Light Mulching

EROSION CONTROL TECHNIQUE

Revegetation	✓	Temperate Climates	✓	Short-Term	✓
Non Vegetation	[1]	Wet Tropics	✓	Long-Term	
Weed Control		Semi-Arid Zones	✓	Permanent	

[1] When used in the absence of vegetation/seeding, light mulching can be used to provide temporary erosion control.

Symbol

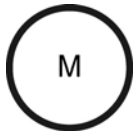

Photo 1 – Hydro-mulcher

Photo 2 – New grass emerging through light coverage of straw mulch

Key Principles

1. The primary function of light mulching is to achieve effective short-term erosion control through coverage of the soil surface, thus the effective percentage surface cover is the key application measure.
2. Operational performance is governed by the control of raindrop impact erosion and dust.
3. Primarily used in association with grass seeding to control raindrop impact erosion and reduce plant watering requirements.
4. Though applicable in all climates, straw mulching is particularly useful in areas where water conservation is critical, while *Bonded Fibre Matrix* is most useful during heavy rainfall.
5. Can be used as an alternative to grass seeding during times of severe drought; however, seed should be applied to the treated area prior to the return of erosive rainfall.

Design Information

Loose mulches such as straw are generally spread evenly to a maximum depth of 50mm.

Minimum 70 to 80% coverage of the soil surface (depending on location and soil type).

Application can be achieve over approximately 1 to 2ha/day per spreader unit.

The following application rates are provided as a guide only. Seek local expert advice.

Bonded Fibre Matrix (BFM)

Bonded Fibre Matrices are hydraulically applied mulches that perform a function similar to erosion control blankets once dry. They have a viscous bonding agent that dries to form a protective skin over the soil surface. Once dry, it often takes on the appearance of a thick layer of papier-mache.

Bonded Fibre Matrices contain long wood-fibre strands as the basis for their mulch. Mulch, glue, seed and fertiliser are all contained within the slurry. The process differs from hydromulching due to the incorporation of non-wetting glues, thus allowing better performance in wet environments. However, unlike hydromulch, the dry matrix is easily damaged by vehicular or pedestrian traffic, which allows water to enter under and detach the matrix.

BFMs typically require 12 to 24 hours to dry before they become fully effective.

Application rates vary from 4 to 6t/ha. Typically a minimum application rate of 5t/ha (0.5kg/m^2) is specified with a minimum 400kg/ha of non re-wettable (non re-wetting) tackifier.

Hydromulching

Hydromulching involves the spraying of a slurry mix consisting of seed, fertiliser, paper pulp (1.5 to 2t/ha) or wood pulp (not less than 2.5t/ha) and acrylic polymer or other tackifier (5 to 10% by weight). Generally the longer the fibre length the better for erosion protection. Typical tackifiers include: acrylic copolymer, guar, psyllium (refer to *Mulch Tackifier* fact sheet).

Hydromulching can be used for the establishment of grasses and some native shrub species.

Hydromulches can be sprayed directly from a truck up to 30 metres, or via hose extensions up to 100 metres (contact operator for specifics).

The seed generally sticks to the pulp, which improves the microclimate for germination and establishment. The rate of application should be between 30,000 and 40,000L/ha, or 2.2 to 3.4t/ha with a desirable minimum 80 to 100% cover.

Hydromulching can be problematic within the wet tropics, where the use of substances such as *Bonded Fibre Matrix* that incorporate non re-wettable glues may be preferred.

Sugarcane mulches are typically applied at rates of around 2 to 3t/ha of organic mulch with 40 to 60kg/ha of a tackifier mix on slopes up to 3:1 (H:V). Drying time is around 3 to 5 days, after which twice-daily watering commences as required (in the absence of sufficient rain). High pressure jet watering should not be used on hydromulch.

Straw Mulches

Straw has traditionally been the most commonly used mulch, particularly in conjunction with seeding. Other than in bushland areas, wheat or oat straw is usually suitable. The mulch should be dry when applied, weed-free with a low leaf content, and have a minimum strand length of 100mm.

Expected reduction in erosion rates are (Fifield, 2001):

- 75% at 1.1 tonnes/ha
- 87% at 2.2 tonnes/ha
- 98% at 4.5 tonnes/ha

Application rate of 200 to 300 bales per hectare, or 2.2 to 5t/ha (machine placement), or 1 bale per 25 m^2 (hand spread). Straw blowers can distribute straw a maximum 45m depending on the wind.

