Healthy Soils – Part 2:
Soil Preservation, Restoration, and Maintenance Practices for Sustainable Landscapes

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With slides from
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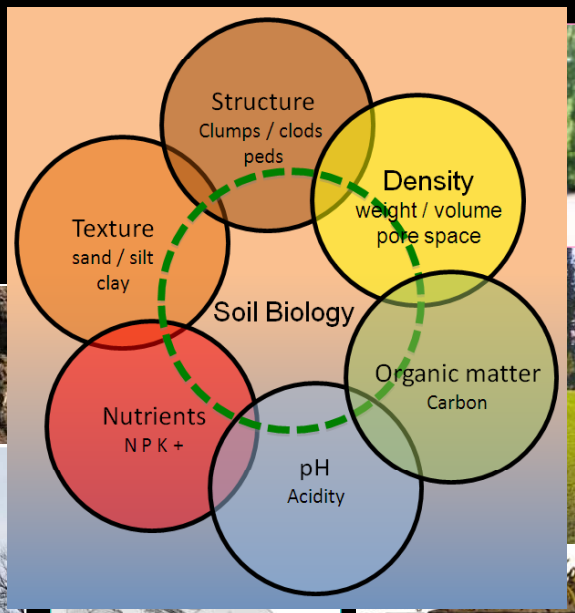
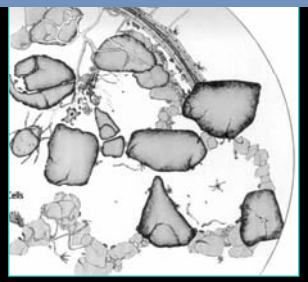
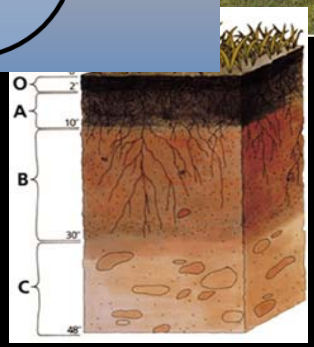






Based on Healthy Soils Part 1 and Healthy Soils Part 2 by James Urban and David McDonald from ASLA conference Phoenix 9/6/2012, and Soil Improvement for Stormwater, Erosion, & Landscape Success by David McDonald from WSU Low Impact Development course 4/11/2012

www.SoilsforSalmon.org
www.BuildingSoil.org

Regulatory requirements
for new construction, in WA Dept. of Ecology's *Stormwater Mgmt. Manual for Western WA*

BMP T5.13 "Post-Construction Soil Quality and Depth"

- Retain native soil and duff wherever possible
- All areas cleared and graded require 8 inch soil depth:
  - Organic matter content ≥ 10% dry weight (5% for turf)
  - Use native topsoil, amend existing soil with compost, or import topsoil blend
  - Subsoil scarified 4 inches below 8-inch topsoil layer
  - Protect amended soil from compaction
  - Mulch after planting
  - Maintenance practices to replenish organic content

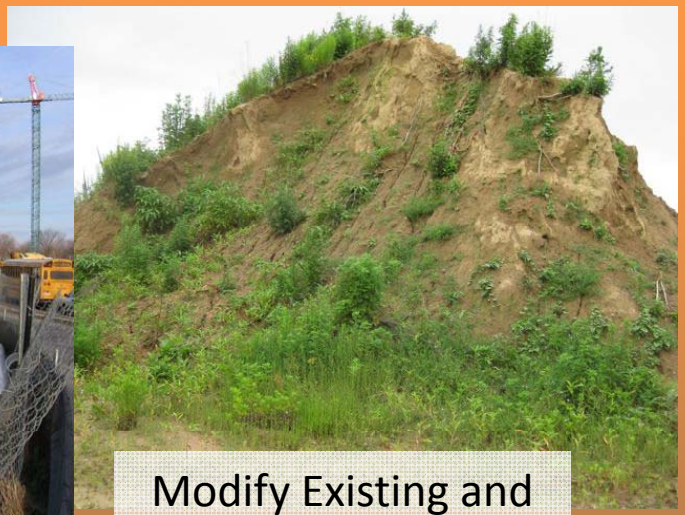
Guidelines Manual for Implementing BMP T5.13

- Manual developed regionally with experts
- 10% O.M. for landscape beds; 5% for turf
- Develop a “Soil Management Plan” for each site
- Four options for soil management (can use 1 or more / site):
  1) Retain undisturbed native soil & vegetation, protect from compaction
  2) Amend existing soil in place with compost
  3) Stockpile topsoil prior to grading, and reuse on site (amend if needed)
  4) Import topsoil meeting organic matter content requirements
- Choose pre-approved or custom calculated amendment rates
- Simple field inspection and verification procedures
- Includes model specs written in CSI and APWA formats
- Available **www.soilsforsalmon.org** or **www.buildingsoil.org**

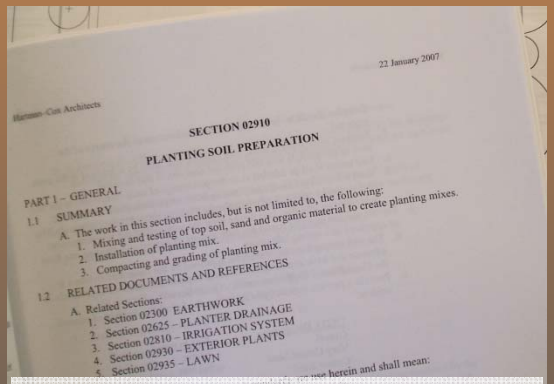
Preservation, Restoration, and Maintenance of Healthy Soil

Preserve Existing Soil

Reuse Existing Soil



Modify Existing and Imported Soil



22 January 2007

SECTION 02910

PLANTING SOIL PREPARATION

PART 1 – GENERAL

1.1 SUMMARY

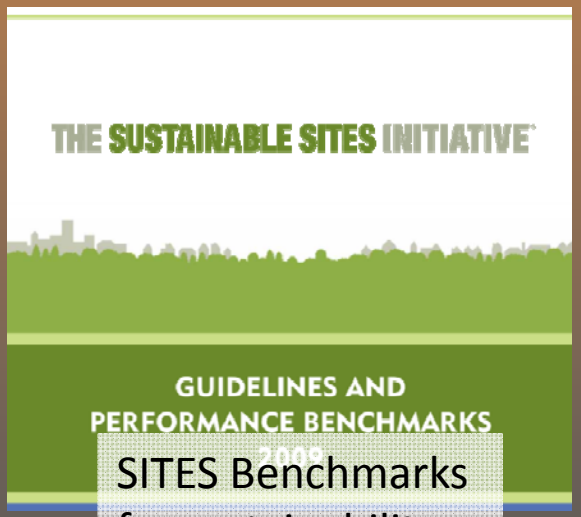
A. The work in this section includes, but is not limited to, the following:
1. Mixing and testing of top soil, sand and organic material to create planting mixes.
2. Installation of planting mix.
3. Compacting and grading of planting mix.

1.2 RELATED DOCUMENTS AND REFERENCES

A. Related Sections:
1. Section 02300 EARTHWORK
2. Section 02625 – PLANTER DRAINAGE
3. Section 02810 – IRRIGATION SYSTEM
4. Section 02930 – EXTERIOR PLANTS
5. Section 02935 – LAWN

