Principles for Restoring Landscape Resilience

1. **Increase the extent of native vegetation** with an appropriate species mix and sufficient structural complexity that it provides habitat for a range of flora and fauna.

2. **Repair ecosystem processes**: e.g., nutrient cycling, retention of water and limiting resources, soil stability, pollination, gene flow, animal movement by - revegetation (natural regeneration, direct seeding, tubestock), management actions such as strategic grazing, fire management, soil manipulation, landscape engineering, control of aggressive or invasive species, and maintaining keystone habitat features (e.g., paddock trees, fallen logs, deep pools in streams).

3. ***Protect – Improve – Enhance – Reconstruct***
   Protect: maintain existing native vegetation through fencing or sympathetic management.
   Improve: improve quality of existing native vegetation by removing or controlling threatening processes (e.g., weeds, feral animals, firewood collection, inappropriate fire regimes).
   Enhance: supplement and enlarge existing patches of native vegetation through revegetation of habitat gaps or buffers (particularly around sensitive areas such as riparian zones).
   Reconstruct: create new patches of native vegetation through replanting or manipulation of physical processes to promote natural regeneration. Priority should be given to reconstructing large patches of under-represented vegetation classes.

4. **Build spatial variation** (i.e. patchiness) and landscape heterogeneity - seek variety in patch types, patch shape and size (though larger patches are preferred), patch boundaries and landscape position.

5. Revegetation - seek to **simulate natural processes** by representing original Ecological Vegetation Classes and functional vegetation types (e.g. nectar, seed and fruit producing plants).

6. **Promote continuity of vegetation along environmental gradients** (e.g. rainfall, geographic, altitudinal, topographic). Connectivity at this scale is important to allow movement in response to changes in resource availability over time, natural catastrophes and climate change.
7. Strategies to **counter habitat fragmentation** (i.e., restore landscape connectivity):
   i. **Expand area** of existing remnants.
   ii. **Increase number of patches** through reconstruction, particularly between existing patches of native vegetation.
   iii. **Create landscape linkages**, including corridors (linear strips that link patches of native vegetation) and stepping stones (small patches located between existing native vegetation)
   iv. **Amalgamate nearby patches** to form a single larger patch.
   v. **Reduce the hostility of the matrix** to native fauna by 'softening' boundaries between landscape elements, maintaining habitat elements in the matrix (e.g., paddock trees, fallen logs, rocks), strategic arrangement of different land-use types, reducing intensity of land-use across the landscape (for example, increasing the area of native pastures) and incorporating refuge areas in high land-use intensity zones.

Guidelines for Landscape Linkages

1. Clearly define biological purpose of linkage in terms of target species or faunal groups, spatial (i.e., extend over what distance) and temporal (i.e., used over what timeframe) scale and ecological function (e.g., seasonal migration, access to irregular resources, natal dispersal).

2. Consider design, dimensions, vegetation type and management required to meet purpose. Knowledge of ecology and behaviour of target species is helpful here.

3. Retain existing natural links where possible ……..rather than create new habitat.

4. Connectivity is more than 'wildlife corridors'. Stepping stones, increased permeability of non-habitat, alternative land-uses and ephemeral links may also achieve desired outcomes.

5. Ensure habitat quality and diversity in linkages is suitable for target species. Wildlife will not enter linkages if quality is poor, even if destination is pristine.

6. Structural priorities for landscape linkages:
   i. The wider the better – ultimate test is the maintenance of connectivity. Aim for twice the width of edge effects (e.g. light penetration, habitat structure differences, floristic composition, weed invasion) to ensure there is some 'interior' habitat.
   ii. Longer linkages must be wider to provide 'habitat for the journey' (i.e. increased resources).
   iii. Including nodes (small patches built into the linkage) increase use by wildlife but do not negate the need to maximize the width to length ratio.
   iv. Where appropriate, fill in gaps in existing linkages.
7. Location priorities for landscape linkages:
   i. Follow natural movement pathways if known – e.g. migratory routes, daily foraging patterns.
   ii. Follow natural environmental features – rivers, creeklines, drainage lines, ridges, and gullies but attempt to incorporate all habitat types (multiple paths) in one or several links. These are often irregular rather than straight lines between two patches.
   iii. Include existing natural vegetation, where possible.
   iv. Unique or irreplaceable linkages should be afforded highest priority (but network of multiple connections usually functions more effectively).
   v. Locate away from sources of human disturbance, including freeways / roads.
8. Design linkages that enable passive wildlife recolonisation. That is, recognize that restored sites must be colonised from existing source habitats. Thus, providing links to known or potential source populations is critical to success. Habitat quality in recipient patch must also be adequate to support populations of target species.
9. Monitor success of linkage against original objectives. Can effectiveness be increased through adaptive management (e.g. provision of nest boxes, habitat manipulation, or increased width)?

Ref: "Effective Landscape Restoration for Native Biodiversity in Northern Victoria" Jim Radford, Jann Williams & Geoff Park NCCMA 2006