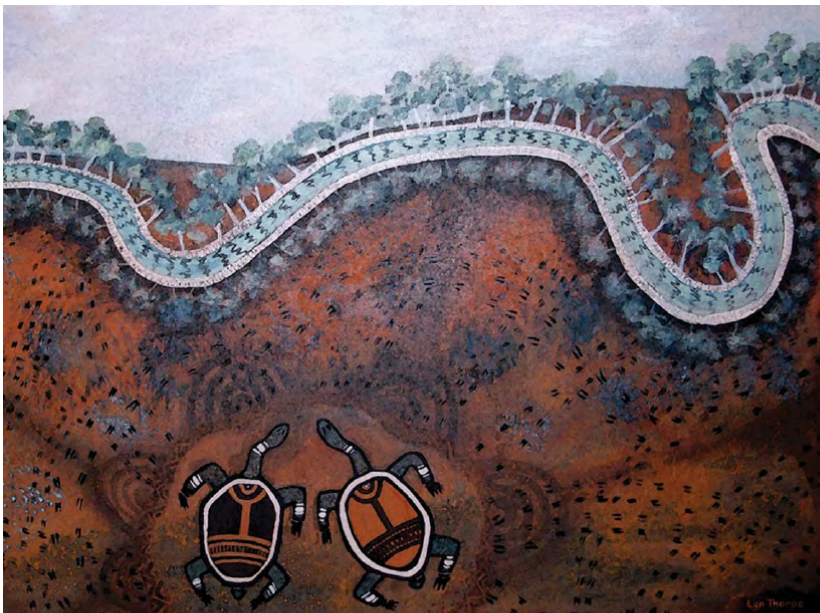
KEY MESSAGES

- Water is not the enemy, it is water velocity that causes the damage.
- Riparian vegetation provides individual and cumulative benefits to landholders upstream and downstream.
- Australian rivers are meant to be rough and bumpy.

Opposite: Limited erosion occurred because of some riparian vegetation and good groundcover. Above: This is the same creek but the next bend downstream where the creek bank has suffered greater erosion due to excess water velocity and limited riparian cover.

<https://arcc.com.au/portfolio/riprap/>





Rivers are flows of life

DEIRDRE WILCOCK HIGHLIGHTS THE IMPORTANCE OF APPRECIATING AND UNDERSTANDING DIFFERENT VIEWS AND KNOWLEDGE OF RIVER ENVIRONMENTS.

Adaptive management could be the key in moving towards a broader and more inclusive debate about water allocation and the environmental flows required by rivers. Recent developments in river restoration emphasise the need to respect and understand the different ways people think and talk about place. Appreciation of different people's perceptions and beliefs is critical in negotiating contested resources, and practical interventions require a keen eye and ear to bring groups together for constructive conversations. The Murray–Darling Basin is a good example of the turmoil implicit when dominant views fail to acknowledge other people's histories and understandings about 'place'.

Varied meanings of flow

'Flows' usually mean water allocation—a physical volume or water level which is crucial for ecological health. 'Flows' can have other meanings, for example the recent introduction of the term 'cultural flows' and its connection with Aboriginal groups. Aboriginal groups' usual entry to natural resource management (NRM) has been through an archaeological interest, for example, cultural heritage or reclamation to the past ('stones and bones'). The concept of 'cultural flows' expands this to the present day, and recognises the need by Aboriginal groups for 'flows' to enable caring for country in a living context.

Above and inset:
Kaieala Woka—Goulburn
River Country (Yorta Yorta).
A painting by Lynette Faye
Thorpe.



Cultural flows

The term 'cultural flows' is new, having only come into mainstream use in the past few years. It has been created by Aboriginal people as a way of easily encapsulating the cultural benefits they will gain from their ownership and management of water.

The concept of 'cultural flows' aims to translate the complex relationship Aboriginal people have with water resources into the language of water planning and management. In November 2007, MLDRIN developed a definition of cultural flows known as the *Echuca Declaration*, which has since been adopted by NBAN and the North Australian Indigenous Land and Sea Management Alliance (NAILSMA). The short definition of cultural flows is as follows:

“Water entitlements that are legally and beneficially owned by the Indigenous Nations and are of a sufficient and adequate quantity and quality to improve the spiritual, cultural, environmental, social and economic conditions of those Indigenous Nations. This is our inherent right.”

