REVEGETATION TECHNIQUES

Revegetation is an important tool in helping to restore the landscape back to its original (or as close to) state prior to disturbance. This can be achieved through a natural process of regeneration, direct seeding or replanting using endemic (local) plant species. This information sheet focuses primarily on techniques for replanting. For more information, see the Landscape and Revegetation Guidelines.

Revegetation techniques

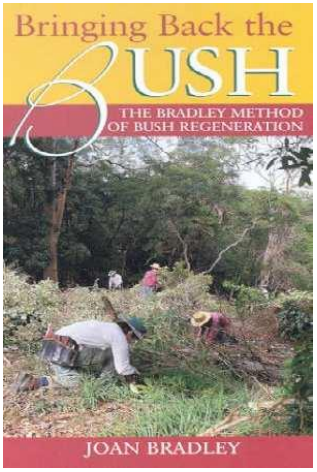
When planning your revegetation project, it may be beneficial to contact the Shire's Environmental Service officers to discuss which technique or combination of techniques will give the best results.

Revegetation can assist to:

- Restore wetlands and watercourses (eg. rivers, streams and creeks) to improve wildlife habitat, water quality and reduce erosion;
- Restore degraded land to create wildlife corridors linking patches of remnant bushland;
- Restore bushland to improve wildlife habitat and reduce weed invasion and erosion.

There are three main revegetation techniques – they can be used individually or in combination depending on the site requirements:

- Regeneration;
- Direct Seeding;
- Replanting.



Following the Bradley method of bush regeneration, aim to restore the best areas first. Remove weeds and protect the areas that are in the most natural state, and then restore adjacent more disturbed areas. As weeds are removed they can be replaced with direct seeding or replanting where natural regeneration is unlikely.

Natural regeneration

Natural regeneration allows the natural regrowth of native vegetation from the existing native plants and seed banks in the soil. Natural regeneration may be preferred to replanting if the regrowth is a good representation to what was growing at a site before it was disturbed.

Regeneration may only be appropriate in some areas, where topsoil is intact and contains enough viable native seed in the soil. It may not be suitable for areas that have been subjected to long term disturbances such as weed invasion (where

regrowth will be mostly weeds). When relying on this technique, surveys should be conducted to assess richness and diversity of native species. If either is lacking then regeneration must be supplemented with direct seeding and/or replanting.

Direct seeding

This involves the sowing of seeds, either by hand or machine, directly to a rehabilitation area. Direct seeding is considered more cost and labour efficient than planting (excluding the time for seed collection). It allows for a higher plant density, which provides shelter for seedlings and reduces the potential for weed intrusion. Direct seeding also results in a more natural mix of trees, shrubs and groundcovers than can be achieved through planting seedlings. Weed management can be challenging where direct seeding is applied due to the sporadic nature of seed germination.

Recommended sowing rates to ensure successful revegetation vary from 400 to 1000 grams of seed per hectare. There can be differences in the germination rate between species, so the following guide is recommended:

Species type	**Recommendation per hectare**
Eucalypt species	50-100 grams per species
Acacia and large seeded species	50-100 grams per species
Other species	25-50 grams per species

Seed can be bought from commercial providers or collected by hand. If you are planning to collect seed from outside your own property, contact the DBCA's Department of Parks and Wildlife to obtain a seed collectors permit. All efforts should be made to obtain local seeds close to the revegetation site.

Replanting

This involves the direct planting of native seedlings from tube stock or transplanting native plants from one area to another. Tube stock are plants that are grown in narrow nursery pots to encourage good root development prior to planting. Tube stock plants are generally smaller and less expensive than advanced (older) stock and therefore well suited for larger revegetation projects.

Native tube stock can be sourced from your local nursery or from the Shire's Seedlings for Landcare Program.

Plant seedlings in clumps, if possible, and mix trees and understorey. This provides a greater range of habitat and diversity. The ratio of trees to shrubs and groundcover plants, and their densities will depend on the type of vegetation community being created and/or specific requirements or limitations of a site. As a general rule, for restoring bushland environments, a

20% overstorey of trees and an 80% understorey of shrubs and ground covers is suggested. However, this may need to be altered depending on other factors such as bushfire safety requirements.