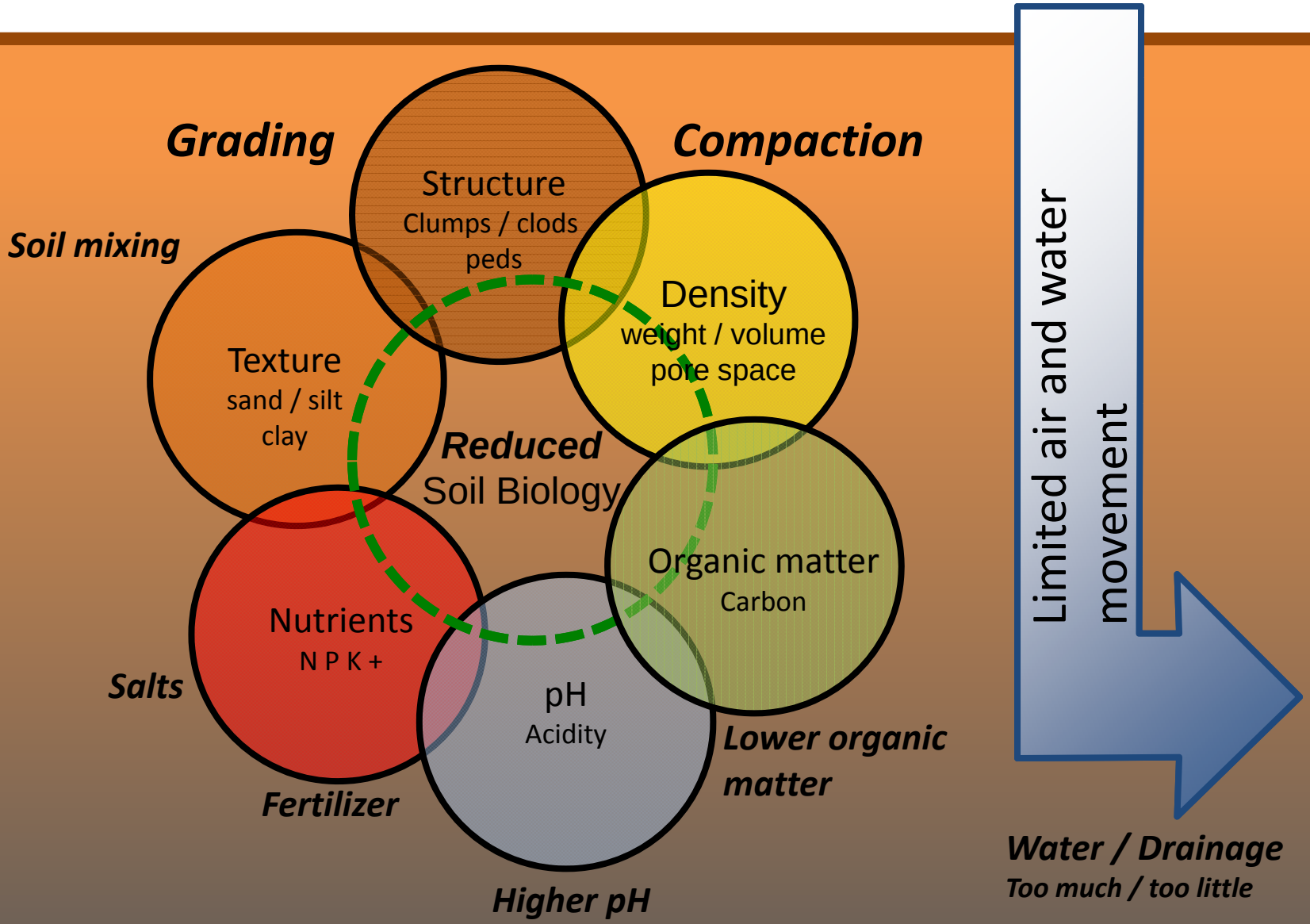
Soil Management Plans

Maintaining Healthy Soils

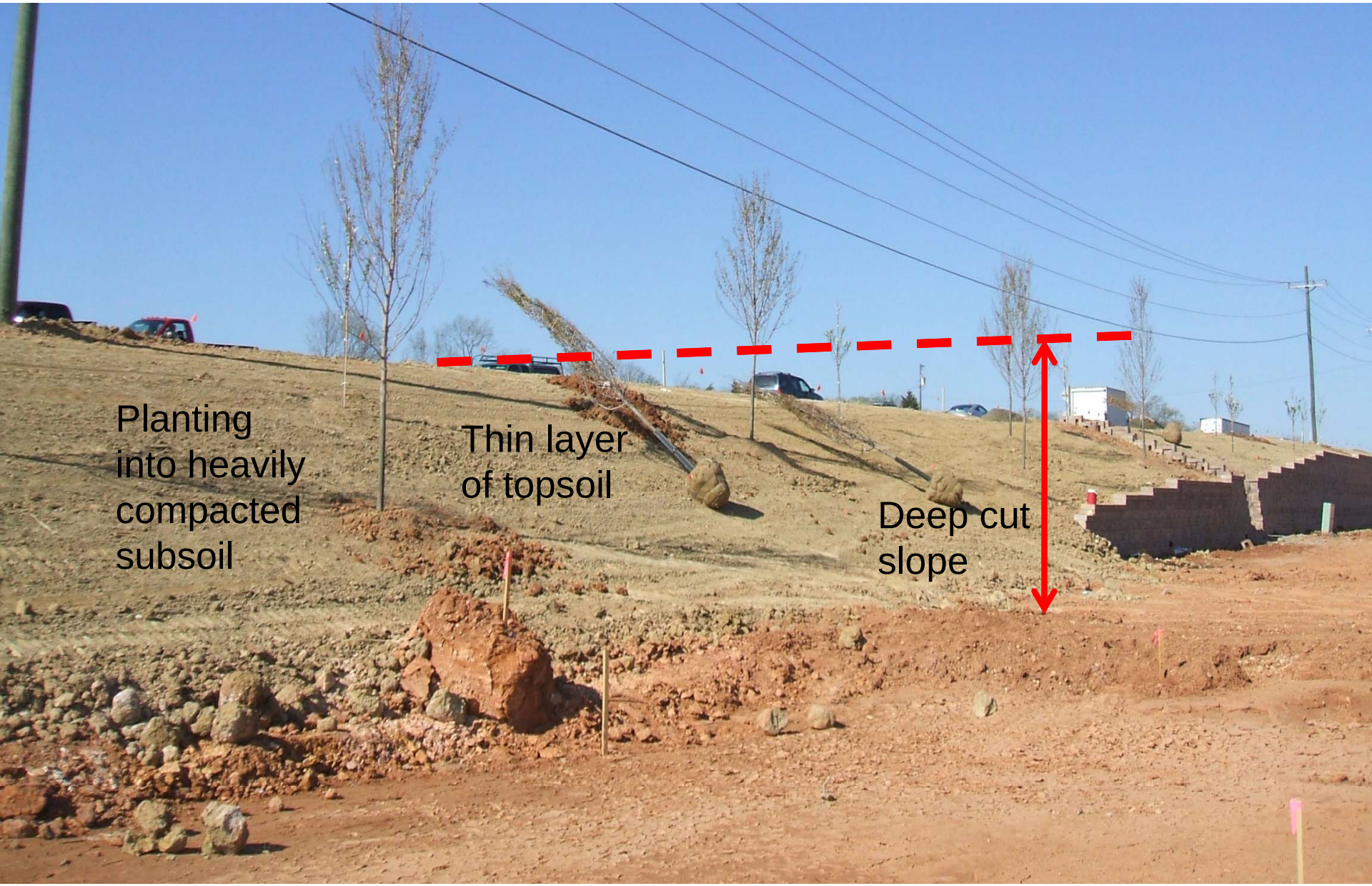


SITES Benchmarks for sustainability

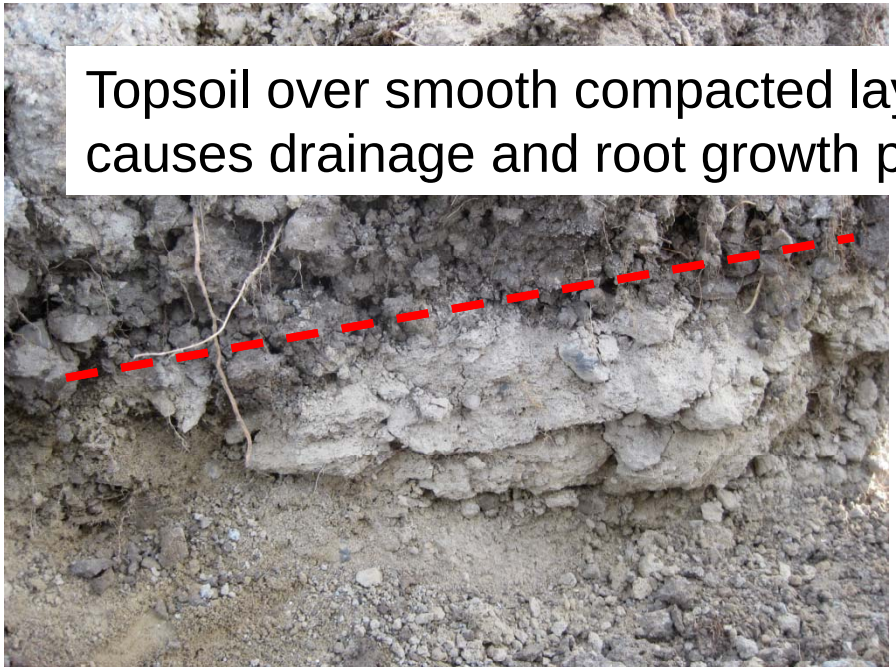
Designing to Modify Past and Future Soil Disturbance



Grading and compaction impacts



Soil Interfaces



Topsoil over smooth compacted layers causes drainage and root growth problems

Better:
Scarified subsoils

Subsoiling (ripping)

Loss of organic matter

- Plan to preserve existing soil & vegetation where possible
- Minimize grading, cut and fill
- Minimize traffic off road bases
- Even a low-organic subsoil can be substantially restored by amending 10-25% (by volume) with mature, stable compost.

Chemical changes

- pH (sometimes due to compacted, anaerobic conditions)
- Nutrient deficiencies (loss of topsoil)
- Toxins: oil, metals, chemicals

Compost amendment tends to correct all of these

Visually examine and smell, then test for suspected deficiencies, toxins, & pH

Chose well-adapted plants, tolerant of your soil conditions (pH etc.)

Preserve Existing Soil

Protect soil & vegetation during construction

- Fence ***vegetation & soil protection zones***
- Inform all contractors & subs: no stockpiles etc.
- If temporary vehicle access required, place steel plates over 6” coarse wood chip.

Reducing soil disturbance

Reduce, simplify paved foot print

Consolidate the planted spaces

Decide early which trees to preserve/protect, or remove

Balance/reduce cut and fill

Control the grading plan

Shallow subsoils (B horizon soils) better than deeper C horizon soils

Contractor laydown/staging in areas that will be disturbed or paved

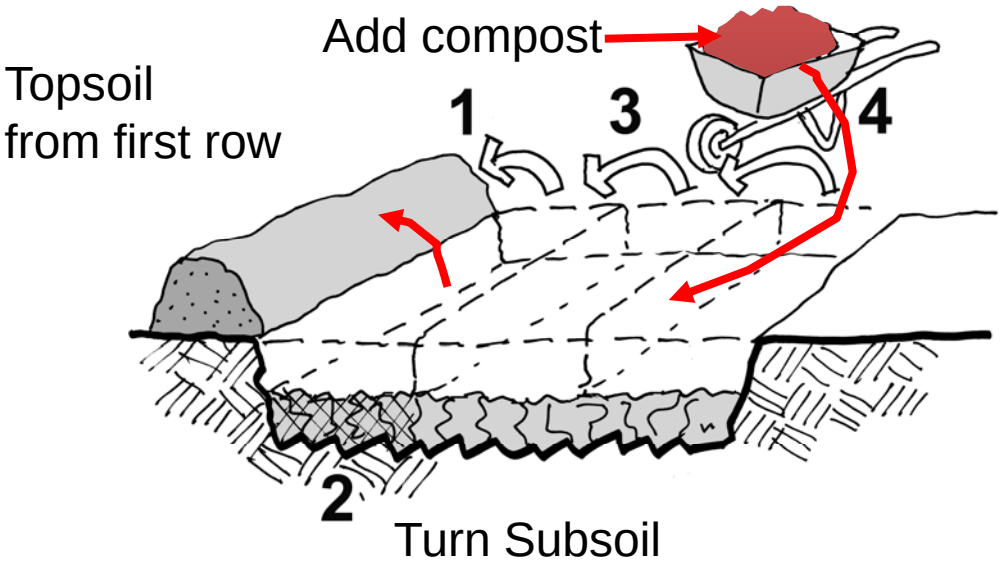
Fence off areas of good topsoil that don’t have to be to be graded

Restoring Top Soil and Sub Soil in Place

Restoring soil in place

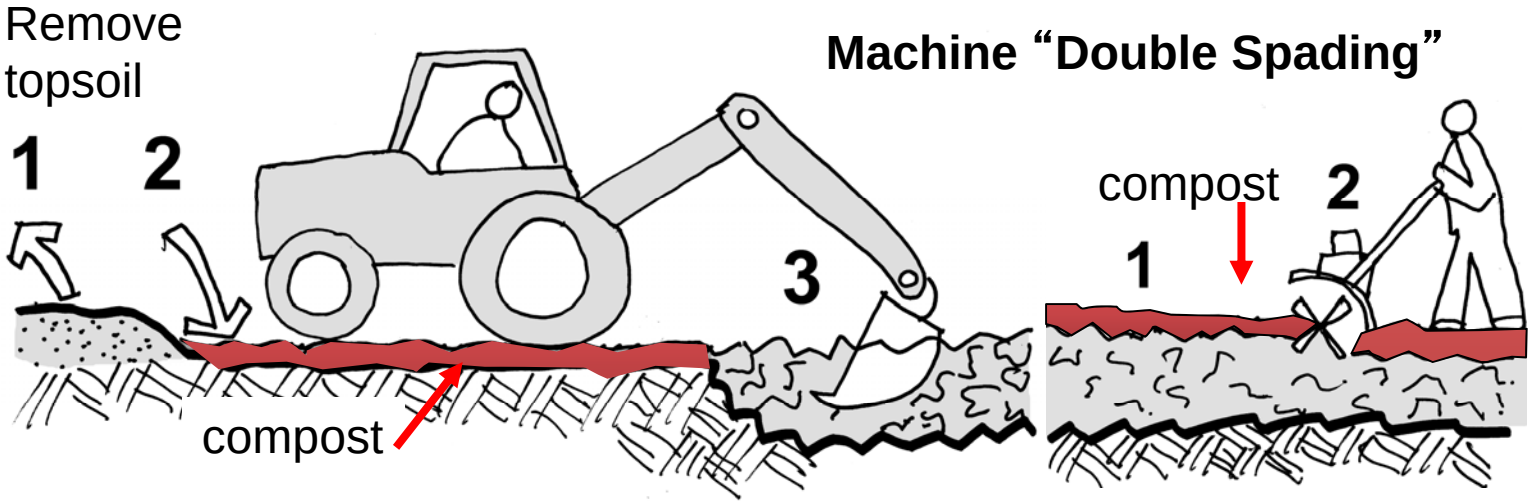
- Place sub-drainage if req'd
- Range of equipment for different-sized sites
- If compacted, rip (scarify) to 12-18" depth before or while amending
- 2-4" compost mixed into upper 8-12" of soil

English Double Spading”