Among the potential benefits cultural flows could provide to Indigenous people are improved health, wellbeing and empowerment from being able to care for their country and carry out cultural activities. Implicit in the implementation of cultural flows would be an important and respectful acknowledgement of Indigenous culture, traditional knowledge and spiritual attachment to place.



BARKINDJI RANGER PROJECTS

THE **BARKINDJI MARAURA ELDERS ENVIRONMENT TEAM** (BMEET) ARE WORKING TO IMPROVE FISH HABITAT IN WESTERN NEW SOUTH WALES. IN PARTNERSHIP WITH THE **MURRAY-DARLING FRESHWATER RESEARCH CENTRE** (MDFRC), THE TEAM IS INVOLVED IN VARIOUS PROJECTS THAT ARE BRINGING TOGETHER SCIENCE AND CULTURAL KNOWLEDGE.



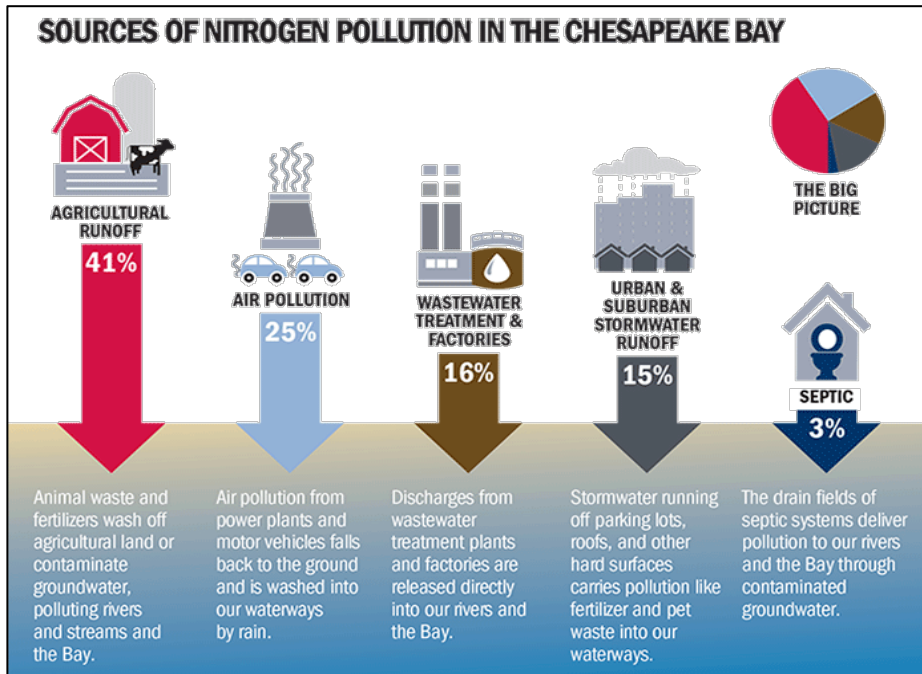
Aboriginal management



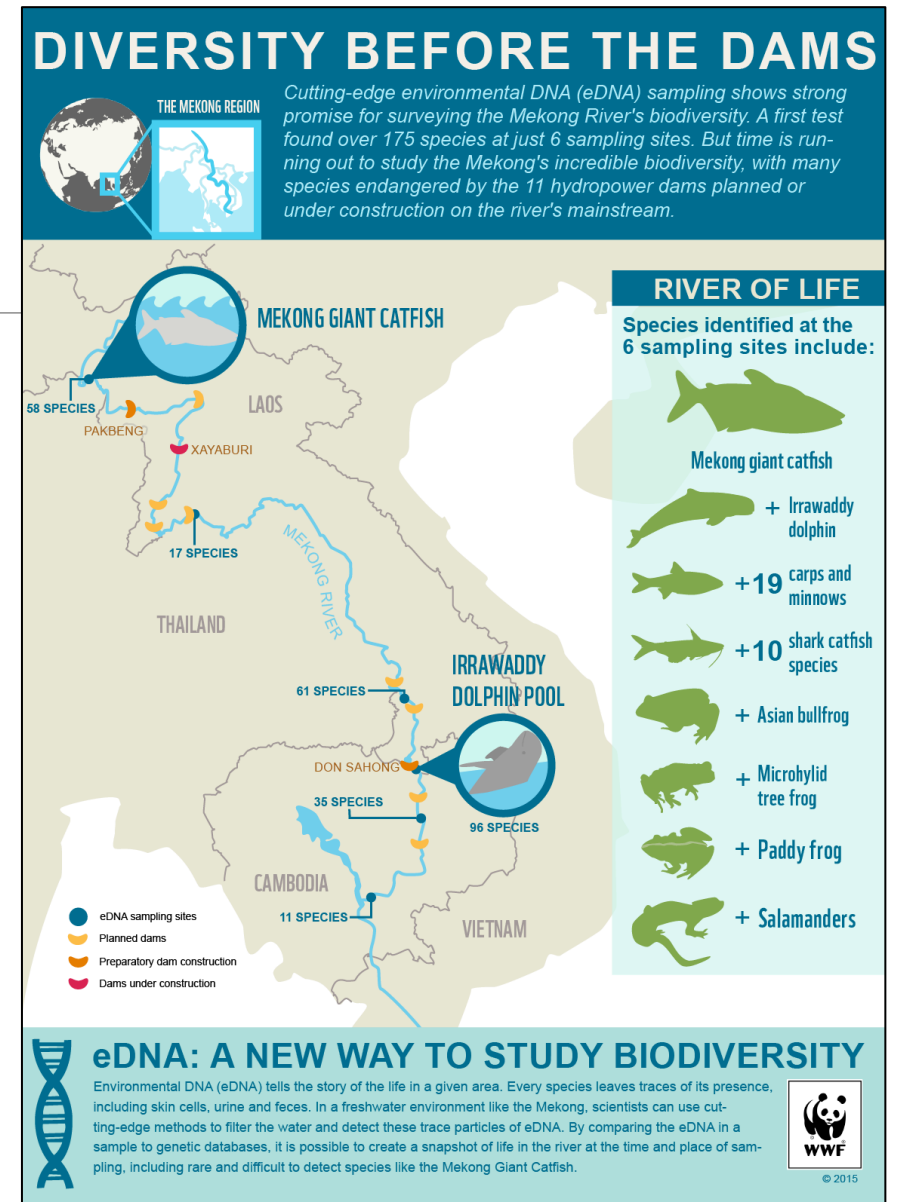
David Fleer (right) from the South Australian Research and Development Institute and a member of community who helped capture carp as they attempted to enter a floodplain wetland to spawn on the River Murray in South Australia.



INFOGRAPHICS



<http://www.cbf.org/how-we-save-the-bay/chesapeake-clean-water-blueprint/what-is-killing-the-bay>



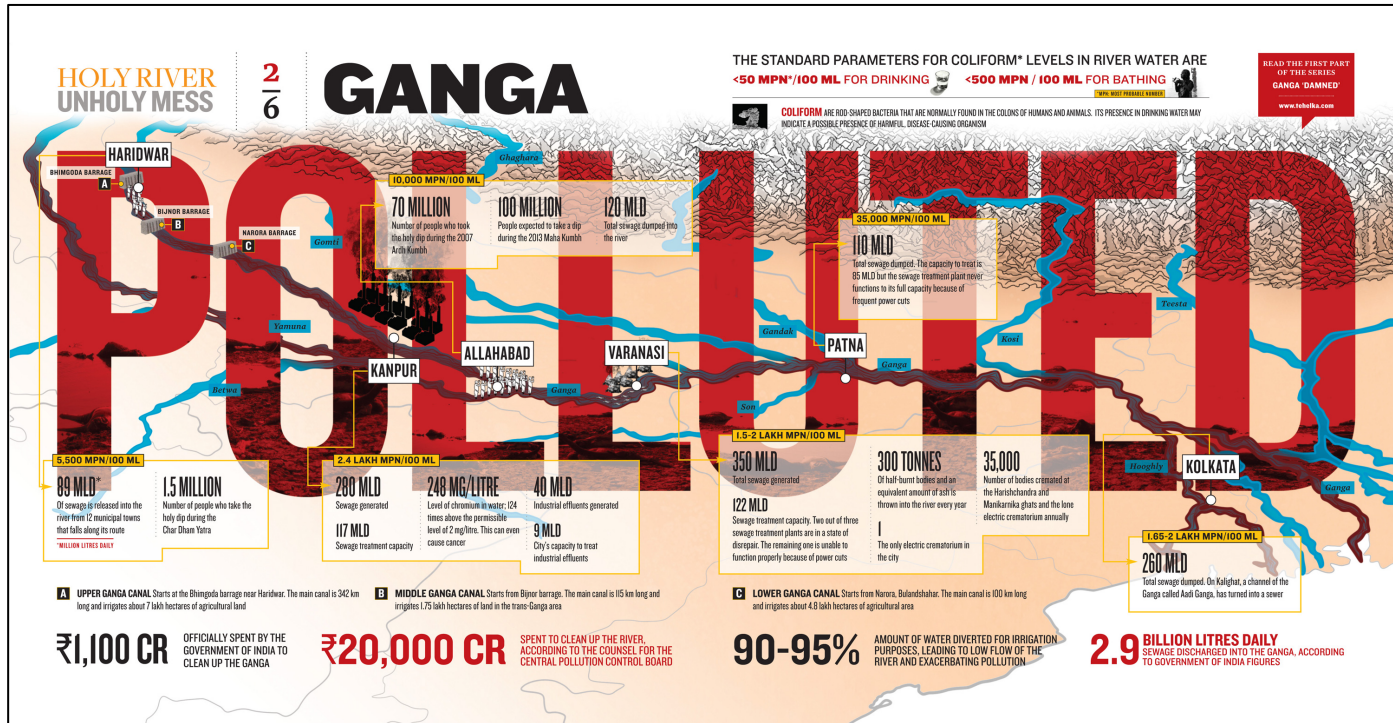
http://d2ouvy59p0dg6k.cloudfront.net/img/mekong_mainstream_dams_1_529076.png

