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Soil Matters: Adjusting the Narrative on (Top) Soil in Design

"Land, then, is not merely soil; it is a fountain of energy flowing through a circuit of soils, plants, and animals."
Aldo Leopold, A Sand County Almanac, 1949

PURPOSE

A gram of topsoil can contain over 50,000 species and is arguably the most important biological characteristic of a development site, as well as the most important indicator of successful post-construction stormwater management and restoration of native vegetation.

Topsoil Assessment Benefits and Methods

The goal of topsoil assessment across a site should be to characterize the relative quality of soil to sustain native vegetation.

- Preserving topsoil and native root mass leads to successful, efficient site restoration: the deep roots of native vegetation retain more water than turf grass and gravel during heavy storms and periods of drought (Dreves, 2019).
- Once buildable area has been determined and geotechnical investigations are scheduled, add topsoil characterization as a cost-effective component of early investigations.
  - Identify field texture and obtain laboratory analytics for pH, organic matter, nutrients, and salts.
  - Interpret the results of topsoil testing combined with results of vegetation survey to map relative productivity, species and health of vegetation and root mass across a site.

Tailored Grading Approach

As a goal of design, develop a grading plan that avoids impacts to the highest quality site topsoil and minimizes overall impacts. Retaining quality topsoil is the most important method for maintaining a native seed bank for future site reclamation.

- Delineate areas that should not be disturbed and specify how the areas will be identified during construction.
- Identify local noxious weed species, and methodology to maintain disturbed areas as weed-free as practical and possible.
- Avoid grading and compaction within areas of highest quality topsoil as identified in pre-construction assessment.
- For areas where construction activities impacting topsoil are unavoidable, optimize recovery of topsoil where possible and add BMPs as design features into integrated construction plans for a project, such as:
  - Transfer topsoil from topsoil stripping sites to suitable topsoil storage locations promptly.
  - Salvage topsoil when moist (salvage of wet or dry topsoil destroys texture).
  - Store topsoil for less than one year in shallow (<2 foot) piles in weed-free locations.
  - Minimize exposed areas by scheduling topsoil stripping appropriately.
  - Monitor topsoil storage locations for stability, seedbank, and seed viability.
  - Following construction, replace topsoil with minimum number of machines passes to promote natural variability of topsoil depths.
  - Replace topsoil within a few days of seeding.

Restorative Planning

Every project should have a Restoration Plan that includes Topsoil Management and addresses the goals of site restoration (*e.g., implementation of agrivoltaics, maximizing tax credits, lowest O&M costs, achieving ecological goals, etc.).* The Plan should:

- Identify seedbed preparation methods to be carried out before, during and after construction – these could be related to soil compaction requirements; reduction of equipment movement; utilization of equipment, such as disks, tillers, or harrows; or combination of items.
- Incorporate principals of adaptive management, and specifically outline thresholds for when adaptive management would trigger.

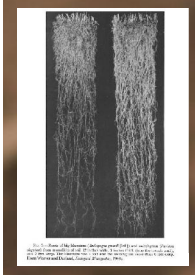
Best Management Guidance for Restoration

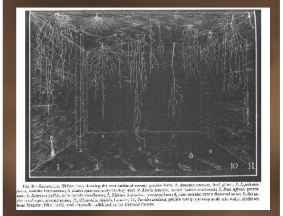
- Seeds of individual species, unmixed, should be purchased whenever possible from regionally based providers.
- Seeds and seed mixes should be certified free of weeds, recently tested for the ability to germinate, and have a high germination rate. Some native species germinate best when seeds are several years old; therefore, to obtain the best possible seed:
- Plan seed orders early, at least 120 days prior to the planting time.
- Buy seed approximately 90 days prior to planned use. This will allow enough time to examine the seed tags and the seed.
- Check the seed tags and bag labels to verify receipt of correct order or substitution of appropriate species. Seed quality can be improved dramatically by requesting certified seed.
- The only way to tell for certain is to receive your desired variety in the original bag with the Certified Seed Blue Tag.
  - Avoid seeds with the following characteristics: "Variety Not Stated (VNS)", "seed from a certified field," or "no tags available yet," or "just as good as certified."
  - Accept only seed with a complete analysis label on the bag and a current germination test conducted by an accredited laboratory.
  - Most species are sold on a Pure Live Seed (PLS) basis, with the price adjusted accordingly. PLS equals the percent purity times percent germination. When given a choice between buying on a PLS or bulk basis, PLS is always preferable.
- Drill seeding, hydroseeding or broadcast seeding could be utilized individually or in combination based upon grading, topsoil and time of year. When possible, avoid hydroseeding for the project area unless irrigation throughout the growing season.
- To limit erosion and provide additional support during germination, mulch, including certified weed-free hay or bonded fiber mats, should be applied after seeding.

ABSTRACT

Soil is an important consideration in design of any energy project, but it is far too often a consideration merely for structural, erosion and drainage considerations. As the opportunities surrounding agrivoltaics, brightfields, and native plant restoration continue to increase on energy sites, it is time to adjust the narrative for how we address and incorporate soil considerations universally. This presentation will examine three key steps in better addressing soil in design, including:

1. The benefits and methods of early characterization of topsoil,
2. Tailored grading approaches to maximize preservation of topsoil and, conversely, minimize erosion and stormwater management measures; and,
3. Restoration planning of native species that maximizes multi-uses of land and potential land value following construction and facilitates successful decommissioning.





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