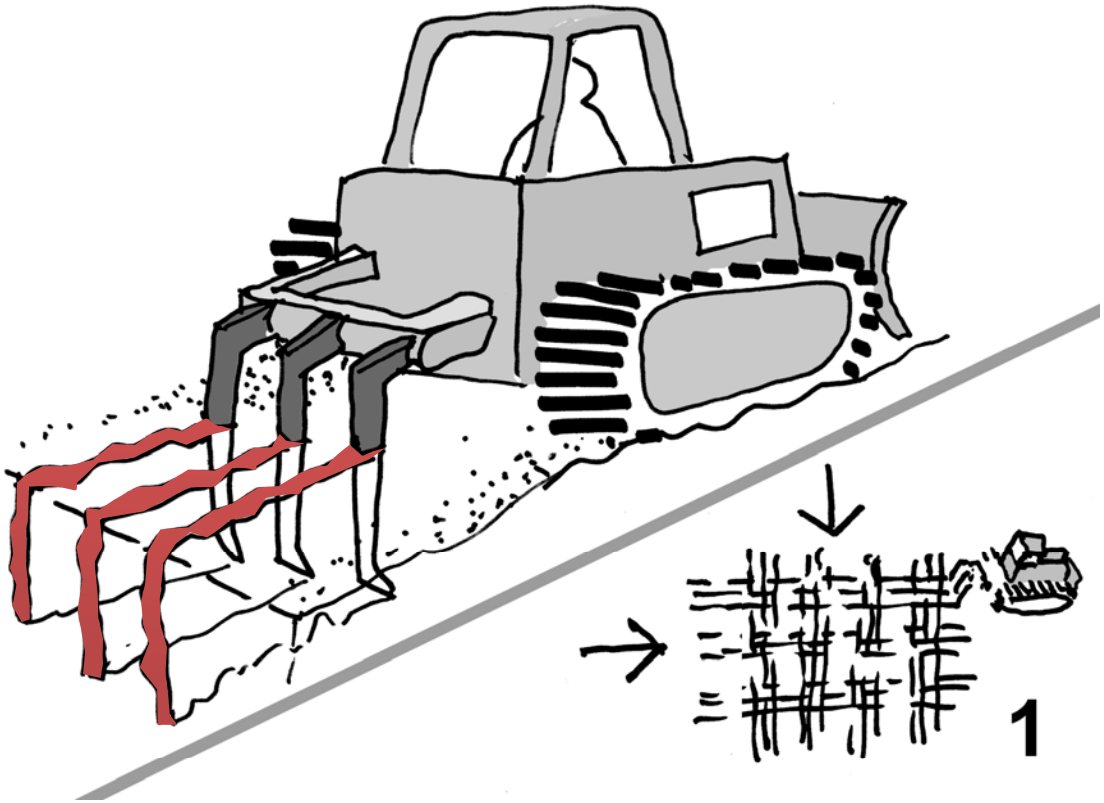
1. MECHANICAL COMPACTION REDUCTION METHODS

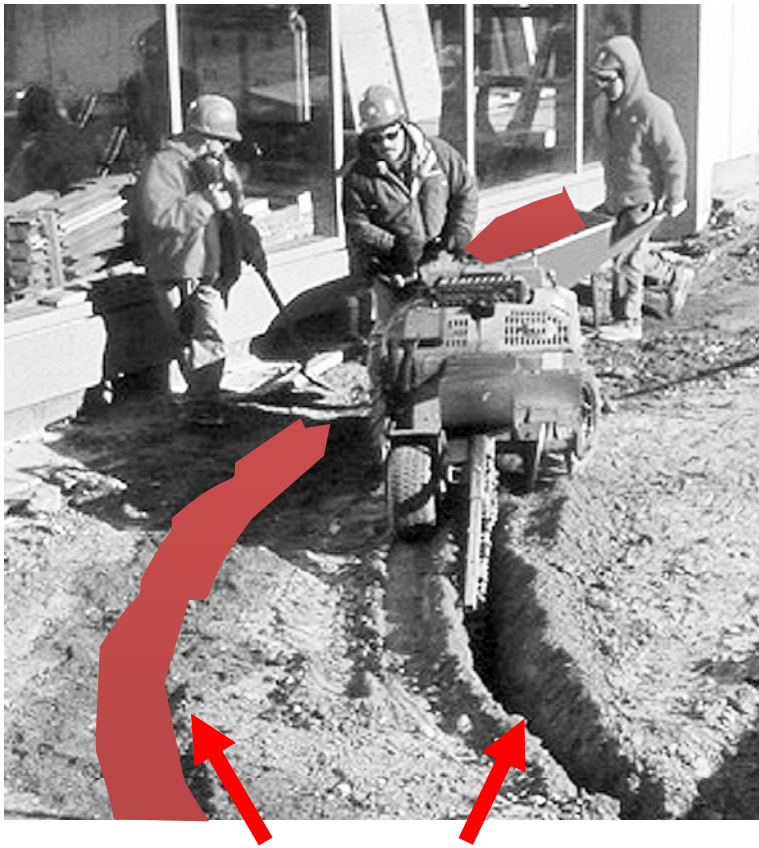
Machine “Double Spading”



Step one

Step two





Trenches filled with compost

Subsoiling large site

Subsoiling small site

SUBSOILING (RIPPING)

Modify Existing and Imported Soil

Defining usable soils

Collected soils for resale

Undisturbed field soil

Construction on disturbed soils

Previous development sites

While some of these soils may look terrible they may be just fine after de-compaction and the addition of compost.

Textural limitations

Fine grained soil: Will drain very slowly if over-compacted and /or heavily graded. May become anaerobic.

Coarse grained soils: May “self” compact or are easily compacted. May be too dry.

General ranges of textural limitations

	Un-screened	Screened
Clay/Silt combine	20-60%	15-45%
Sand	40-80%	55-85%
Gravel	10% max	8% max

Organic Matter %dry weight

Topsoil as harvested	2.5% min
Subsoil	No practical limitation assuming that compost will be added to increase the OM

Soil harvesting, storage, & re-installation

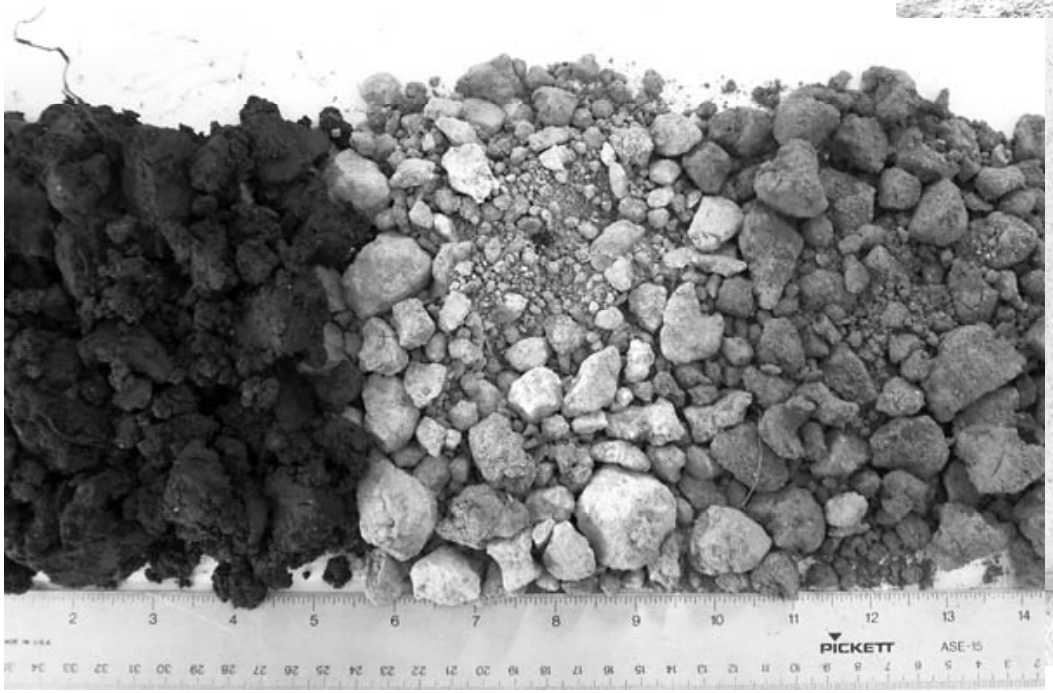
- Harvest at start of grading
- Store covered with breathable fabric, coarse wood chips, or sterile annual grass to prevent erosion and weeds
- Amend with compost just before re-spreading
- Rip in first lift to avoid sharp soil interfaces (which can limit air and water movement)
- Don’t work soil when saturated

Soil removal / replacement

Soil removal and ped retention

Use big loaders and excavators

Remove soil in big scoops to preserve clumps. Do not screen. Preserve peds!



Soil screening machines……

…..produces soil with few soil peds

Maintain more macro pore space with soil ped retention

Soil Installation
Working with soils with retained peds

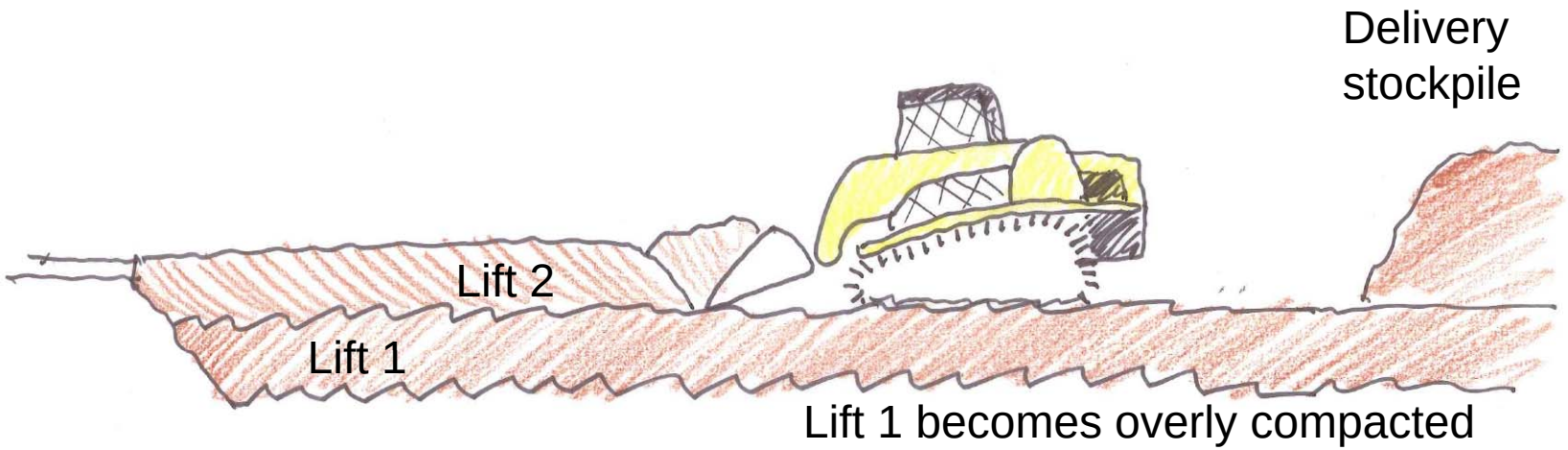
Teeth on loader bucket

Constantly loosen soil while installing to avoid buildup of deep compaction. Back drag over loader tracks each time.

