

ENV101 EARTH SYSTEMS

Practical Exercise 12 – Ecosystems and Biomes

1. OVERVIEW

This practical is designed to give students an overview of global biomes and ecoregions, as well as to start to look at the patterns of vegetation within these regions and how they have been affected by European settlement. The ability to analyse multi-temporal data is an important aspect of GIS, and helps aid understanding of various environmental processes as they occur through space and time.

1.1. Learning Outcomes

After completing this practical, students will be able to:

1. Describe the characteristics and distribution of global biomes;
2. Link the effects of temperature and rainfall with the patterns of ecoregions in Australia;
3. Analyse the change in vegetation distribution pre- and post-European settlement in Australia;
4. Summarise Australian vegetation types with respect terrestrial ecoregions as delimited by The Nature Conservancy.

1.2. Preparation

External students:

- Ensure that you have installed and licensed the ArcGIS 10 software from the CD that you received in the mail.
- Create a folder (e.g. Prac12) on your C drive on your home computer where you can store all the files and folders for this class. Regardless of the location, note that it is not good practice to use spaces in file or folder names. Instead, use an underscore to give the effect of a space between words.
- Copy all the data required for this tutorial from the CD you received in the mail, or download from week 8 of the ENV101 companion site <http://learnline.cdu.edu.au/units/ses101/materials.htm>, into the folder that you have just created. Hereafter this folder will be referred to as your *working directory*.

Internal students:

- Create a folder (e.g. Prac12) for today's practical on the desktop, your personal student folder (G:\ENV101\sXXXXXX), or a personal memory stick/hard drive. Hereafter this folder will be referred to as your *working directory*.
- Copy all the data required for this into the folder you created above (e.g. Prac12).
- If you are working in the GIS/RS lab, you can either work from the student server (slow, but will be backed up), your personal hard drive or your desktop (faster, but will NOT be backed up and all data will be removed on logout). If you are working from the desktop, you should copy your work onto a memory stick or the student server at the end of the session BEFORE logging out.

1.3. **Required data**

Prac12-Ecosystemsandbiomes.mxd

Arcview/ArcMap project file containing pre- and post- European vegetation data layers.

Pre_european_veg

Shows a reconstruction of natural vegetation of Australia as it probably would have been in the 1780s. Areas over 30 000 hectares are shown plus small areas of significant vegetation such as rainforest. Attribute information includes growth form of the tallest and lower stratum, foliage cover of tallest stratum and dominant floristic type.

Source: Geoscience Australia

Post_european_veg

Shows vegetation of Australia in the mid 1980s. Areas over 30 000 hectares are shown plus small areas of significant vegetation such as rainforest and croplands. Attribute information includes growth form of the tallest and lower stratum, foliage cover of tallest stratum and dominant floristic type.

Source: Geoscience Australia

TNC_terrestrial_ecoregions shapefile

Major Habitat Type Name as defined by World Wildlife Fund (Olson, D. M. and E. Dinerstein, 2002) – Broad kinds of ecoregions that: a) Experience comparable climatic regimes; b) Have similar vegetation structure; c) Display similar spatial patterns of biodiversity; d) Contain flora and fauna with similar guild structures and life histories; e) Have similar minimum requirements and thresholds for maintaining certain biodiversity features; and f) Have similar sensitivities to human disturbance. Acquired from <http://conserveonline.org/workspaces/ecoregional.shapefile>

2. **GLOBAL BIOME DISTRIBUTIONS AND CHARACTERISTICS**

Work through the interactive tutorial exercise at

http://bcs.whfreeman.com/thelifewire9e/default.asp#542578_640244

Click on the 'biome data' button to access the database. Read the information and look at the links on the bottom, including temperature, precipitation, biological activity, composition and photos. Don't forget to complete the short Quiz at the end.

(Note: The link might take some time to load. If it doesn't load you might need to update your version of Adobe Shockwave Player or use another internet browser such as Mozilla Firefox)

Q1. Summarise the information provided about the major terrestrial biomes in Australia. Note that the graphs provided for temperature, precipitation, and biological activity are based on northern hemisphere data, so exhibit the inverse pattern of what we would expect in Australia. Account for this inversion in your answer.

3. ECOREGIONS IN AUSTRALIA

Open the ArcMap project file Prac12-Ecosystemsandbiomes.mxd.

You will see that it just contains 2 layers in it – pre and post European settlement vegetation. However, also in the data folder for this week is an additional layer derived from the Nature Conservancy Terrestrial Ecosystems.



Click the 'add data' button and navigate to the data folder for this week and select the TNC_Terrestrial_Ecoregions shapefile.

Choose appropriate colours for the display of each category. To do this, **Right click on the layer name** in the table of contents and go to **Properties** → **Symbology**. Click on **Categories** → **Unique value** on the left hand side of the properties dialog box, then click **Add all values** (down the bottom of the dialog box) Change individual colour patches as appropriate by double clicking on them.

Read the following information about the ecoregions found in Australia
<http://www.environment.gov.au/parks/nrs/science/bioregion-framework/terrestrial-habitats.html>

Q2. Based on your knowledge of temperature and rainfall patterns from previous practical exercises, discuss how these affect the spatial distribution of ecoregions across Australia.

4. LOOKING AT CHANGE OVER TIME

Have a closer look at the layers representing Pre- and Post-European settlement vegetation distribution across Australia.


Right click anywhere in the main toolbar region and select Effects


This will bring up the 'Effects' toolbar, giving you a couple of new tools with which to experiment.



Firstly, you need to be aware of the layer to which you are applying a set effect. In the above figure, you can see that I have chosen the Post European Veg layer. You can use the drop down arrow to change this at any time, but remember that you should apply your effects to the top most layer in your table of contents, otherwise you will not be able to see the changes (i.e. they will be hidden by another layer sitting on top of them).

Make sure that both your Pre- and Post-European vegetation layers are 'ticked on'. And the TNC layer is ticked 'off', or is at the bottom of the list in the table of contents.

 **Use the Swipe tool** from the Effects tool bar to swipe the layer backwards and forwards (or up and down) like a curtain over the lower layer. This will allow you to interactively determine differences between your two datasets.

 Try using the transparency tool from the effects toolbar to adjust the transparency of your selected layer. This will allow you to see differences in vegetation types and boundaries between your data sets.

Q3. Describe the patterns of change that you see between the Pre- and Post-European Vegetation distributions. Why do you think these patterns are evident?

Q4. Summarise the main vegetation types (Post-European) that exist within the TNC Terrestrial Ecoregion layer