The following densities are recommended as a general guide when replanting is used as the sole revegetation technique, but may need to be adjusted to suit local conditions.

Category	**Height**	**Density**
Groundcovers and climbers	<0.5m	1 per 2sqm
Small shrubs	<1.0m	1 per 5sqm
Medium shrubs	1-3m	1 per 8sqm
Tall shrubs	>3m	1 per 10sqm
Trees	>3m	1 per 10sqm
Sedges and rushes	1-2m	1 per 1sqm
Grasses	0.5-2.0m	1 per 1sqm

Replanting techniques

Plant your seedlings during or immediately following the first rains (for wetlands and waterlogged areas, planting may best be done when soils are no longer inundated. Some wetland species such as sedges can tolerate waterlogged soils).

Once replanting is completed, the major threats to seeding survival are:

- Lack of water (drought);
- Too much water (waterlogging);
- Weed invasion;
- Grazing/trampling;
- Lack of adequate nutrients (fertiliser);
- Phytophthora dieback.

<u>Site preparation</u>

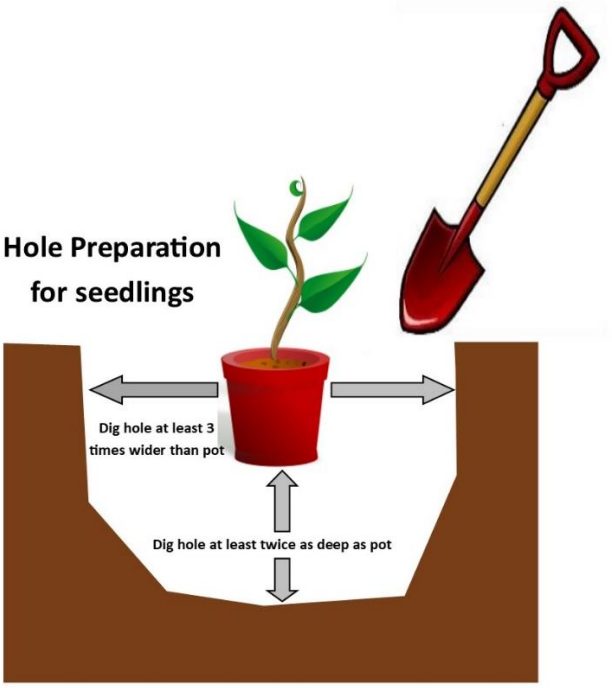
Before undertaking any revegetation, site preparation is an essential part of ensuring success. A well prepared site will enable you to better manage newly established vegetation and ensure greatest seedling survival.

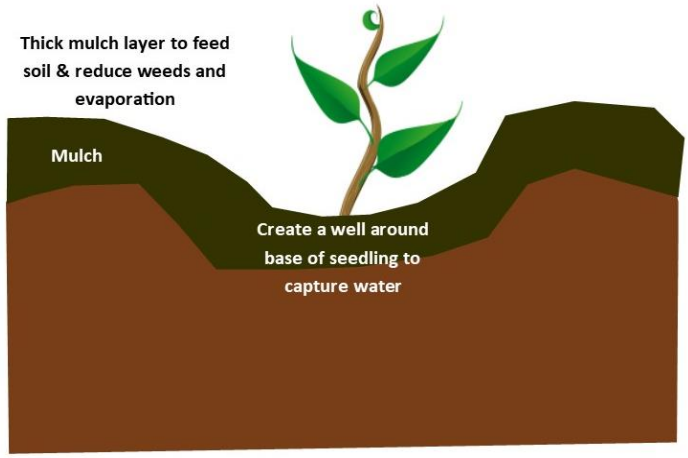
Good site preparation will:

- Reduce competition from grasses and weeds;
- Help build soil moisture;
- Provide the best opportunity for rainfall to infiltrate the soil;
- Allow for rapid and healthy root development.

