A new approach to rehabilitation monitoring and the determination of closure criteria

DnA Environmental have developed a unique methodology addressing most regulatory requirements associated with rehabilitation monitoring and the development of closure criteria. Importantly the monitoring program is tailored to meet the individual needs of the mine site and is designed to provide a set of relevant information that can easily be interpreted and replicated through time.

The methodology takes into account variations in seasonal and climatic conditions, post-mining land use and associated management practices, vegetation community and pre-mining disturbances of the local catchment area. It incorporates the use of clearly defined, repeatable and consistent methodologies for monitoring changes in various aspects of ecosystem function, succession and long-term sustainability.

The rigorous monitoring program involves:

- Undertaking simple, reliable and repeatable measurements in different aspects of ecosystem function and development;
- Establishing a range of relevant reference sites to compare and track the progress and inherent ecosystem function of rehabilitation areas;
- Selecting a range of suitable reference sites that reflect the desired final land use, biodiversity targets and local community expectations; and
- Undertaking a monitoring program that provides simple but informative and reliable information that indicates positive recovery trends or rapid detection of rehabilitation failure.

Establishing a rehabilitation monitoring program: What is monitored?

The monitoring methodology is a standard and simple procedure that can be easily replicated over any vegetation community or rehabilitation area and importantly results in a system that compares “apples with apples”. The methodology uses a combination of Landscape Function Analyses (LFA) and a rapid assessment of various ecosystem diversity and habitat values. Both methods were developed by CSIRO scientists.

LFA is a methodology used to assess key indicators of ecosystem function including landscape organisation and soil surface condition as a measure of how well the landscape retains and uses vital resources. Results are compiled to produce three indices of ecosystem function including stability, infiltration and nutrient recycling ability.

The rapid ecological assessment provides quantitative data that measures changes in floristic diversity including species area curves and growth forms, ground cover diversity and abundance, vegetation structure and habitat characteristics (including ground cover, cryptogams, logs, rocks, litter, projected foliage cover), understorey density and growth (including established shrubs, direct seeding, tubestock plantings and tree regeneration), overstorey characteristics including tree density, health and survival and other habitat attributes such as the presence of hollows, mistletoe and the production of flowers and seed. Permanent transects and photo-points are established to record changes in these attributes over time.

The monitoring program provides a measure of changes occurring within the revegetation areas and simultaneously compares them to a range of relevant reference sites.

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Selecting relevant reference sites is fundamental

As specialists in restoration ecology, DnA Environmental utilise a range of reference sites that will best reflect the post-mining ***landuse*** of the rehabilitation areas. Essentially, this dictates the type of ***vegetation community*** that will need to be established and the final ***management regime*** that it will be subjected to. The methodology also considers the ***condition*** of the reference sites as it has a significant bearing on the composition, structure and function of the community and subsequently its long-term sustainability.

DnA endeavour to select reference sites that will provide a realistic set of data that will form the basis of ***achievable*** closure criteria in the context of the local environment. The appropriate selection of reference sites can therefore provide:

- A series of revegetation benchmarks. That is, revegetation areas can be compared to sites with a history of disturbance through to relatively undisturbed sites, in the local context;
- A record of changes in community structure and function under different management regimes, climatic conditions or disturbance events. For example the final landuse may be a grazed pasture or woodland area therefore the closure criteria also should reflect this planned disturbance event; and
- A range of data from representative ecosystems in the local area thus assisting with the planning, implementation and maintenance of revegetation projects.

The monitoring program in summary

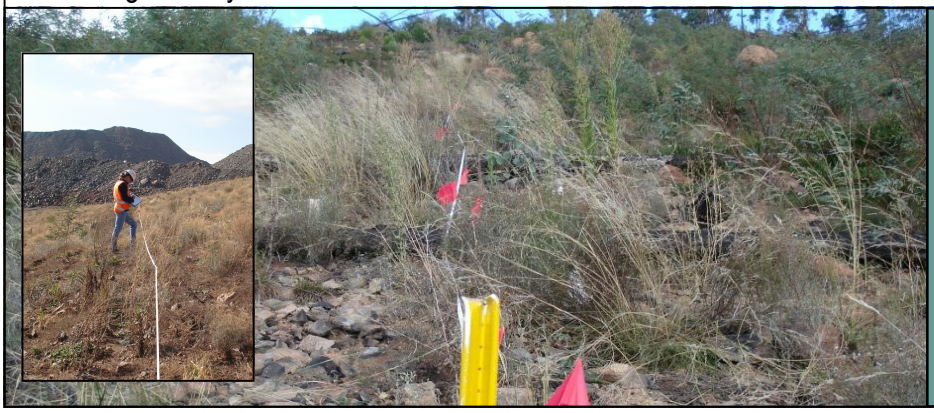
1. Data obtained from the reference sites will provide a range of values that are obtained from replicated examples of representative ecological communities.
2. Rehabilitation areas will be matched to the reference sites that best represents the 'final landuse community" and the management conditions it will be subjected to.
3. Simultaneous monitoring of the reference sites to recognise the dynamic nature of ecosystems and to account for changes in climatic conditions, and planned and unplanned disturbance events.
4. Selected closure indicators will be expected to equal that or exceed values obtained from the reference site under the same set of conditions or demonstrate a positive trend towards target values.
5. The program fits neatly within the proposed "hierarchy of ecosystem succession" model against which revegetation and mine closure is likely to be assessed by regulators in the near future. It also addresses the range of technical issues associated with revegetation and ecological succession highlighted in reports produced within the mining industry.

Why is the program unique?

The monitoring program considers many ecological impacts and processes associated with past landuse and future rehabilitation objectives. In particular it establishes criteria by utilising "real" data from "real" ecosystems, thus providing realistic revegetation milestones and goals in the context of the local pre-mining environment under a range of different disturbance and historical events. The program is simple, repeatable and consistent and is specifically designed to meet the individual requirements of the mine site.

About DnA Environmental

DnA Environmental is a small environmental consultancy based near Orange in the Central West of NSW. Established in March 2007, Donna and Andrew have collectively over 46 years of experience and offer a range of services related to mine rehabilitation and the management of natural resources.



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