Require all equipment to have teeth on bucket to scarify soil

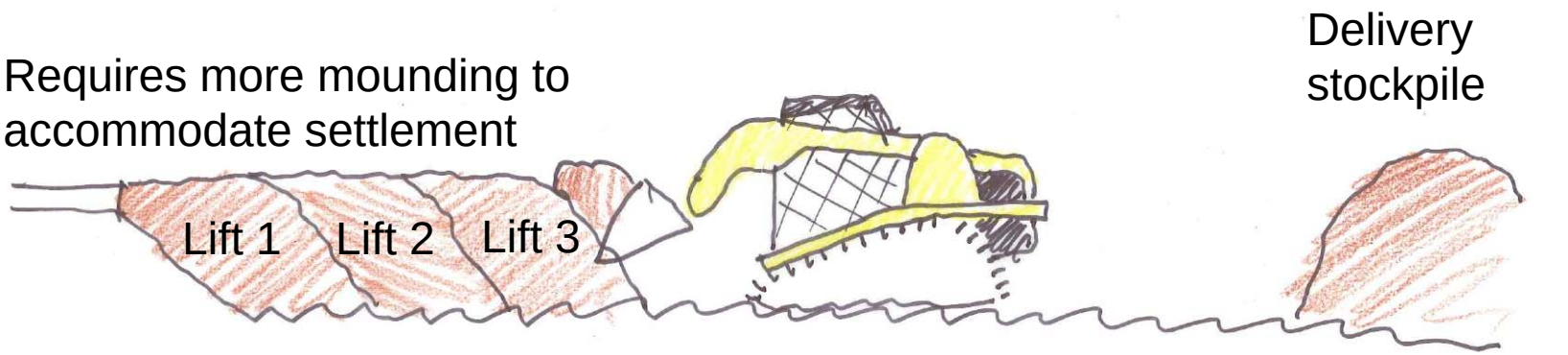
Require low ground pressure equipment (4 psi preferred - 5 psi max)

Soil Installation



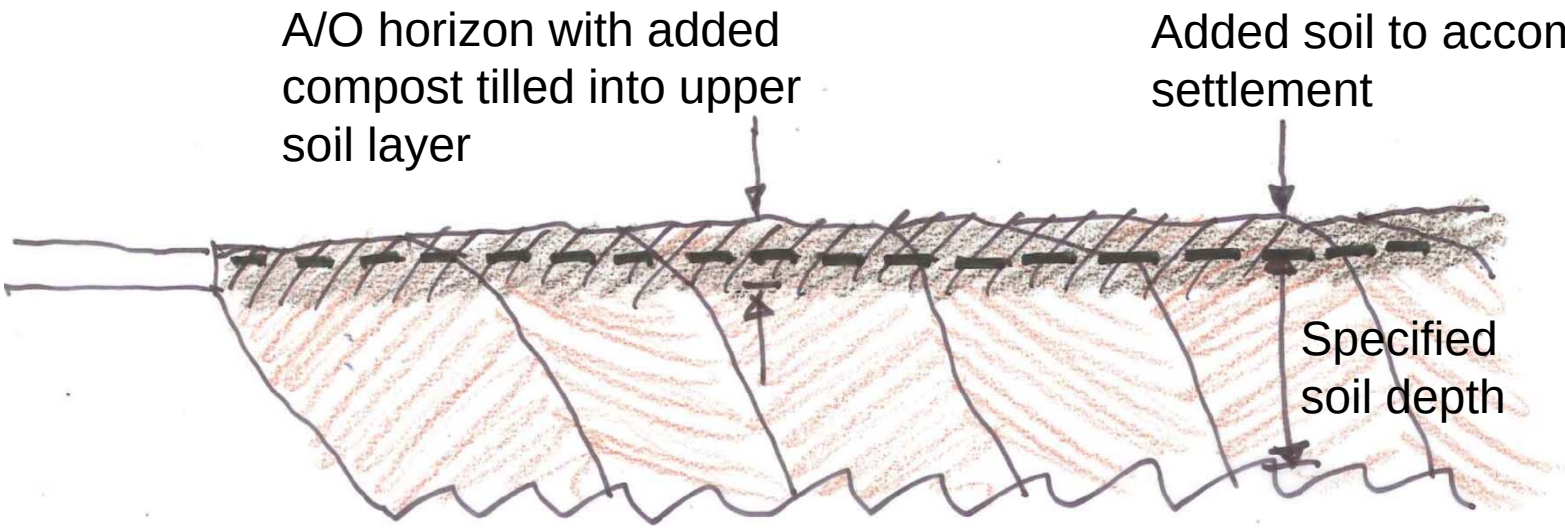
Traditional soil delivery

Requires more mounding to
accommodate settlement



Alternative soil delivery

Soil Installation



Surface preparation prior to planting

Anticipated settlement	
Sand Lawn soils	5% of soil depth
Soil/sand/compost soil mix	10% of soil depth
Loam soil w/ peds and small amounts of compost	10-15% of soil depth

Change spects to allow a combined rocks, roots, sticks, debris up to 5% or maybe even 10%.

Eliminate ***"free of"*** from your spec.

Light screening through 2 or 3 inch mesh may be needed on soil with large amounts of debris.

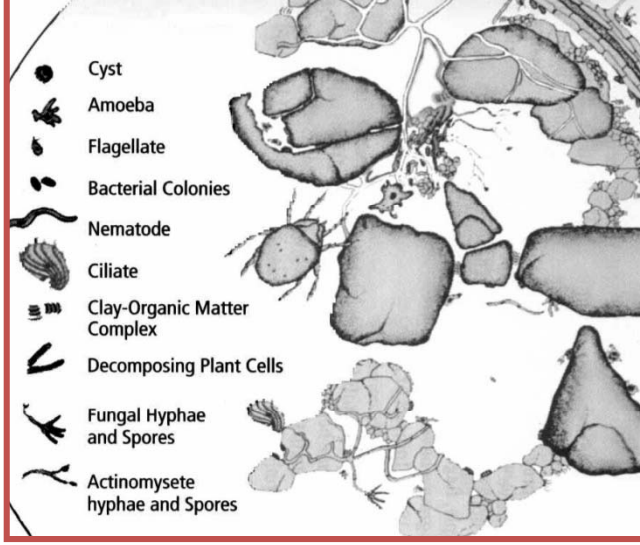
Control construction debris and trash by approval of soil source not by screening.

Amending soil (existing, stockpiled, or imported soil)

Amending soils on site

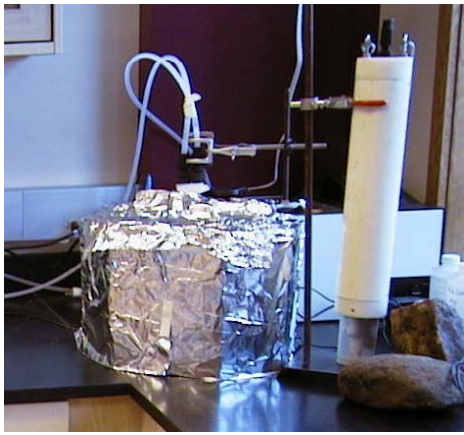
- Place sub-drainage if req'd
- Range of equipment for different-sized sites
- If compacted, rip (scarify) to 12-18" depth before or while amending
- 2-3" compost mixed into upper 8-12" of soil

Clearing up the confusion about **“% Organic Matter”**



Soil Organic Matter = long term accumulation of living soil organisms and dead organic material in the soil. In natural soils organic matter is completely integrated into smallest soil particles.

“% Soil Organic Matter Content” reported in a lab soil tests is by loss-on-ignition method. Just measures **Carbon % by dry weight**



Compost and other organic amendments = material in process from raw dead matter into a more stable form.

Most composts and plant materials are 40-70% organic content by the loss-on-ignition test method.

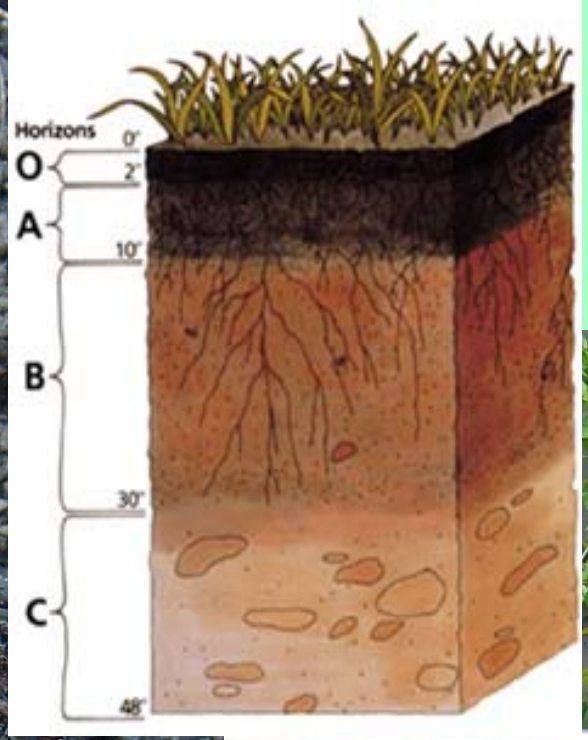
Organic amendments float in-between clumps of soil. As compost decomposes it feeds soil life, and some is turned by those organisms into long term soil organic matter.

Compost is **added** (amended) into the soil by moist volume.
The resulting soil is **tested** by dry weight loss-on-ignition.

Adding 10% compost to a soil does not increase the Soil Organic Matter by 10%. It will raise the **tested SOM** by only 1-3% (depending on the organic content of the compost, and its dry density relative to heavier soil's density).

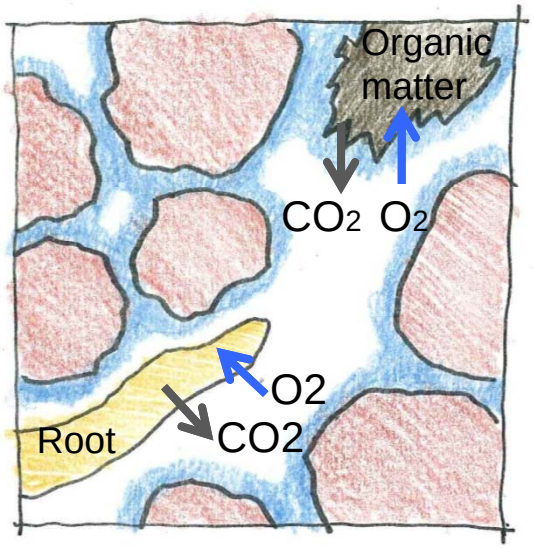
% (volume) compost added to mineral soil or soil mix			% (dry weight loss-on-ignition) rise in tested Soil Organic Matter
for trees	10-15%	→	1-3%
for lawns	15-25%	→	3-8%
% (volume) compost added to sand for bioretention soil mix (for stormwater swales)			
	30-40%	→	10%

Use less compost in clay/fine-textured soils

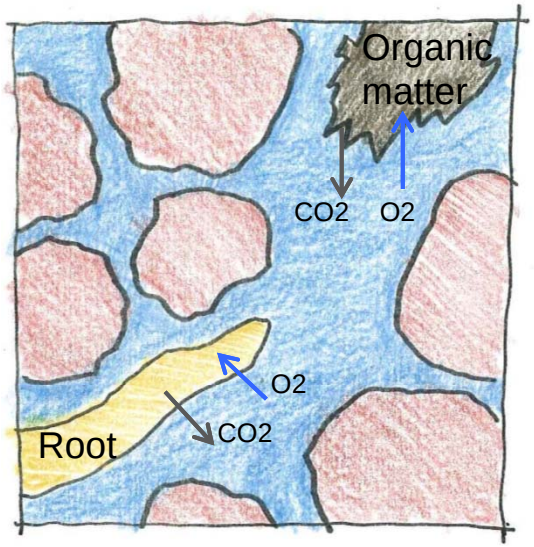


Add Compost:
Most of it in the top layer of the soil profile –
mimic natural profile!