The following activities are recommended as a minimum for site preparation. Note: not all activities will be suitable for all sites.

Activity	Details
Ripping and mounding	 Best suited for large scale plantings in cleared areas (e.g. planting shelterbelts in paddocks). Ripping and mounding can help to control erosion if done correctly. Deep ripping the soil prior to planting or applying direct seed helps relieve soil compaction and allows for better water infiltration, root penetration and establishment. Ripping is undertaken with a machine and a ripping tine. Do not rip in areas prone to erosion, e.g. down slopes or where existing native vegetation may be damaged as a result.  Mounding is undertaken in areas prone to waterlogging, it is also done by machine to create lines of mounded soil raised above the ground level into which seedlings are planted.
Weed control	 Weeds and grasses rob young seedlings of moisture, nutrients and light. The less competition your seedlings have, the better their chance of survival. Remember — your new seedlings only have a short amount of time to settle in before the hot summer months. Weed control should be done before, during and after revegetation. Removing and controlling weeds will prevent them from out competing native seedlings which can result death of seedlings. It is important to consider the types of weeds being controlled, site features (existing vegetation, watercourses) and eradication or control methods, frequency and timing.

	The Plants Out of Place booklet provides details on weed control options for common weeds in the Shire.
Hole preparation (for replanting)	The key to survival is to dig a hole several times deeper than the seedling container (pot) depth. The deeper the hole and the looser the soil, the easier it will be for the young seedling roots to find their way down and seek out moisture that will sustain the plant during the hot summer months. Use a shovel or trowel to dig a hole 3 to 4 times as wide as the container. The depth of the hole should be at least twice the depth of the container. Place the seedling (minus the plastic pot) in the middle of the hole, taking care to ensure the root collar sits at or just below ground level.  If the soil is dry, soak the hole with water. If planting with native tube stock, soak your seedlings in a shallow dish of water (or water them using a watering can or hose) to assist in removing them from the pots. Hold the tube upside down (using fingers to prevent seedling falling out) and gently squeeze or tap the plant and root ball out of the tube. If the roots are coiled and only if the plant is pot bound, gently tease out the roots (but do not tease dry roots this can damage them). Make sure the tap root for trees is straight. If the plant is not pot bound, do not interfere with the root system as some plants, e.g. Hakeas are sensitive to root disturbance.

	Place seeding in the centre of the hole and back fill with soil, loosening any compacted soil as you go. Once backfilled, gently press the soil down around the root ball to get rid of any air spaces in the soil. To optimise water retention, create small well (depression) around the root collar area of seedling that is lower than ground level, to help capture and hold water around the seedling.
Mulch	**Hole Preparation**  Mulching helps retain moisture in the soil, feeds the soil, supresses weeds and lowers soil temperature. It also helps build soil health as it breaks down and feeds soil bacteria. Ensure mulch is certified free from dieback to avoid introducing dieback onto your property (which kills many native plants). When spreading mulch, do not allow the mulch to lie or build up against the seedling stem (trunk) as this can cause collar rot.
Soil improvement	 Assess the condition of the soil to see if compost, fertiliser and/or a soil wetting agent is required for the successful establishment of seedlings. Use caution when using fertilisers with some natives such as Grevilleas, Hakeas, Banksias and Proteas, which are sensitive to phosphorus. Native plant and low phosphorus controlled release plant food formulations are available. Frosts are a problem in some areas. If fertilising plants, do not use until danger of frosts is over. Fertiliser encourages fresh young growth which is susceptible to frost damage. An upturned flowerpot placed over a seedling can protect it from