As a general rule, straw mulching is preferred in dry areas where water supply is limited (due to its ability to reduce watering needs), while hydromulching is preferred in the more temperate areas.

Straw mulch tackifiers typically usually consist of 1000 to 2000L/ha of 50:50 anionic bitumen emulsion, or 250L/ha polymer binder (refer to *Mulch Tackifier* fact sheet).

Wood Cellulose Fibre Mulch

These mulches consist of short cellulose fibres typically applied by a hydroseeder or hand placement. Wood fibre does not require tacking, although tacking agents can be added to the slurry. In the absence of a tackifier, however, the mulch can be less stable on steep slopes.

Wood fibre hydro-seeder slurries may be used to tack straw mulch on steep slopes, critical areas, and where harsh climate conditions exist. Wood fibre mulch, however, does not provide sufficient erosion protection to be used alone.

Wood fibre mulches are generally short lived and need 24 hours to dry before rainfall occurs.

Application rate of 2 to 2.5t/ha of wood pulp, or 60:40 to 70:30 wood fibre:paper mix, plus 112kg/ha of tackifier. Hydroseeding trucks can typically hold 1600 to 11,000L of slurry.

Cotton Fibre Matrix (CFM)

Cotton Fibre Matrix is an erosion control product developed in cooperation with the U.S. Department of Agriculture (USDA) and the U.S. Cotton Incorporation. It is made from a combination of cotton gin by-products, straw, tackifiers, and additives.

Description

Light mulching is the application of a protective blanket of straw or other plant residue to the soil surface.

Light mulching can be applied as either a 'dry' or 'wet' process. Dry mulch usually consist of organic materials such as straw, green waste, or a thin biodegradable erosion control blanket. Wets mulches are applied with hydraulic equipment and usually contain wood fibre or paper slurry. Wet mulching methods include hydro-mulching and *Bonded Fibre Matrices*.

Purpose

Light mulching is primarily used during revegetation to promote seed germination and reduce soil erosion. Light mulching is not used for weed control.

Light mulching assists seed germination and growth by:

- reducing moisture loss from the soil;
- reducing watering demands;
- controlling soil temperature;
- reducing seed loss by stormwater runoff;
- controlling surface sealing and crusting of the soil;
- sustaining soil organisms;
- providing nutrients.

Light mulching controls soil erosion by:

- reducing raindrop impact;
- promoting quicker and more vigorous grass establishment;
- reducing wind erosion;
- reducing surface sealing, thus increasing rainwater infiltration.

Mulching (light or heavy) is most useful when used on clayey soils that potentially could release high levels of turbidity.

Limitations

Some mulches cannot be used in bushland areas due to possible introduction of unwanted seed.

Light mulching is not suitable for areas of concentrated flow. Instead, consider the use of *Rock Mulching*, or *Erosion Control Blankets*.

Mulch should cover 80% (minimum) and ideally 100% of the soil surface to give adequate protection against erosion.

Mulching should not be placed directly onto dispersive soils.

Useful life of approximately 2 to 6 months.

Advantages

Mulching is generally the most effective and practical means of controlling erosion prior to and during vegetation establishment.

Straw mulching is particularly useful in during periods of drought, and in arid and semi-arid areas to reduce watering requirements during plant establishment.

Disadvantages

Can be displaced if subjected to flooding or concentrated overland flow, or if the site has inadequate drainage control.

If washed from the site during heavy storms, or if incorrectly applied, bitumen-based tackifiers can pollute receiving waters.

Potential for the introduction of weed seed.

Common Problems

Mulch washed from slopes caused by inadequate up-slope drainage control.

Mulch blown from the site caused by inadequate anchorage or tacking (gluing).

Inadequate coverage of mulch allowing raindrop impact erosion and turbid runoff.

Weed infestation caused by poor quality control in the manufacture and/or sale of straw, or in the use of hay instead of straw.

Special Requirements

In windy areas, or on steep slopes, straw mulch may be anchored by 'crimping' the mulch into the soil with agricultural machinery, by applying a tackifier, or by covering the mulch with a suitable mesh such as jute or coir mesh. Crimping is not recommended in sandy soils.

Application of a suitable tackifier is the preferred method for anchoring straw mulch.

Light straw mulch should be spread evenly with a maximum depth of 50mm.

Site Inspection

Treated areas may need re-application if the vegetation does not establish in the required time.

