SES500 GIS applications for environmental management
Electronic Journal

This document is set up so that you can use it as your electronic journal - e-journal. Most of the reflections (Think) and activities (Do this) that you are asked to complete as you work through the materials in this unit are recreated in this document with space to record your answers and your ideas.

Feel free to add to the journal in any way, or change it to reflect your approach to the journal work.

This is not assessable work, it is simply a tool to help you organise your work.

If you have trouble figuring out where to start typing click the ¶ symbol on the Microsoft Word toolbar. This will show you all the paragraph breaks on the page. You can click in front of any of these and start typing.

If you have downloaded this as a pdf file instead of a Microsoft Word file, you will need to print the pages and write your ideas in the available space.

1. Definitions and descriptions

Use the spaces below to make notes on the issues you discuss. Expand them to fit the amount of writing you want or need to include.

THINK

Before we tell you what landscape ecology is, think for yourself about what it might be.

THINK

How do these descriptions fit with your earlier ideas about landscape ecology?

THINK

People usually have an idea of holistic medicine, but what do you think holistic means when we are talking about land management?

THINK

What comes to mind when someone mentions ' landscape' ?

DO THIS: Identify a landscape   WHY?

These pictures demonstrate different resolutions of imagery for the Milton Ulladulla area of New South Wales. Which do you think is a ' landscape' ?

 (NOTE that this interactive activity is designed for the computer)

THINK

How do these definitions relate to your original ideas? Which one is better than the others, or, is there a better one you can offer? (Give your own, if you can.)

THINK

What might be the landscape boundaries for

    a.   a flea on a dog?

    b.   a space shuttle pilot on a mission?

THINK

Can you identify the hierarchy in these landscapes? Where does each picture 'fit into' the others?
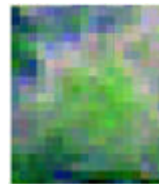
Small scale 33kb   Medium scale 29kb   Large scale 18kb

THINK

Which of the terms above best apply to the landscapes below? You might like to discuss your choices on <u>Talkline</u>.

Florence Falls 17kb   Ayers Rock 23kb   Kakadu wetlands 14kb

THINK

Why is it useful to study the environment at the landscape level? What other options are there? (You might need to recall the reductionist approach mentioned elsewhere.)

DO THIS: Why study landscapes

Note the key points from Reading 1.1

2. Structure and pattern

DO THIS: Landscape drawing

Look at the Kellerberrin landscape in Case Study 1. Make a line drawing of the features you can see in this landscape.

DO THIS: Label patches

Refer to the landscape drawing you made earlier. Use the descriptions on the web site work out which features of your drawing are patches and label them. Read the description of patches in the wheatbelt to check your labelling.

DO THIS: Classify patches

What types of patches are found in Kellerberrin?

Do the same type of patches exist in New England?

THINK

What comes to mind when you hear the word 'corridor'? How might this be relevant to landscapes?

DO THIS: Classify corridors

Which type of corridor exists in Kellerberrin?

Do the same types of corridors exist in New England?

Label any corridors you can identify on the drawing you made earlier.

DO THIS: Identifying the matrix

How clear are the distinctions between patch and matrix in New England?

 Is the matrix easier to identify in Kellerberrin?

Describe the matrix in each location.

Add labels to your drawing to show the main areas of matrix.

DO THIS: Applying measures

Which of the landscape measures and metrics above would be most helpful in studying
   a) patches
   b) corridors
   c) matrix

DO THIS: Identify appropriate measures

Would the same measures be appropriate in studying Kellerberrin and New England?

Identify what would be best in each location.

3. Function and process

DO THIS: Linking changes in function to changes in structure

From what you have learned in this topic, list the changes in landscape functioning that can be attributed to structural changes.

DO THIS Comparing patch changes

Are remnant patches changing in size, shape and position in <u>Kellerberrin</u>?

Is the same change obvious in <u>New England</u>?

DO THIS Comparing fragmentation

Is Kellerberrin more or less fragmented than New England?

What are some of the implications of a high degree of fragmentation?

THINK

Which do you think might be more important, one single reserve or several small reserves linked spatially? Why?

THINK

Do either Kellerberrin or New England have a problem with metapopulations or the spatial arrangements of habitat patches?

4. Change and dynamics

DO THIS: Contrasting structural changes

List the structural changes taking place in Kellerberrin and New England landscapes. What differences can you identify? Do you think they can be quantified in the same way?

DO THIS: Comparing causes of landscape structure

Identify the specific factors which determine the formation of landscape structure in Kellerberrin and New England and note them under the headings in your e-journal.

Impact of Factors	Kellerberrin	New England
Physical		
Biological		
Disturbance • **Natural** • **Human**		

DO THIS: Classifying modifications

Which classifications listed above best define human modification at Kellerberrin and New England?

DO THIS: Recall disturbance types and results

List the main types of disturbances and the sorts of changes that can result from these disturbances.

THINK

Which disturbance classification best represents each picture below? Discuss this on Talkline if you wish, but make some notes here first so that you have your ideas together.

DO THIS: Comparing regional fragmentation

1. Has fragmentation occurred in these two regions?

Kellerberrin	New England

2. Identify the causes of fragmentation (if possible).

Kellerberrin	New England

3. List the problems associated with fragmentation (if possible).

Kellerberrin	New England

DO THIS: Management rationale and decisions

Why is it important to take an integrated approach to land management that considers the spatial and temporal characteristics of landscapes?

Suggest some management solutions for Kellerberrin and New England.

Technical issues

1. Definitions and descriptions

THINK!

What is GIS? Try to put together your own rough definition.