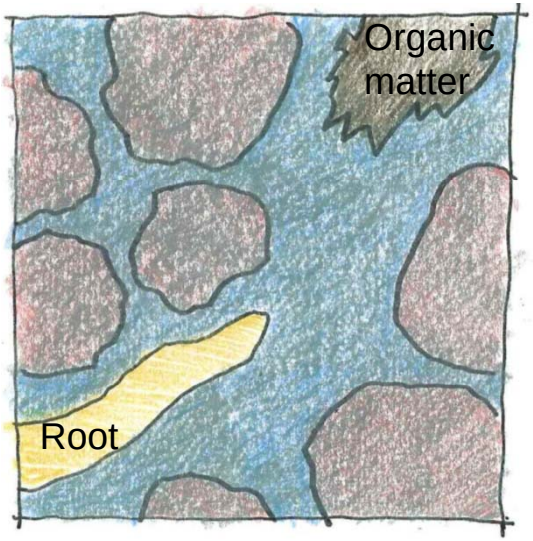
Plants and decaying organic matter in soil must respire (bring in oxygen expire carbon)



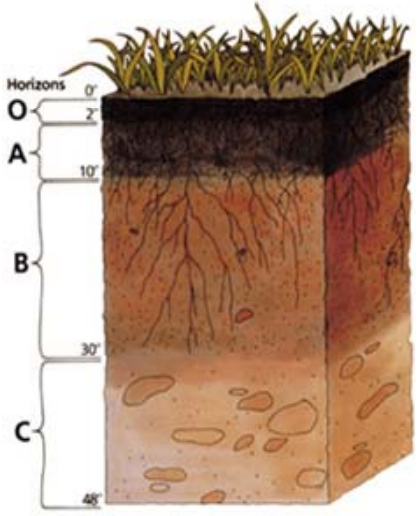
Aerobic Soil
Good respiration



Saturated Soil
Slow respiration



Anaerobic Soil
No respiration



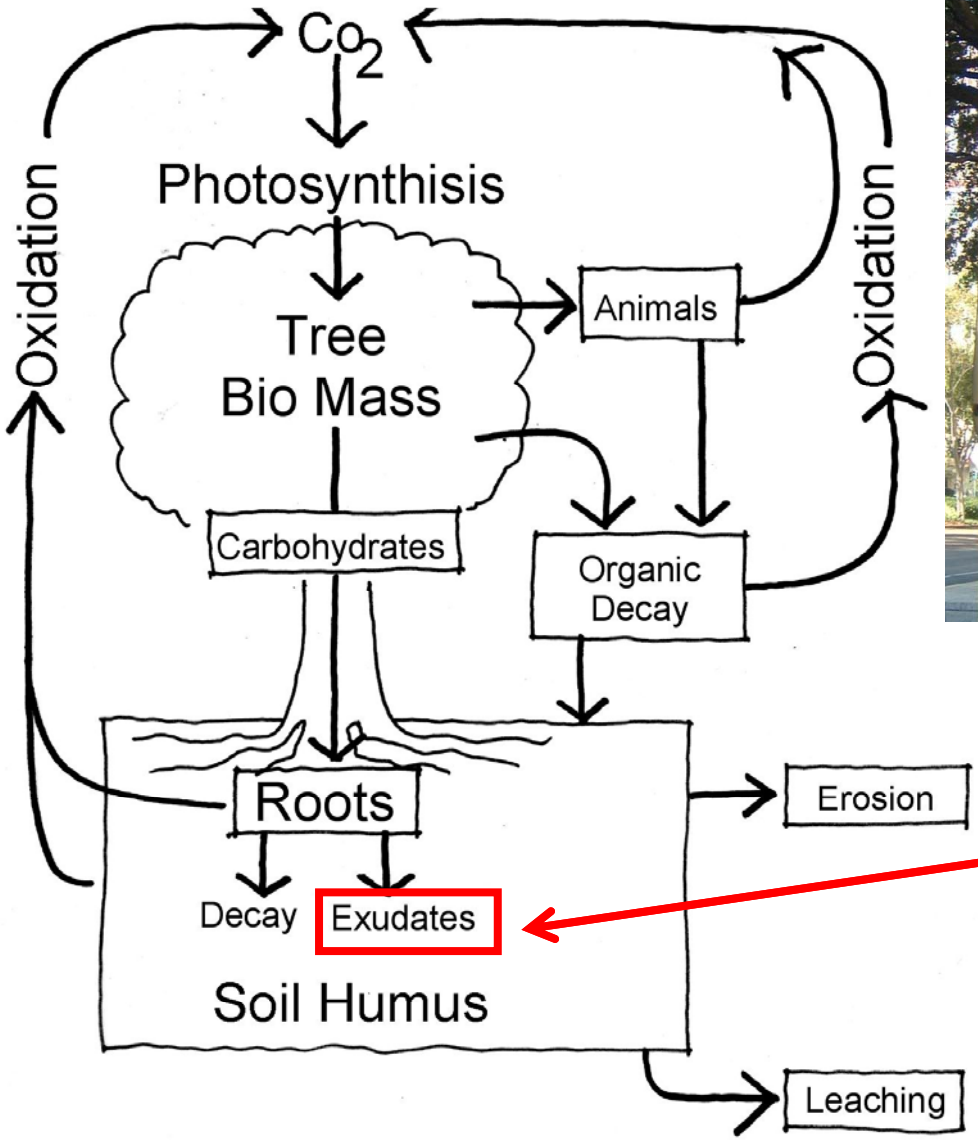
- Too much compost too deep in the soil profile promotes anaerobic conditions
- Plants will die more quickly with too much water than too little !!!!!
- Add most compost to upper 8-12” of soil
- Rip a little compost into deeper soil when subsoiling – just enough to restart soil biology

Wrong! Hard features on amended soil.
30% compost in landscape soil mix.
Soil settlement after 3-4 years.

Right! Hard features based on subsoil.
20% compost into reused soil, with final lift added to meet grades after settling.

Over 15% compost in soil mix increases soil settling.

- Base hard features on subsoil, not amended soil.
- Allow for settling by slightly mounding amended soil, or spreading 1-2 topsoil to meet finish grades.



How can trees grow well when completely covered with paving?

Exudates feed soil life to create soil organic matter. Plants are net contributors to soil organic matter through leaf fall, root shedding, and exudates. This helps maintain healthy OM levels after installation.

How to Select Compost

Know your supplier!

Field tests:

- earthy smell - not sour, stinky, or ammonia
- brown to black color
- uniform particle range
- stable temperature (does not get very hot if re-wetted)
- not powdery or soaking wet

Soil/compost lab test info:

- Nutrients
- Salinity
- pH
- % organic content (OM)

Mfr.-supplied info:

- State permitted composting facility
- Meets US Compost Council (STA) "Seal of Testing Assurance" TMECC lab test methods, specs:
  - C:N ratio
  - Weed-seed trials
  - Nutrients, salinity, contaminants
  - Size: "screen", % fines

Stability /Maturity:

- use Solvita test on-site (> 6)

or

- rely on mfr's TMECC tests: CO^2 evolution and seedling growth

Carbon to Nitrogen ratio of composts

- For turf & most landscapes
  C:N ratio of 20:1 to 25:1 - good nutrient availability for first year of growth (no other fertilizer needed)

- For native plants and <u>trees</u>
  C:N ratio of 30:1 to 35:1, and coarser (1” minus screen)
  - less Nitrogen better for woody natives, discourages weeds
  - for streamside, unlikely to leach nitrogen

Match compost C:N and nutrients to plant needs

Compost feedstocks for tree soil amendment

- Generally, <u>yard waste &/or bark compost</u>
  - Higher carbon, lower nitrogen
  - Maturity / stability very important
- <u>Possibly</u> biosolids, manure <u>fully composted</u> with wood
  - Watch the nutrients, C:N, stability/maturity – caution!

Compost Based Erosion Control BMPs

- EPA-approved BMPs: **blankets**, **berms**, and **socks** see www.buildingsoil.org
- "2 for 1" value – use compost for erosion control, then till in at end to restore soil:
  - No disposal costs
  - Faster planting, better growth
- Costs: blankets similar to rolled products, but savings on disposal, plus 2 for 1 benefits

More info at **www.BuildingSoil.org**

Soil biological additive products

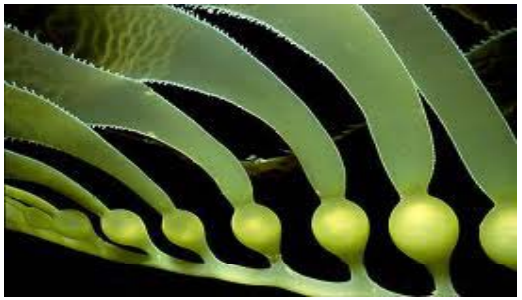
Compost teas – useful in remediation, but just use good compost for soil preparation

Mycorrhizal inoculants – species specific, also in soil from healthy trees

Kelp & other organic additives – match plant nutrient needs – good for micronutrients

Fertilizers – stick with organic sources, match plant needs – compost often supplies most needs for establishment.

Base fertilization on soil test results!



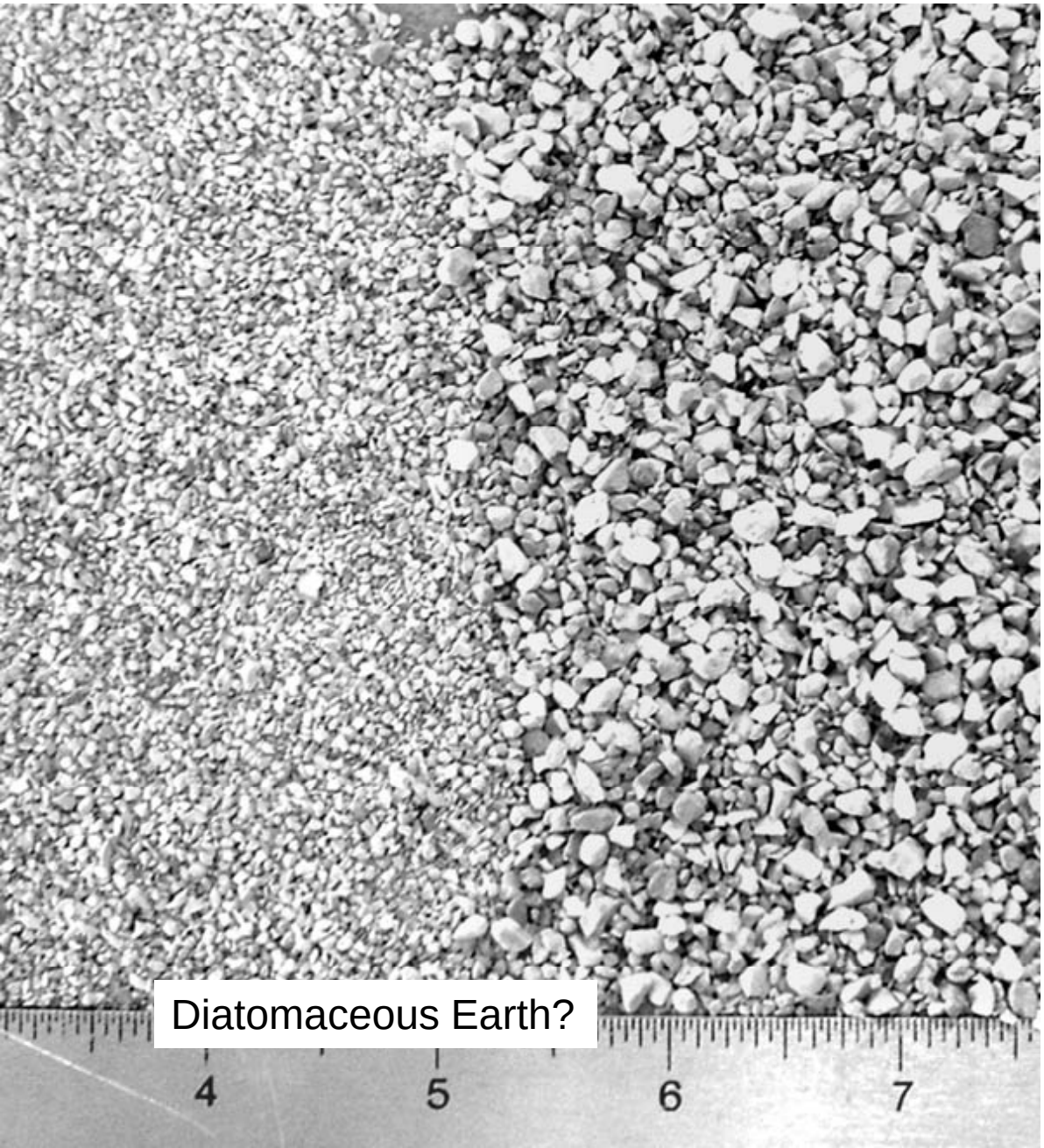
Too much Sand? Too little Sand?

