Theme: Reference Ecosystems and Evaluating Progress.

**A local reference site may not always be available to inform decision making, especially in highly fragmented or disturbed landscapes. (See National Restoration Standards** [**Principle 1**](http://seraustralasia.com/standards/principle1.html)**.) In such cases it is usual to develop a model of a ‘reference ecosystem’ from multiple sources of information such as has been done in the seven Australian cases listed below, which are featured on regenTV.**

Further information is available in National Restoration Standards <http://seraustralasia.com/standards/contents.html>

# Exercises Overview.

Visit the regenTV site - <http://www.aabr.org.au/regentv/>

Once you have viewed a subset of the following regenTV videos, undertake the following exercises that will help you better understand how a **reference ecosystem** is identified for a project and how that information can help inform the development of project targets, measurable goals and objectives. (Note that further information is available in the online reports listed in the right hand column of Table 1 below)

**Table 1.** List of regenTV videos relevant to this topic and their corresponding online reports.

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| regenTV VIDEOS | OTHER ONLINE INFORMATION |
| Large scale reconstruction of semi-arid ecosystems in south-west Western Australia.  Justin Jonson. | <https://site.emrprojectsummaries.org/2016/03/07/peniup-ecological-restoration-project/> |
| Restoration, Regeneration and Resilience in the tropics.  Nigel Tucker.  | <https://site.emrprojectsummaries.org/2016/03/05/donaghys-corridor-restoring-tropical-forest-connectivity/>  |
| Eastern Suburbs Banksia Scrub Restoration and management at North Head Sanctuary, Manly, NSW. Peter Jensen..  | <http://www.aabr.org.au/eastern-suburbs-banksia-scrub-restoration-and-management-at-north-head-sanctuary/>  |
| Planning, implementation and results of a constructed saltmarsh at Penrhyn Estuary, Port Botany. Peggy O’Donnell, Geoff Sainty and Mia Dalby-Ball.  | <https://site.emrprojectsummaries.org/2016/03/07/penrhyn-estuary-habitat-enhancement-plan-habitat-rehabilitation-for-migratory-shorebirds-in-botany-bay-nsw/>  |
| Helping Saltmarsh Recover in the Hunter River Estuary, NSW. Peggy Svoboda.  | <http://www.aabr.org.au/kooragang-wetland-rehabiltiation-project/>  |
| Cook’s River naturalisation, Sydney. Dan Cunningham. . | <https://site.emrprojectsummaries.org/2015/02/08/cooks-river-naturalisation-sydney-nsw-australia/>  |
| Integrating remnant regeneration, regrowth and plantings across an agricultural landscape: Big Scrub Rainforest, northern NSW: Mike Delaney | <http://www.aabr.org.au/20-years-of-restoring-the-big-scrub-rainforests-big-scrub-landcare/>  |

## Activity 1:

For one or more case studies you have examined (via video and online reports), enter into the middle column of Table 2 any of the sources of information on the topics (listed in left column) that the managers of the projects (listed in the right column) drew upon to develop the project’s **reference ecosystem.**

**Complete Table 2** for as many of the 6 ecosystem attributes as you can. If direct information is not available in the video or other online reports, you can suggest likely sources of information.

**Table 2.** Information sources for reference ecosystem models for a range of Australian restoration projects.

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| ATTRIBUTE CATEGORY | INFORMATION SOURCES, DATA COLLECTED | CASE STUDY EXAMPLES(Location-Author) |
| ATTRIBUTE 1. Absence of threats |
| Over-utilisationEcological understanding, historical records, local observation. |  | Big Scrub Rainforest - Delaney |
|  | North Head Sanctuary - Jensen |
|  | Kooragang Island - Svoboda |
| Invasive speciesRegional land use maps, property maps, historical records, local observation. |  | Big Scrub Rainforest - Delaney |
|  | North Head Sanctuary – Jensen |
| PollutionLocal knowledge, soil and water analyses |  | Kooragang Island – Svoboda |
|  | Cooks River – Cunningham |
|  | Penrhyn Estuary – O’Donnell |

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| ATTRIBUTE 2. Physical conditions |
| Substrate - physicalUnderlying landform stability, contours, fauna movement paths, historical records, aerial photography, Agency records |  | The Tropics – Tucker |
|  | Western Australia – Jonson  |
|  | North Head Sanctuary – Jensen |
|  | Kooragang Island – Svoboda |
|  | Penrhyn Estuary – O’Donnell |
| Substrate – chemical Local knowledge-farmers, Soil analysis, Gamma radiometrics, Acid-sulfate soil analysis |  | Western Australia – Jonson |
|  | Kooragang Island – Svoboda |
|  | Penrhyn Estuary – O’Donnell |
| Water chemo-physical Local knowledge‐farmers, Soil analysis, Gamma radiometrics, Acid Sulphate Soil analysis |  | Kooragang Island – Svoboda |
|  | Penrhyn Estuary – O’Donnell |
|  | North Head Sanctuary – Jensen |

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| ATTRIBUTE 3. Species composition |
| Desirable plantsRemnant vegetation maps, botanical surveys, local vegetation maps, regional revegetation guides, local area observation, local experts, |  | Western Australia – Jonson |
|  | North Head Sanctuary - Jensen |
|  | Kooragang Island - Svoboda |
|  | Cooks River - Cunningham |
|  | Big Scrub Rainforest - Delaney |
| Desirable animalsLocal area observation, bird surveys, fauna surveys, threatened species listings, International agreements. |  | The Tropics – Tucker |
|  | Kooragang Island - Svoboda |
|  | Penrhyn Estuary - O’Donnell |
| No undesirable speciesLocal area observation, weed maps, previous project reports, local/network knowledge |  | Western Australia – Jonson |
|  | North Head Sanctuary - Jensen |
|  | Kooragang Island - Svoboda |
|  | Big Scrub Rainforest - Delaney |