Can you list the differences between GIS and RS? Give it a go here.

What do you know about the equipment used and its purpose?

What do you understand about different software limitations and capabilities?

DO THIS: Start thinking about environmental management

From what you learnt about GIS in the definitions section, list the reasons why you think it might be useful for environmental management. As you work through the rest of this theme see if you can add to the list.

DO THIS: GIS diagram

Create a diagram showing how the components of a GIS fit together.

DO THIS: Inputs and outputs

Make a list of the inputs and outputs you might want in an environmental GIS which looks at land use and land cover change over time.

THINK!

How would you now define GIS? How does this definition compare with the one you created at the start of this section?

THINK!

What do you think Remote Sensing is all about? Create another working definition that you can modify as you consider this section.

DO THIS: Background investigation

1. Investigate the URL - **http://www.cla.sc.edu/geog/rslab/rsccnew/fmod1.html** - to find out:

    - How remote sensing is used

    - How remote sensing works

    - What devices are used to collect data

    - How the collected data is analysed

2. From what you now know of RS - list the reasons you think it might be useful for environmental management. As you work through this theme see if you can add to the list.

THINK!

How would you now define RS? How does this definition compare with the one you wrote at the start of this section?

THINK!

How do you think the integration of GIS and RS technologies can help landscape ecologists? Share your ideas on Talkline.

DO THIS: Specific GIS uses

Use the two readings to identify how GIS was used in each study and its specific impact in an environmental context.

Use the table to record your results.

Reading	Use of GIS	Environmental application
Goodchild		
Haines-Young et al.		

2. Data concepts and issues

DO THIS: Justifying raster or vector

Imagine that your colleague has been strongly arguing that vector is the only way to go for the new GIS you are designing. Your output will be mainly for scientific enquiry and needs great accuracy, and your input will mainly be digital images requiring complex analyses.
Is your colleague correct? Explain here then discuss on Talkline if you wish.

DO THIS: Researching suppliers   WHY?

Which of the suppliers listed would be likely sources of vegetation, geological and species data for the 'Top End' ?

Look at the relevant web sites and identify
1.   How much it would cost

2.   Who you would need to talk to in order to acquire the data.

Share your findings on Talkline.

DO THIS: Summarising referencing   WHY?

List the reasons why it is important to georeference the data you use in a GIS and identify how GPS can help.

THINK!

How can metadata help with managing data quality in a GIS? You might like to discuss this in Talkline.

DO THIS: Predicting error

What errors you might encounter in your GIS if you were setting up an environmental GIS that made use of classified satellite imagery, data typed in at the keyboard and a digitised land cover map?

What might the implications be for your output after analysis if you don't try to reduce these errors?

DO THIS: Finding the error source

Classify each of the following errors according to the sources identified above.

1. Two data layers overlayed on one another in the GIS with boundary feature that are common to both that are mis-aligned and don't sit perfectly on top of each other.

2. a GIS map with no legend

3. a numerical attribute that has been rounded up too much for the detail required in analysis

4. a mis-labelled land cover parcel

5. a property boundary that is in the wrong location

6. a mis-classified pixel

DO THIS: Managing error and uncertainty

Think of the sources of error and uncertainty in remotely sensed data. List the ways suggested by Aspinall and Pearson to describe and manage this uncertainty.

You may like to use Talkline to discuss the usefulness of the approach taken in the reading.

DO THIS: Review database structures

1. List the differences between hierarchical, network, relational and object oriented database structures.

2. Which of these do you think might be the best for use in a GIS?

Setting up a GIS

DO THIS: Investigating a real GIS

To gain a practical insight into how to set up a GIS, turn to the final case study about the identification of suitable nesting sites for saltwater crocodiles in the Top End.
Identify the stages that need to be followed, with any associated details which you think could be useful.

Note your ideas in the table.

Stage	Details

THINK!

What are some of the things you could do as a manager to help the integration of people and GIS technology go smoothly?

3. Using GIS

THINK!

Which of these functions do you think are important for environmental applications?

Which of these help address the sort of spatial and temporal analysis discussed in Theme 1?

DO THIS: Relating functions to purpose

List some of the possible functions you might need to use if you wanted to look at the distance between patches and produce a map of your results.

DO THIS: Real questions and answers

Skim read Case Study 3 about landscape functioning in the Kidman Springs area of the Northern Territory. Think about the questions and answers this GIS addresses.
List the emphases.

	Kidman Springs Case Study
Data	
Data patterns	
Data predictions	

THINK!

How might data uncertainty in your GIS affect the usability of an environmental model? Comment on Talkline if you want.

DO THIS: Internet research

Think about other possible environmental modelling applications of GIS. Then, do a simple search on the Internet using 'environmental modelling and GIS.' What do you find? Bookmark any interesting findings (they may be useful for Theme 3).

DO THIS: Applying spatial analysis

Revisit the crocodile nest case study. Would spatial analysis of landscape pattern help find suitable habitat for crocodile nests? Explain.

DO THIS: Using Patch Analyst

Read the Kidman Springs case study. Do you think that the patch statistics applied using Patch Analyst and ArcView give a useful description of patterning in this landscape? How effective would the description be without it?

Applications

DO THIS: Possible applications   WHY?

Read through this list and use your e-journal to jot down how you think the GIS could be used for each of these landscape ecology applications

- Natural resource management

- Wildlife habitat modeling

- Wetland restoration

- Forest management

- Fire management

- Coastal management

- Fisheries management

- Recreation resource management

- Floodplain management and flood control

- Aquifer and groundwater management

DO THIS: More possible applications

Return to the list you created. Jot down any further applications that could be explored.