Adding sand to improve drainage

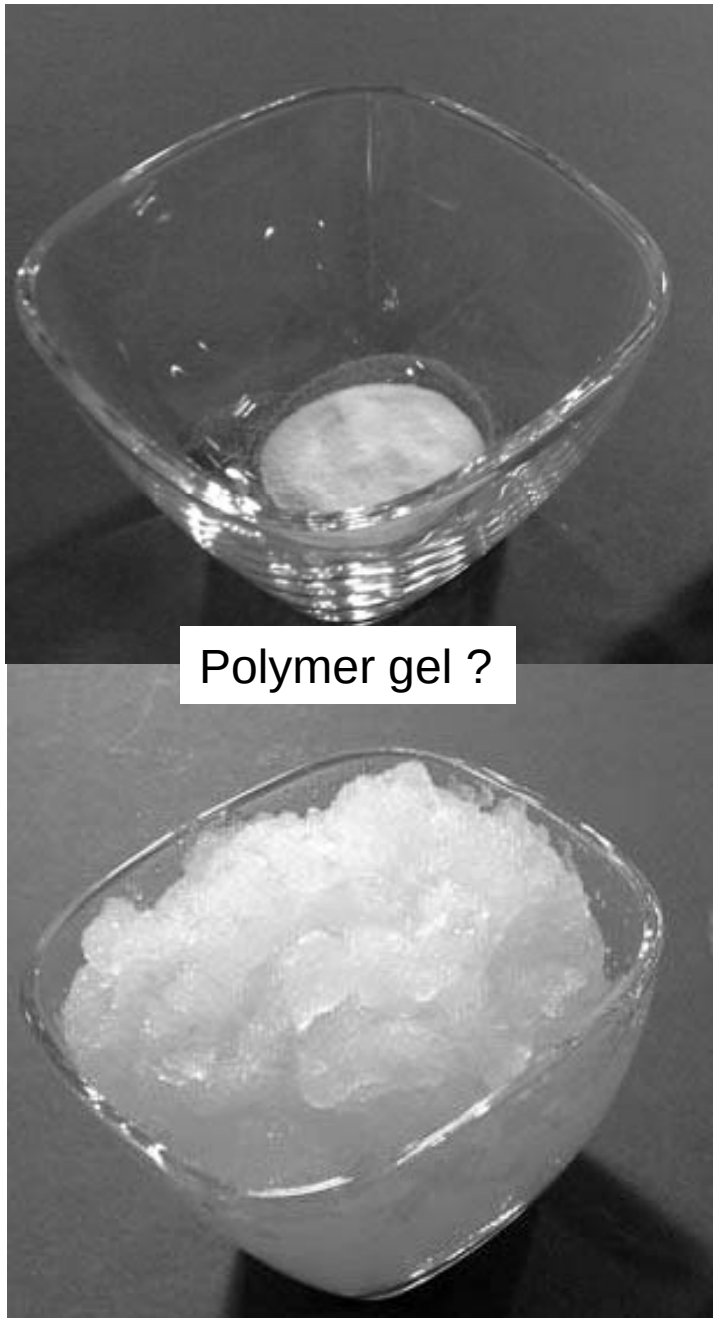
Sand does not mix into **surface soil** well and is **not advised** unless the soil is a soil mix component and large equipment is used.

Use coarse sand (concrete sand) at quantities where the **medium to coarse sand** in the **final mix** will exceed 55%. Below that amount you can do more harm than good. Self compacting, and drainage not improved or made worse

Other soil amendments



Diatomaceous Earth?



Polymer gel ?

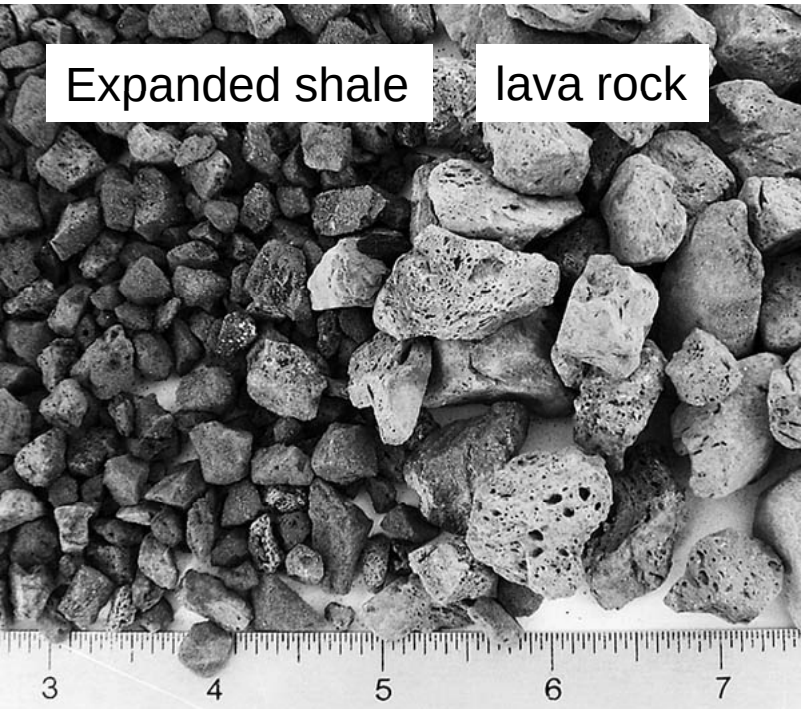
Soil texture modification

In heavy clay soils:

Gypsum can improve structure which improves drainage

Adding expanded shale (or lava rock) at about 25-30% by volume may increase soil drainage.

Organic matter (compost) opens up micro-structure and improves macro-structure, which improves drainage, aeration, root access, water and nutrient cycling.



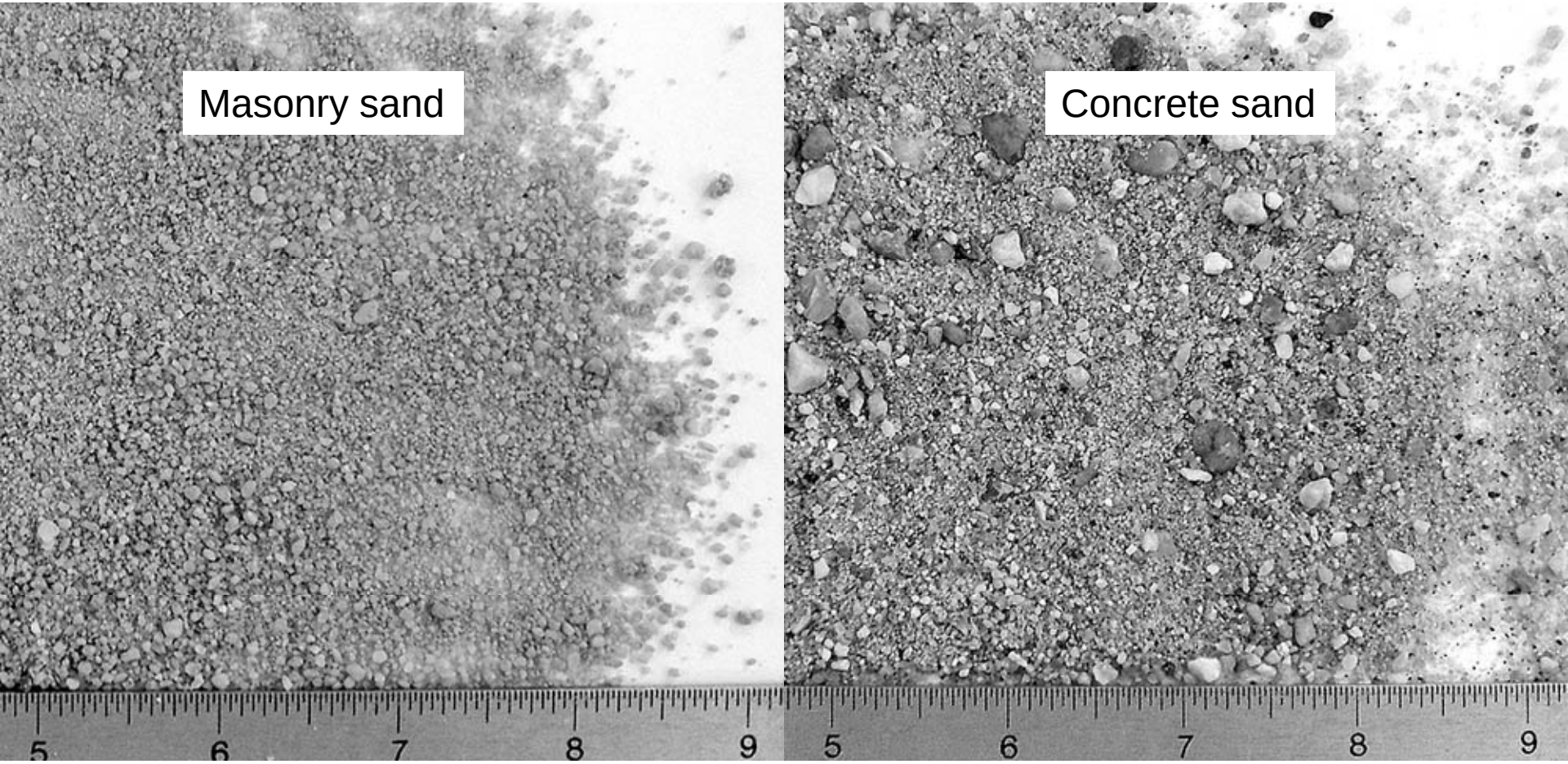
What kind of sand?

ASTM C 33 Coarse Concrete Sand – **Not** masonry sand

Fines Modulus Index of between 2.8 and 3.2

River pumped round sand or quarried sharp sand (regional variation

Calcareous stone vs quartz sand – Can you accept a higher pH?



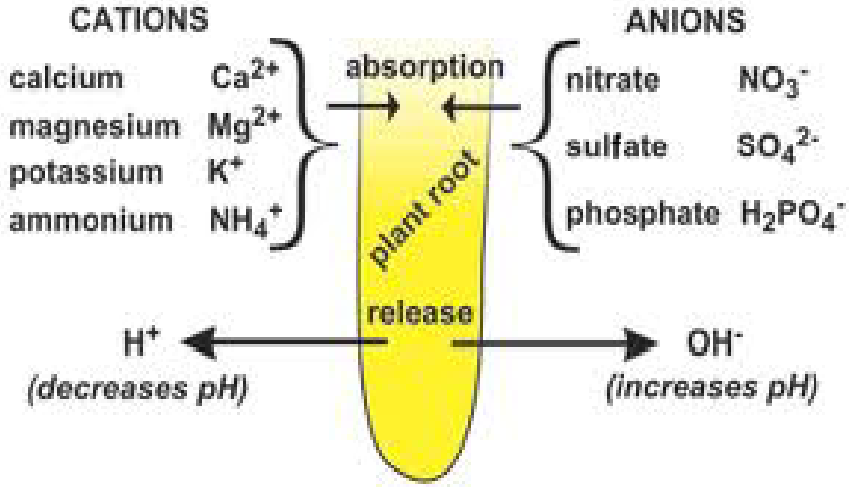
Soil chemistry & pH modifications

- **Match plant selection to site soils**, rather than trying to modify chemistry

- Compost buffers pH, acid or alkaline towards optimal 6.3-6.8
- Compost increases cation exchange capacity (CEC) = nutrient storage & availability

- Lime as needed for Ca & Mg plant needs
- Sulfur applications only lower pH temporarily

Plant problems?
Get a soil test.