	frost overnight, but remember to remove the flowerpot in the morning.
Plant protection	 Tree guards or fencing may be required to prevent trampling or grazing of new seedlings. Empty milk cartons can be made into plant protectors, or plastic or mesh tree guards are another option. A tip for protecting your seedlings from predation by kangaroos is to surround the young seedlings with sticks and twigs. Tree guards or empty milk cartons can be used to protect plants from rabbits. Weigh the opened flaps of the milk cartons down with stones. Alternatively, scramble up to six eggs in one litre of water in a sealable container (a plastic two litre milk container is perfect) and leave out in the sun for two weeks. Add 125ml of white acrylic paint and shake well. Spray onto the stems of any plants that are under threat from rabbits and kangaroos – repeat as often as necessary (usually when the paint fades). In addition protect with wire tree guards and sprinkle blood and bone around the base of the plants. Stock and poultry should be fenced off from creek lines, and kept out of bushland and revegetated areas. Staking of semi-mature trees may also be necessary to give them additional support until they are established.
Watering	 Water your plants before you plant them. Ensure your plants are well watered in immediately following planting (half a bucket to a bucket or more per plant depending on size of plant, soil type etc). Determine how you will water plants following planting. Hand watering or installing irrigation are good options, depending on how much time you have, budget, location of plants, access to a water source etc.

	Plants and irrigation equipment should be monitored regularly, especially during summer. If you notice wilting or browning, these are signs of water stress. While it may not be necessary, an occasional thorough watering (½ to 1 bucket per plant) over summer is better than daily watering. It is important to encourage deep root development from the start. If all site preparation and planting went to plan at the time of planting, your plants may not require further watering but keep an eye on your plants and water at the first signs of stress.

Other considerations

Dieback

Revegetation activities have the potential to introduce and spread Phytophthora Dieback. The following procedures should be followed to minimise the risk of Phytophthora Dieback being introduced into dieback free sites and prevent the disease spreading from dieback infested sites to other sites:

- Seedlings: plant dieback free seedlings from Nursery Industry Accreditation Scheme Australia (NIASA) nurseries where possible.
- Mulch: mulch prepared in accordance with Australian Standard AS 4454-2012, and stored appropriately, will be dieback-free. Always check with the supplier or look on the bag for the Australian Standard label.
- Equipment: vehicles, tools, footwear, equipment and machinery should be clean and free of all mud and soil when entering and exiting the revegetation area.
- Undertake planting when the soil is moist, not wet.
- Water for plants should be from mains water supply. If from creeks or dams, it should be sterilised to kill dieback spores.

For more information on preventing and managing dieback, see the publication Managing Phytophthora Dieback in Bushland.

Road verges

Check with the Shire of Mundaring before undertaking planting on any road verge to ensure it is done in a safe and appropriate manner (eg. fire hazard, lines of sight, crossovers, location of underground services and overhead power lines need to be considered). For information on verges and local laws relating to verges visit the Shire's website at: https://www.mundaring.wa.gov.au/ResidentServices/InfrastructureWorks/Pages/Verges.aspx.

Services

Trees should not be planted underneath power lines or too close to houses. A minimum clearance of 8m is recommended. Use low shrubs or groundcovers under power lines. Check for underground services before planting and keep clear of septics, leach drains and water pipes.

Clearing vegetation

Creeklines, native vegetation and habitat trees are protected under the Shire's Local Planning Scheme No. 4. Most development affecting the natural environment will require planning approval. However there are exemptions for certain types of work (e.g. installing perimeter firebreaks to comply with bushfire requirements) or for smaller lots, where retaining bushland is not practical.

Some work may require State Government approvals as well as local government planning approvals. Clearing of native vegetation may require a clearing permit from the Department of Water and Environmental Regulation (DWER). Works in or near a watercourse (creekline or wetland area) may require a beds and banks permit from DWER. Clearing or development that affects protected native species, or the Helena River floodplain, may require separate approvals from the Department of Biodiversity, Conservation and Attractions. Clearing of federally protected habitats (including banksia woodlands and black-cockatoo habitat trees) may require referral to the Australian Department of the Environment and Energy.

If you are unsure whether your revegetation plans will require formal planning approval, it is best to contact the Shire's Planning and Environment Service. Clearing, or earthworks affecting watercourses without approval, may be an offence under the Planning and Development Act 2005.

For more information contact:

Bushland Reserves, Parks & Verges: Shire of Mundaring Operations Service – 9290 6716

Private Land: Shire of Mundaring Planning & Environment Service - 9290 6651