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## Challenging Sites: 3 Restore Disturbed Soils



**Figure 1 Compost amendment of disturbed soils reduces long-term maintenance, reducing or eliminating the need for pesticides and herbicides and irrigation.**

- no longer be absorbed and conveyed downhill in the soil, but instead runs off, carrying pollutants with it.
- Plant establishment depends on roots' access to air and water in soil voids.
- Landowners often respond to unhealthy plants by applying pesticides, herbicides, fertilizers and additional irrigation.

In studies done by Washington State University Extension Services, simply ripping, without folding in compost, allows the soil to slump back into a compacted state. These studies found that when disturbed soils were amended with compost and finished in lawn or shrubs in a landscape area, the areas responded to rainfall events as if they were 50% - 80% forested, respectively, and remained permeable over time. All the jurisdictions in Western Washington now require this method of soil restoration on all projects to "regain greater stormwater functions in the post development landscape, provide increased treatment of pollutants and sediments that result from development and habitation, and minimize the need for some landscaping chemicals, thus reducing pollution through prevention".

### Design

For all proposed landscape areas inside the disturbed area (clearing, vehicular and/or foot traffic, re-grading), till compost into the top few inches of native soils. The ideal organic content is 10% for landscaped beds. A lower target rate for turf areas of 5% is recommended since a higher organic content could make mowing more difficult.

As an alternative to costly soil testing, the following guidance is a method that can be successfully implemented to any kind of soil (sandy, clay, silty, etc).

The practice of amending disturbed soils (i.e. any soil in a town, city, or other historically populated area) is a simple, cost-effective practice for restoring and preserving the long-term permeability of soils that have been compacted by vehicular or, in the case of clayey soils, even foot traffic. The practice is also a great way to conserve water.

### When to Amend

Compaction reduces voids in the soil, which has several impacts to water quality & availability.

- Rain falling on compacted soil can



**Figure 2 Urban soils, especially clayey soils, are easily compacted, even by foot traffic, generating runoff volumes similar to that of hardscapes surfaces like conventional sidewalks and roads.**



**Figure 3 Lawn or landscape garden, the same generalized cross section of loosened and amended soils apply.**

To amend proposed landscaped beds:

- Till or scarify soil 12" deep.
- Place 3 inches of compost and till into 8 inches of soil (a total amended depth of about 9.5 inches, for a settled depth of about 8 inches).
- Rake beds to smooth and remove surface rocks larger than 2 inches diameter.

- Mulch planting beds with 2 – 3 inches of organic mulch.

To amend proposed turf areas that will be mowed:

- Till or scarify 12" deep.

- Place 1.75 inches of composted material and roto-till into 6.25 inches of soil (a total amended depth of about 9.5 inches, for a settled depth of about 8 inches).
- Water or roll to compact to 85% of maximum dry density. Rake to level, and remove surface woody debris and rocks larger than 1 inch diameter.

## Compost Specification

When amending soils, care should be taken to ensure that compost is clean and free of weeds, pollutants, or other deleterious materials that may impact plant health and water quality.

Organic compost should have the following properties:

- Weed seed and pollutant free.
- 100% shall pass a 1/2-inch screen.
- pH between 5.5 and 7.0. If the pH isn't quite right, it may be lowered by adding iron sulfate and sulfur or raised by adding lime or recycled, ground gypsum board.
- Carbon nitrogen ratio of 35:1.
- Organic matter content between 40 and 50 percent.
- Fully composted. Earthy is good. Avoid compost that smells like ammonia.



**Figure 4 Compost should be fully composted (in other words, smell like earth, not ammonia) and dark in color.**

Organic compost may consist of the following:

- Mushroom Compost. The used bedding material from commercial mushroom production.
- US Compost Council Seal of Testing Assured compost. Visit <http://compostingcouncil.org/participants> to find a participating supplier near you. The STA program is no guarantee of quality, only that the compost has been tested and those test results are available for the designer's review.

Organic compost may NOT be:

- Composted Yard Debris. Excessive pollutants, mostly herbicides, pesticides, and fertilizers, have historically been found in these materials. "Cides" can kill beneficial soil life, reduce stormwater benefits, and increase maintenance.
- Peat Moss. Peat moss is extracted from wetlands; this has negative impacts on the watershed from which the peat moss was removed.

## Other Amendments

Since soil life may have died due to poor air and water conditions, mycorrhizae (mushrooms) and biological (bacteria) treatments can be added to soil to enhance the soil's biology and ability to support plant life. This is likely to speed establishment and reduce water demand during this period.

One locally made product that has been used with great success is Permamatrix (<http://www.permamatrix.com/how-it-works/>), but a search online for "mycorrhizal fungi" will yield an array of garden products that may provide as great a benefit.

## Conveyance

No routing is needed. Compost amended areas are considered self managing. Grading plans should show a 2% minimum slope away from buildings for a distance of 10' in landscape areas to ensure adequate drainage during large storms, which are expected to generate runoff. This is a common rule of thumb and shouldn't change the grading design from that of a conventional stormwater approach.

## Physical Setting

Compost amended soils should be used anywhere soils have been disturbed and where a future landscape area is proposed. Compost amendment should not be performed under tree canopies or other established landscape areas to be preserved since the tilling process will damage roots. Any kind of soil will benefit from compost amendment, but in particular, watersheds with clay will benefit the most.

## Construction

Amending soils should happen at the end of construction or at least at the completion of concrete work. Protect areas from compaction and erosion afterward with fencing and signage as needed<sup>1</sup>. Minimize erosion by covering soil with mulch and planting right away.

## Maintenance

Maintenance of compost amended soils is the same as any landscape area. It should be possible to reduce or eliminate the use of irrigation, fertilizers, herbicides and pesticides. Keep soil in landscaped garden areas covered with 2-4" of compost by mulching once a year. Aerate turf areas and top-dress with fine mulch.



**Figure 5 A range of construction equipment (cat mounted ripper, tractor-mounted disc, tiller, etc) or simply shovels and rakes may be used depending on the extend of the area to be amended.**

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<sup>1</sup> Stormwater Management Manual for Western Washington:  
<http://www.ecy.wa.gov/programs/wq/stormwater/manual.html>