pH

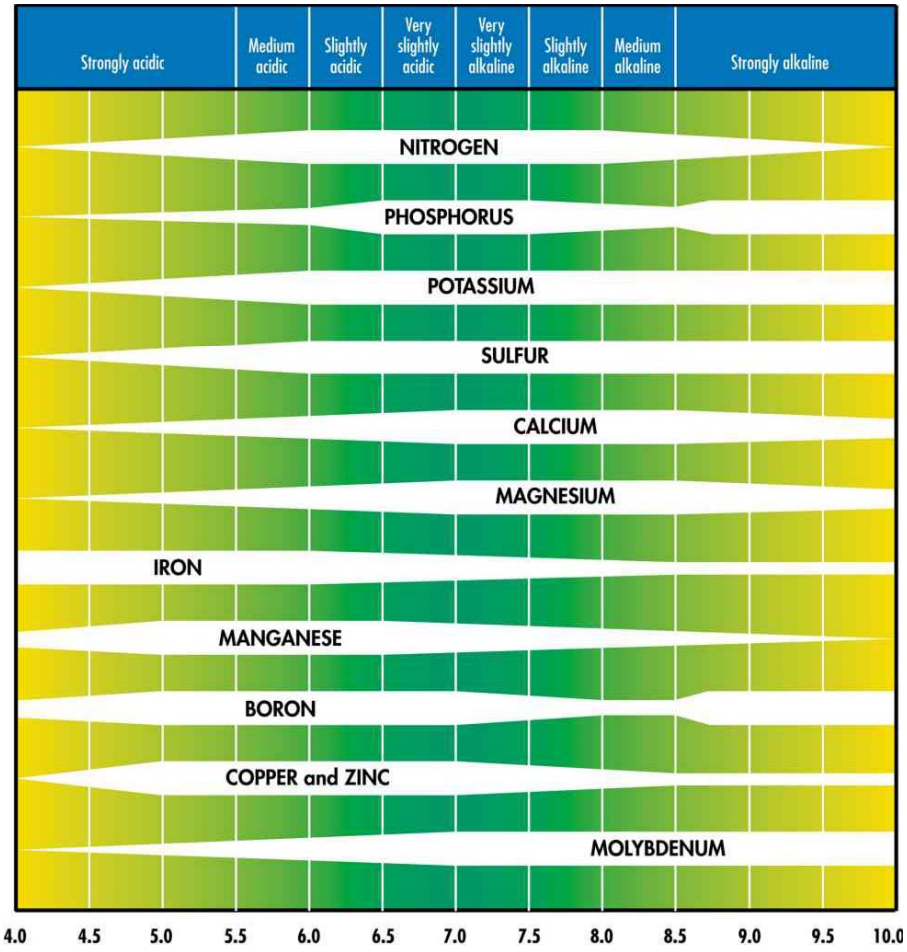
Best option, pick plants that are pH adaptable.

pH can be raised easily with lime.

pH can be lowered with sulfur products but…..

Is only temporary and requires continuous re treatment

Long term treatments can create other soil toxicities.



Rationale for less fertilizer for urban trees and landscapes

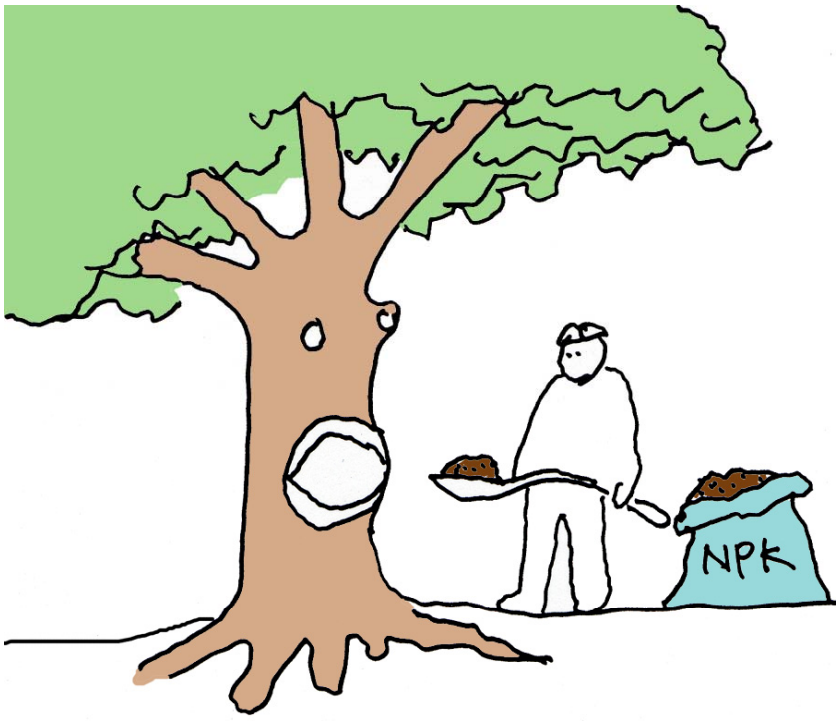
Not crops – Fruit production or crop yields not required

Sufficient required nutrients available to support plant goals

No yearly harvest/removal of biomass

Slower growth may be a desirable trait

Too much N increases sucking insects and foliar diseases, and annual weeds



Feed the soil, not the plant by mulching and leaving fallen leaves.
Plant problems? Get a soil test.

Soil Toxicity

Explore possible contaminants early in site design

•Involve a local soil expert, and dependable lab

•Know the site's history

- Lead, arsenic, chemical, oil tanks, etc.

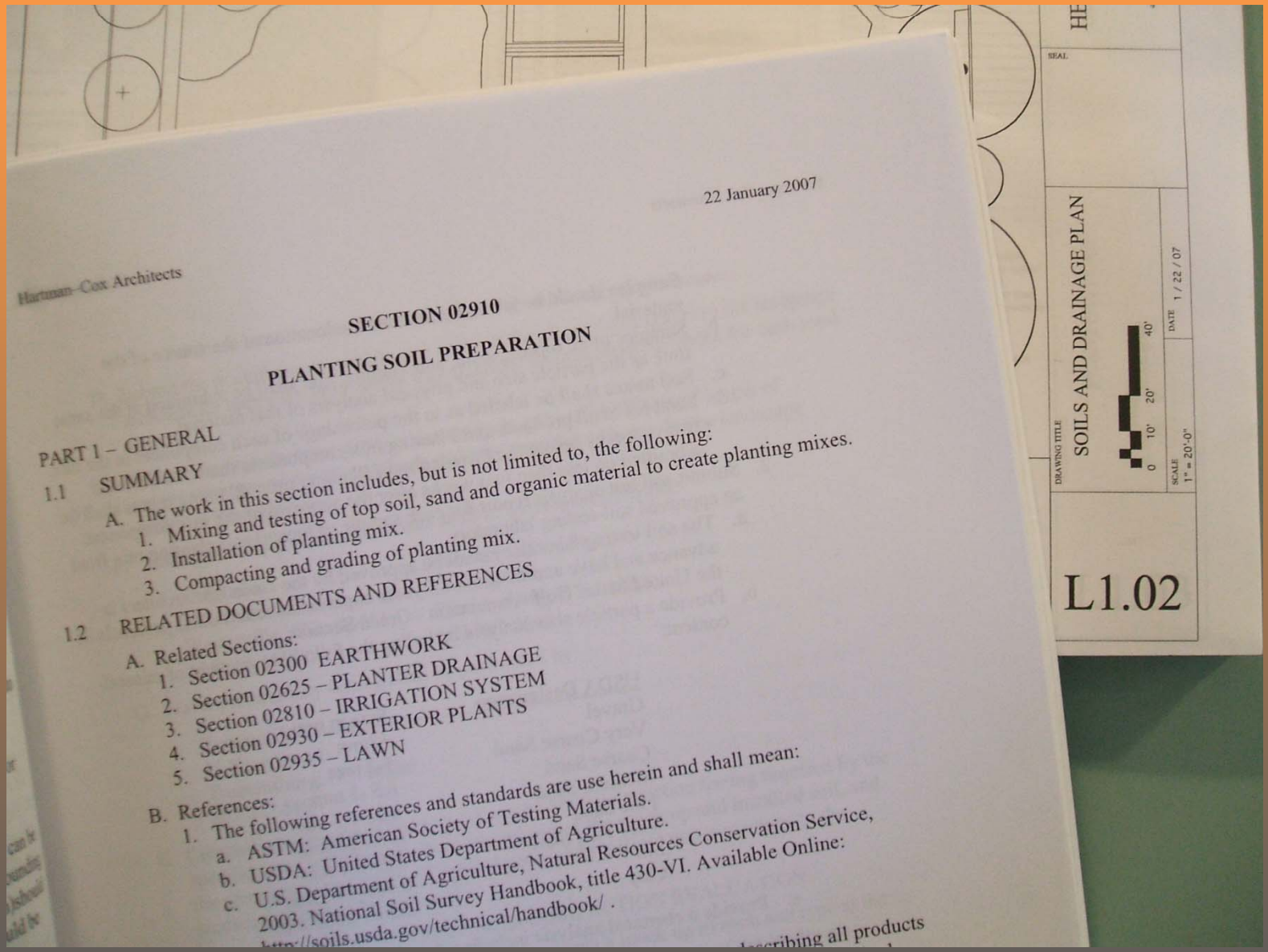
When to get rid of, cap, or remediate the soil

- Toxic plant nutrients, salts
- Other chemicals toxic to plants
- Chemicals toxic to soil organisms or people

Remediating soil

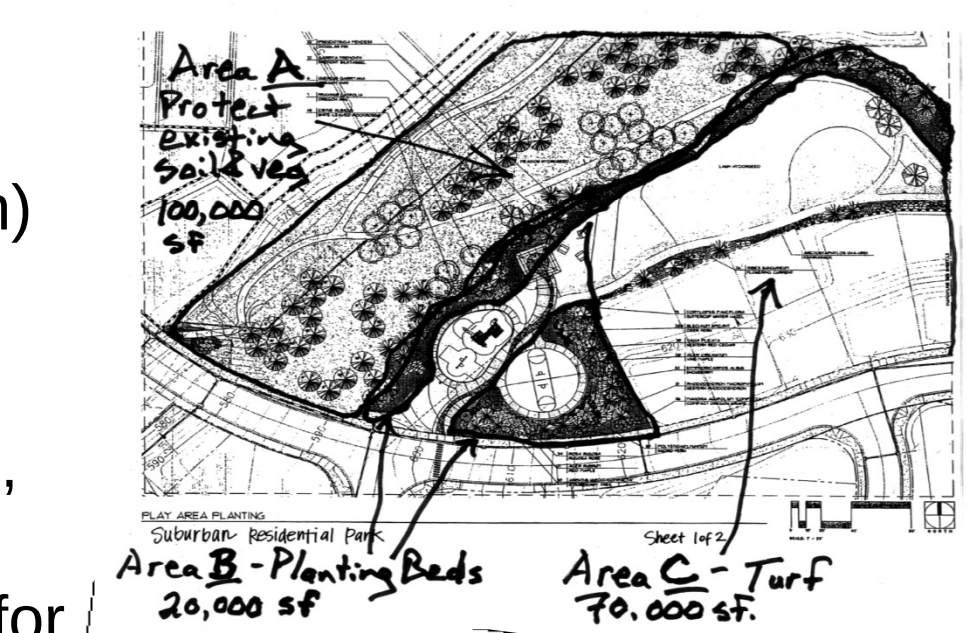
- Compost amendment reduces heavy metal mobility, toxicity,
  and breaks down hydrocarbons & most pesticide residues
- Specific microbial remediation for complex chemicals

Soil Management Plans



Create A Soil Management Plan (SMP)

- A scale-drawing identifying areas where each treatment (soil protection or restoration) option will be applied.
- A completed SMP form identifying treatment options, amendment products and calculated application rates for each area.
- Identify a Reference Soil as a guide for planned soil restoration.



