



Wetlands chemistry

Background

The SPICE resources that make up *Wetlands chemistry* can be drawn together into a learning pathway that enables students to develop their understanding of the water cycle, wetlands, and how human activities, including the use of chemicals, can impact on these systems. The pathway is structured around a constructivist learning model based on the 5-Es where teachers can:



- **Engage** students' interest and minds through immersion in a realistic story activity that involves empathy, problem solving and decision-making skills in an environmental context.
- **Explore** what they know about the water cycle, wetlands and chemicals in the environment, and thereby lay the foundations to further develop these concepts.
- **Explain** the concepts. The activities prompt responses that allow misconceptions to be addressed, and they focus on the role of scientists in situations similar to the scenario presented here.
- **Elaborate** on the concepts. Here students may apply and extend their knowledge through research, practical activities and open scientific investigations, especially in relation to solutions and solubility.
- **Evaluate** as opportunities occur throughout the resource.

The pathway has been designed for teachers of senior school chemistry but it may also be used with students in earlier years at the discretion of teachers.

Purpose

To develop understanding of how chemicals can enter and affect ecosystems through human activity, and how understanding the chemistry of solutions can lead to sustainable practices in the use of chemicals.

Outcomes

Students will be able to:

- identify and describe factors that influence the introduction of chemicals into the environment and their impact on ecosystems;
- analyse information to form an opinion and interact collaboratively with others to make decisions relating to human activity within an ecosystem;
- explain possible results of chemicals entering an ecosystem;
- explain the scientists' role in the community in relation to chemicals entering ecosystems; and
- further develop understanding the chemistry of solutions through practical activities and investigations.

Learning pathway



Wetlands dilemma

Wetlands dilemma includes this teacher guide, a procedure sheet, student worksheets and a PowerPoint presentation.

This resource engages students by immersing them in a story about an area of land that has been changed through years of human activity, and asking them to solve problems relating to this context.



Chemicals in the environment

Chemicals in the environment includes this teacher guide, a student worksheet and five fact sheets.

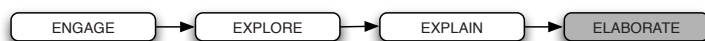
Students work collaboratively to develop understanding of the range of chemistry concepts involved in the dilemma story. They explore a wider range of scientific concepts that can be used to interpret what is happening within a wetland ecosystem.



Environmental impacts on wetlands










Environmental impacts on wetlands includes this teacher guide and a student worksheet.

This resource enables teachers to probe understandings that students have gained from previous resources, to build explanations about the concepts involved and address any misunderstandings that may result from the jigsaw activity.



At the end of this guide there are suggestions on guided practical activities, open investigations and information research to elaborate on ideas developed in the preceding resources.

Components

	NAME	DESCRIPTION	AUDIENCE
	<i>Wetlands chemistry</i> teacher guide	The guide describes how the resource <i>Wetlands dilemma</i> may be used to develop students' understanding of the impact of human activities through the case study of a wetland environment. Encourage students to become immersed in a realistic situation in which they analyse information and work collaboratively with others to make difficult decisions. Students explore the impact of chemicals in the resource <i>Chemicals in the environment</i> , before consolidating their understanding through use of the worksheet in <i>Environmental impacts on wetlands</i> .	teachers
Part 1: Wetlands dilemma			
	<i>Worksheet 1: Water cycle and wetlands KWL</i> worksheet	This worksheet prepares students to think about the issues before and after the story or presentation.	students
	<i>Wetlands story</i> procedure sheet	This document contains the full dilemma story and questions raised by the story.	teachers and students
	<i>Wetlands dilemma</i> presentation	This presentation is used with the procedure sheet to set out the story of an increasingly degraded wetland, and to raise questions that students discuss and answer collaboratively.	teachers and students
	<i>Worksheet 2: Chemistry from the story</i> worksheet	This worksheet contains a retrieval chart for gathering information from the story.	students
Part 2: Chemicals in the environment			
	<i>Worksheet 3: Wetlands concept map</i> worksheet	This worksheet helps students capture ideas from a class discussion about chemical principles underlying the dilemma.	students
	<i>Worksheet 4: Wetlands fishbone organiser</i> worksheet	This worksheet enables each student to summarise key information from the jigsaw activity.	students
	<i>The water cycle</i> <i>Wetlands</i> <i>Salinity</i> <i>Nutrient enrichment</i> <i>DDT and heavy metals</i> fact sheets	These fact sheets are for use by students in a 'jigsaw' designed to share information about chemicals in wetlands.	students
Part 3: Environmental impacts on wetlands			
	<i>Worksheet 5: Environmental impacts on wetlands</i> worksheet	By completing this worksheet students demonstrate their understanding of processes that introduce chemicals into the environment	students

Technical requirements

The guide, procedure sheet, fact sheets and worksheets require Adobe Reader (version 5 or later), which is a free download from www.adobe.com. The worksheets are also provided in Microsoft Word format. The presentation is in Microsoft PowerPoint and Adobe PDF formats.

Part 3: Environmental impacts on wetlands (Explain)

ACTIVITY	POSSIBLE STRATEGY
Teacher and students complete <i>Worksheet 5: Environmental impacts on wetlands</i> . Students then add further comments to <i>Worksheet 1: Water cycle and wetlands KWL</i> .	teacher-led whole group discussion

Using this Explain activity

Students complete question one in *Worksheet 5: Environmental impacts on wetlands* using information from the fact sheets and research.

The teacher helps students complete the first flow chart in the worksheet before they complete the rest, including the question about the role of scientists. Further discussion and reflection, based upon the final part of KWL strategy, should draw out the idea that deep understanding of the chemistry of solutions would enable more informed decision making about chemicals entering ecosystems.

Further activities (Elaborate)

Students can be given the opportunity to attempt practical and open investigations relating to solutions.

Practical activities

Students could be guided to use practical activities from *Exploring chemistry, Stage 2*, published by the Science Teachers Association of Western Australia (STAWA) ⁽¹⁾.

Research activity

Students may research how the chemistry of solutions affects on real-life contexts. They may use their research collaboratively to develop small group presentations for the whole class, or to share their findings through an 'envoy' activity.

Some issues for researching include:

- Causes of eutrophication of wetlands and other waterways in Western Australia
- Why do some wetlands turn saline?
- How do stalactites and stalagmites form in underground caves?
- Why does some bore-water cause brown stains on walls and fences?
- Why can arsenic be a problem associated with wetlands?
- How can tailings dams or petrol stations contaminate groundwater?
- Wetlands can be described as 'nature's own filters' and also as 'sinks'. What does this mean?

Acknowledgements

Designed and developed by the Centre for Learning Technology, The University of Western Australia. Project team: Leanne Bartoll, Emma Donnelly, Alwyn Evans, Bob Fitzpatrick, Sam Gallagher, Trevor Hutchison, Stan Koios, Faye Paioff, Paul Ricketts, Jodie Ween and Michael Wheatley with thanks to Fred Deshon, Roger Dickinson, Jenny Gull and Wendy Sanderson.

A version of this resource also appears on the Socially Responsible Science website ⁽²⁾, developed with an Australian School Innovation in Science, Technology and Mathematics (ASISTM) project grant.

References

- 1) Clarke, J. (2008). *Exploring chemistry, Stage 2*. Osborne Park: Science Teachers Association of Western Australia. Available from <http://www.stawa.net>.
- 2) Koios, S. (n.d.). Wetlands dilemma. Retrieved October 29, 2008 from <http://www.dilemmas.net.au/course/view.php?id=5>

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