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| ATTRIBUTE 4. Community Structure |
| All vegetation strataLocal area observation, local lists, understanding of disturbance and succession,  |  | Western Australia – Jonson |
|  | North Head Sanctuary – Jensen |
|  | Kooragang Island – Svoboda |
|  | The Tropics – Tucker |
|  | Big Scrub Rainforest – Delaney |
| All trophic levelsLocal observation, historic species lists, adjacent area lists, understanding of food chains and webs.  |  | The Tropics – Tucker |
|  | North Head Sanctuary – Jensen |
|  | Penrhyn Estuary – O’Donnell |
|  | Kooragang Island – Svoboda |
| Spatial mosaicRegional landuse maps, property maps, historical records, local area observation. |  | Western Australia – Jonson |
|  | North Head Sanctuary – Jensen |
|  | Kooragang Island – Svoboda |
|  | Cooks River – Cunningham |
|  | Big Scrub Rainforest – Delaney |

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| ATTRIBUTE 5. Ecosystem function |
| Productivity, cycling Local knowledge, air photos, local experts, ecological studies  |  | The Tropics – Tucker |
|  | Western Australia – Jonson |
|  | Penrhyn Estuary - O’Donnell |
|  | Kooragang Island - Svoboda |
| Habitat provision and interactions Local knowledge ecological studies, local observation, disturbance history, EIS investigations |  | The Tropics – Tucker |
|  | Western Australia – Jonson |
|  | Penrhyn Estuary - O’Donnell |
|  | Kooragang Island - Svoboda |
| Resilience, recruitment Local knowledge, ecological studies.  |  | The Tropics – Tucker |
|  | North Head Sanctuary - Jensen |
|  | Penrhyn Estuary - O’Donnell |
|  | Kooragang Island - Svoboda |
|  | Big Scrub Rainforest – Delaney |

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| ATTRIBUTE 6. External exchanges |
| Landscape flows Local observation, vegetation mapping, air photos, local knowledge, fire history records, coastal changes records, tide records, ecological studies |  |  |
|  | The Tropics – Tucker |
|  | Penrhyn Estuary - O’Donnell |
|  | Kooragang Island - Svoboda |
|  | Big Scrub Rainforest – Delaney |
| Gene flowLocal observation, local experts, corridor mapping, air photos, ecological studies, genetic studies. |  | The Tropics – Tucker |
|  | Western Australia – Jonson |
|  | Penrhyn Estuary - O’Donnell |
|  | Kooragang Island - Svoboda |
| Habitat linksCorridor mapping, air photos, local experts, ecological studies, threatened species determinations, international agreements. |  | The Tropics – Tucker |
|  | Western Australia – Jonson |
|  | Penrhyn Estuary - O’Donnell |
|  | Kooragang Island - Svoboda |
|  | Big Scrub Rainforest - Delaney  |

Activity 2 (Best undertaken as a group exercise)

### Activity 2a

Select one of the case studies featured in the videos and ask yourself the question ‘what are the project managers using as measures of success of the project? ‘

Imagine you are evaluating the project and see if you can fill in right hand column of Table 3 with the sort of evidence you would be looking for to demonstrate that the site has reached a state where it is on a trajectory to full recovery. In some cases it might be mentioned in the videos, in some cases it might not. (This table is adapted from the table in [Appendix 5 of the Standards](http://seraustralasia.com/standards/appendix5.html).)

In developing your answers, refer back to what would be considered five-star recovery in the Standards ([Principle 4 – Table 2](http://seraustralasia.com/standards/principle4.html)) and try to express these in terms of measurable indicators. For a clearer idea of what might be a measurable indicator refer to the [Standards’ Appendix 4](http://seraustralasia.com/standards/appendix4.html).

***Do this for at least three of the six attributes.***

Activity 2b

During this exercise you will have noticed that identifying these ‘measures of success’ really needs to happen prior to starting the project where possible.

***In discussion with your group, come up with at least two important advantages for identifying clear targets, goals, objectives and indicators prior to the commencement of works.***

Activity 2c

To gain a deeper understanding refer to [Principle 3 in the Standards](http://seraustralasia.com/standards/principle3.html) .

***Discuss with your group how you might identify targets, goals, objectives and indicators at the start of a project.***

**Table 3** Evaluation of ecosystem recovery proforma

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| Evaluation of ecosystem recovery proforma |
| Date | Assessor |
|  | Site |
| ATTRIBUTE CATEGORY | INDICATORS OF FULL RECOVERY |
| ATTRIBUTE 1. Absence of threats |
| Over-utilisation |  |
| Invasive species |  |
| Pollution |  |
| ATTRIBUTE 2. Physical condition |
| Substrate-physical |  |
| Substrate-chemical |  |
| Water-chemo-physical |  |
| ATTRIBUTE 3. Species composition |
| Desirable plants |  |
| Desirable animals |  |
| No undesirable species |  |
| ATTRIBUTE 4. Community structure |
| All vegetation strata |  |
| All trophic levels |  |
| Spatial mosaic |  |
| ATTRIBUTE.5 Ecosystem function |
| Productivity cycling etc. |  |
| Habitat and plant-animal interactions |  |
| Resilience, recruitment etc. |  |
| ATTRIBUTE 6.External exchanges |
| Landscape flows |  |
| Gene flows |  |
| Habitat links |  |