Incorporate ASIA



<http://www.worldbank.org/en/news/feature/2015/03/23/india-the-national-ganga-river-basin-project>

Incorporate ASIA



<https://www.tes.com/lessons/OMmxghTDWIQ-1A/why-is-the-ganges-river-being-polluted-even-though-it-is-a-holy-river>

<http://www.scoopnest.com/user/timesofindia/750962991386984448>

REVIVING THE GANGA

TOTAL 231 PROJECTS UNDER 'NAMAMI GANGA'

112 Uttar Pradesh | 47 Uttarakhand

20 West Bengal | 26 Bihar

26 Jharkhand, Haryana & Delhi

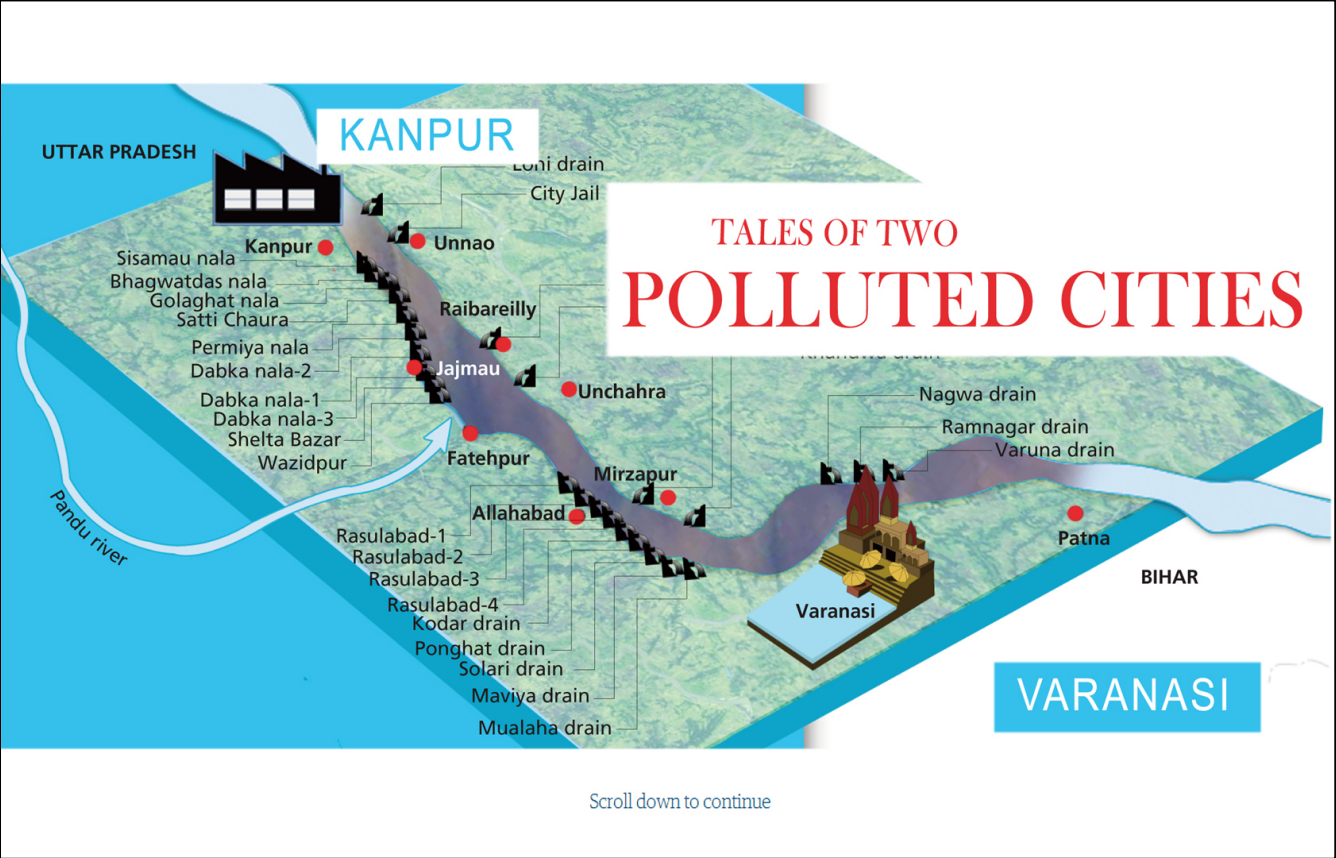
COST
 ₹ 2000 crore

WHAT THEY INVOLVE

- Modernisation of ghats & crematoriums
- Development of sewage infrastructure & treatment
- Afforestation tree plantation (medicinal plants)
- Pilot drain project
- Interceptor drain project
- Trash skimmers
- Preserving biodiversity

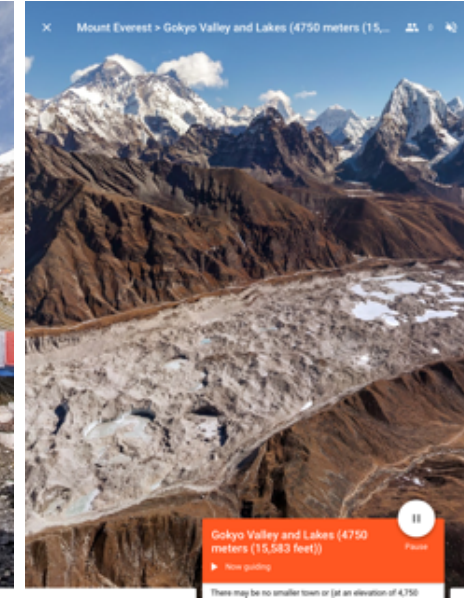
FOR MORE INFOGRAPHICS DOWNLOAD TIMES OF INDIA APP

Interactives



<http://www.indiaenvironmentportal.org.in/media/iep/infographics/Can%20we%20save%20Ganga/index.html>

Virtual reality



Example: Google expeditions

Explore a
landscape

<https://www.theguardian.com/technology/2016/jun/13/best-virtual-reality-apps-smartphone-iphone-android-vr>
<https://edtech4beginners.com/2016/11/14/a-fantastic-virtual-reality-app-fulldive/>

Interactive games / Apps

Run the River (MDBA / Water / Environmental management)

Catchment detox (Water)



NEW

MDBA

Weed App

www.mdba.gov.au

www.runthattown.abs.gov.au

www.abc.net.au/science/catchmentdetox/files/home.htm

Textbooks

Macmillan GeoWorld10 NSW Chapter 5 (Comparative: USA, Netherlands, China) pp134-160

Jacaranda GeoActive 2 Chapter 214 Inland Water pp 294-322
(Comparative : Dams)

Pearson Geography Stage 5 Chapter 11 pp. 274-302 (Comparative s :
Groundwater Great Artesian Basin / Pangani River Basin)

Cambridge Stage 5 Online Chapter Inland water

Oxford Insight Stage 5 Chapter 6 pages pp 230 – 237

Thank You

Good luck choosing what to do !



<http://www.newshub.co.nz/home/new-zealand/2017/02/special-report-how-polluted-are-new-zealand-s-rivers.html>