Look for displacement by wind or water.

Check coverage of soil.

Performance Indicators

Application rate can be measured by placing shallow trays at random locations across the proposed treatment area prior to application of the mulch. The trays (of known surface area) are dried and weighed pre and post application to determine actual dry application rate. The wet application rate (i.e. with water) can also be recorded.

Percentage cover can be measured using the quadrant method (a grided inspection plate which is photographed and analysed) or by visual estimation (refer to the *Revegetation* fact sheet).

Operational performance with respect to the control of raindrop impact erosion can be measured by comparing the relative change in land elevation of a mulched surface with an adjacent non-erodible surface such as a metal plate set into the soil level with the soil surface.

The metal plate must be attached to the soil surface without solid foundations such that the plate can respond to any natural soil compaction, but not be affected by soil erosion (i.e. do not compare the newly mulched surface with a solid object such as a concrete kerb or building foundation).

Operational performance with respect to the control of dust can be measured using traditional dust collectors.

Materials (General)

- Mulch: to the maximum degree practical the mulch shall be free of weed species especially prohibited noxious weed seed. Do not use woody or other heavy materials than may interfere with the emergence of seedlings.

Application (General)

1. Refer to approved plans for location, extent, and application details. If there are questions or problems with the location, extent, or method of application contact the engineer or responsible on-site officer for assistance.
2. Ensure the surface is free of deep track marks of other features that may result in flow concentration down the slope. Where necessary, establish up-slope drainage controls to limit run-on water that may disturb the mulch.
3. Spread enough mulch to completely cover the surface of the soil at the density or thickness specified in the approved plans, but not greater than 50mm.
4. Machine applications shall comprise a minimum of two passes in opposite directions unless otherwise specified.
5. During application, all reasonable efforts shall be taken to avoid spray onto roads, pathways, drainage channels not intended for application, and existing vegetation.
6. Suitable anchorage of the mulch must be accomplished immediately after the mulch has been placed.
7. Ensure the mulch is restrained from excessive movement by wind or stormwater runoff by the appropriately application of an approved tackifier. On flat or gentle slopes, straw mulch may be fixed to the soil by mechanical crimping.

8. If the treated area was seeded, continue to water after mulching in accordance with weather conditions, or as required to obtain suitable germination and plant establishment.
9. Application (spraying) of a tackifier must not be performed during periods of windy conditions that would prevent the proper placement of adhesive.
10. The contractor must take appropriate steps to protect all traffic, signs, structures, and other objects from being marked or disfigured by the tackifier material.

Application (hydromulching)

The following specification applies to grass seeding, not the application of native tree or shrub seed.

1. Refer to approved plans for location, extent, and application details. If there are questions or problems with the location, extent, or method of application contact the engineer or responsible on-site officer for assistance.
2. Ensure the surface is free of deep track marks of other features that may result in flow concentration down the slope. Where necessary, establish up-slope drainage controls to limit run-on water that may disturb the mulch.
3. Prior to application, roughen the soil surface and fill areas by rolling with a crimping or punching type roller, or by track walking where practical.
4. If the soil is dry, water the treatment area before hydroseeding to increase penetration of the adhesive and fertiliser additives.
5. Add straw, wood or paper cellulose fibre mulch to the slurry at the specified rate, otherwise at a rate of 2 to 3 tonnes per hectare.
6. Machine applications shall comprise a minimum of two passes in opposite directions unless otherwise specified.
7. During application, all reasonable efforts shall be taken to avoid spray onto roads, pathways, drainage channels not intended for application, and existing vegetation.
8. The contractor must take appropriate steps to protect all traffic, signs, structures, and other objects from being marked or disfigured by the mulch and/or associated tackifier.
9. Continue to water after allowing 24 hours drying time. Water in accordance with the weather conditions, or as required to maintain suitable germination and plant growth. The wood-fibre should be kept moist until germination occurs.

Maintenance

1. Inspect all mulches fortnightly and after runoff-producing rainfall and strong winds.
2. Check for rill erosion, or dislodgment of the mulch.
3. Replace any displaced mulch to maintain the required coverage.
4. If stormwater runoff displaces more than 10% of the mulch, then investigate the need for additional drainage controls to prevent further displacement.
5. Continue inspections until vegetation is suitably established or erosion control is no longer required.
6. If the mulching is not effective in containing the soil erosion it should be replaced, or an alternative erosion control procedure adopted.