Model SOIL MANAGEMENT PLAN for BMP T5.13
(available as MS Word file at www.SoilsforSalmon.org)

PROJECT INFORMATION
Complete all information on page 1; only site address and permit number on additional pages.
Page # ___ of ___ pages
Site Address / Lot No.:
Permit Type:
Permit Holder:
Permit Number:
Mailing Address:
Phone:
Contact Person:
Plan Prepared By:
Phone:

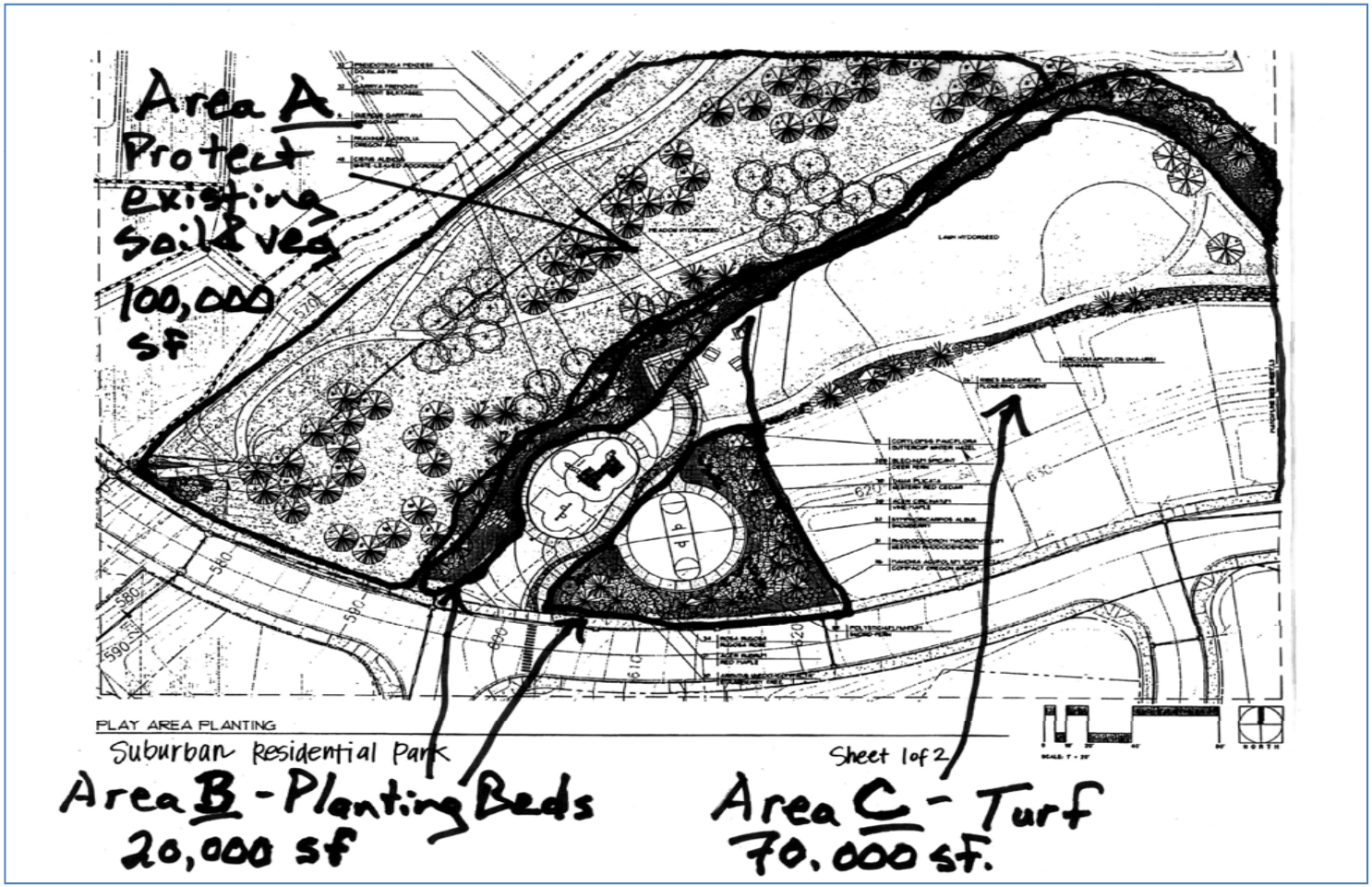
ATTACHMENTS REQUIRED (Check off required items that are attached to this plan)
___ Site Plan showing, to scale:
___ Areas of undisturbed native vegetation (no amendment required)
___ New planting beds and turf areas (amendment required)
___ Type of soil improvement proposed for each area
Soil test results (required if proposing custom amendment rates)
Product test results for proposed amendments

AREA # ___ (should match Area # on Site Plan)
PLANTING TYPE
___ Turf
___ Planting Beds
___ Undisturbed native vegetation
___ Other:
SQUARE FOOTAGE OF THIS AREA: ___ square feet
SCARIFICATION
Subsoil will be scarified
___ inches (depth) of scarification needed to achieve finished
PRE-APPROVED
AMENDMENT

Developing a Soil Management Plan

step 1: Identify & map

- Healthy soil areas as “vegetation and soil protection zones”
- Disturbed areas needing different soil restoration treatments

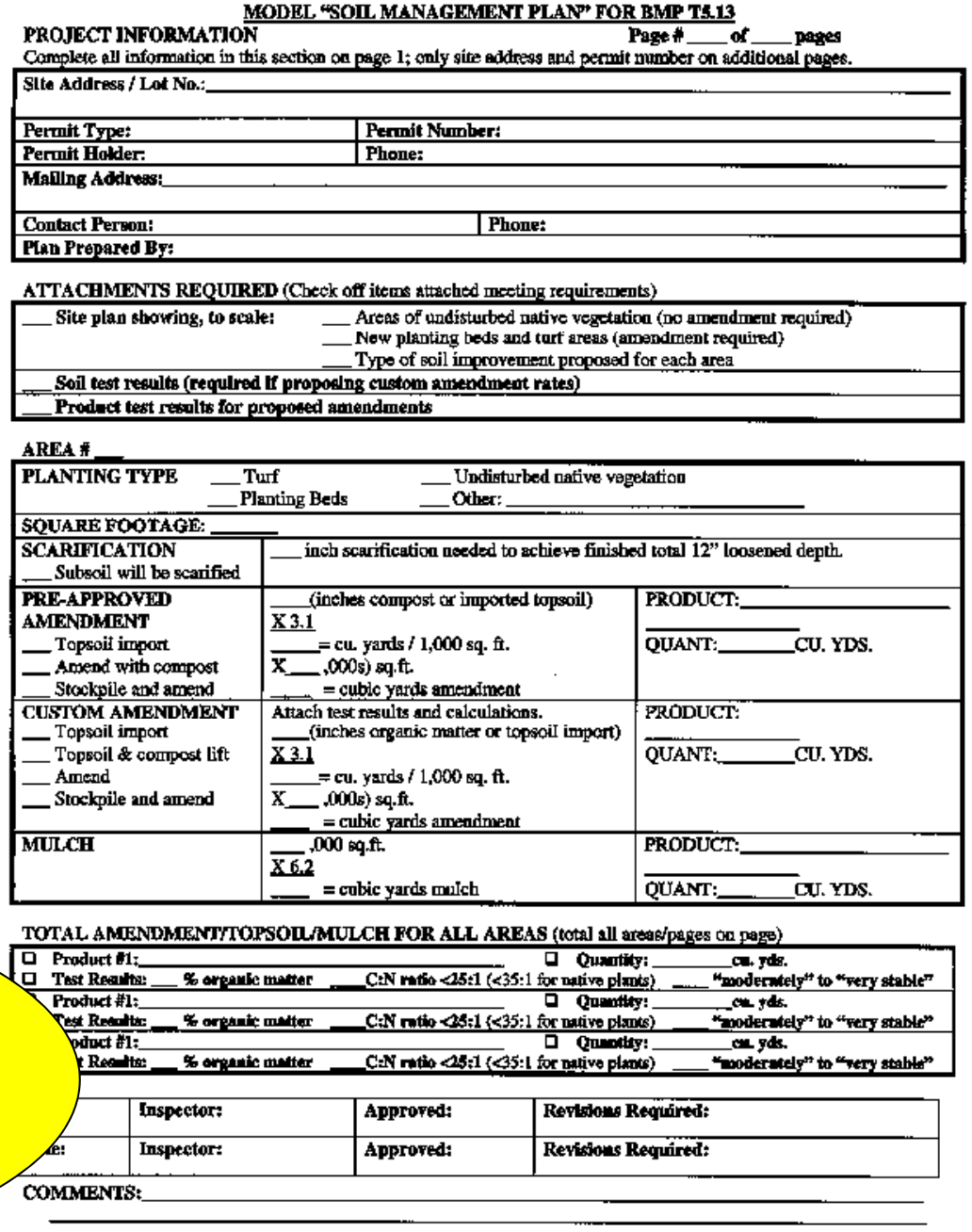


Soil Management Plan

step 2:
Compute compost amendment or amended topsoil and mulch needed for each area

This form is in the Building Soil Manual *at* www.BuildingSoil.org

(see pages 8-13)



MODEL "SOIL MANAGEMENT PLAN" FOR BMP T5.13

PROJECT INFORMATION **Page # ____ of ____ pages**

Complete all information in this section on page 1; only site address and permit number on additional pages.

Site Address / Lot No.:	
Permit Type:	**Permit Number:**
Permit Holder:	**Phone:**
Mailing Address:	
Contact Person:	**Phone:**
Plan Prepared By:	

ATTACHMENTS REQUIRED (Check off items attached meeting requirements)

___ **Site plan showing, to scale:**	___ Areas of undisturbed native vegetation (no amendment required) ___ New planting beds and turf areas (amendment required) ___ Type of soil improvement proposed for each area
___ **Soil test results (required if proposing custom amendment rates)**	
___ **Product test results for proposed amendments**	

AREA # ___

PLANTING TYPE ___ Turf ___ Planting Beds	___ Undisturbed native vegetation ___ Other: _____	
SQUARE FOOTAGE: _____		
SCARIFICATION ___ Subsoil will be scarified	___ inch scarification needed to achieve finished total 12" loosened depth.	
PRE-APPROVED AMENDMENT ___ Topsoil import ___ Amend with compost ___ Stockpile and amend	____(inches compost or imported topsoil) X 3.1 _____= cu. yards / 1,000 sq. ft. X____,000s) sq.ft. _____ = cubic yards amendment	**PRODUCT:** _____ **QUANT:** _____ **CU. YDS.**
CUSTOM AMENDMENT ___ Topsoil import ___ Topsoil & compost lift ___ Amend ___ Stockpile and amend	Attach test results and calculations. ____(inches organic matter or topsoil import) X 3.1 _____= cu. yards / 1,000 sq. ft. X____,000s) sq.ft. _____ = cubic yards amendment	PRODUCT: _____ QUANT: _____ CU. YDS.
MULCH	____,000 sq.ft. X 6.2 _____ = cubic yards mulch	**PRODUCT:** _____ **QUANT:** _____ CU. YDS.

TOTAL AMENDMENT/TOPSOIL/MULCH FOR ALL AREAS (total all areas/pages on page)

☐ **Product #1:** _____		☐ **Quantity:** _____ **cu. yds.**
☐ **Test Results:** ___ **% organic matter**	___ **C:N ratio <25:1 (<35:1 for native plants)**	___ **"moderately" to "very stable"**
Product #1: _____		☐ **Quantity:** _____ **cu. yds.**
Test Results: ___ **% organic matter**	___ **C:N ratio <25:1 (<35:1 for native plants)**	___ **"moderately" to "very stable"**
oduct #1: _____		☐ **Quantity:** _____ **cu. yds.**
t Results: ___ **% organic matter**	___ **C:N ratio <25:1 (<35:1 for native plants)**	___ **"moderately" to "very stable"**

	Inspector:	**Approved:**	**Revisions Required:**
e:	**Inspector:**	**Approved:**	**Revisions Required:**

COMMENTS: _____

Protect soil & vegetation during construction

- Fence ***vegetation & soil protection zones***
- Inform all contractors & subs: no stockpiles etc.
- If temporary vehicle access required, place steel plates over 6” coarse wood chip.

step 3:
Communicate SMP vegetation and soil protection zones and restoration plans to all contractors and crews.

Soil and tree preservation are similar, but trees sometimes need extra effort

Soil Management Plans – real world challenges, schedules, and conflicts

On site storage limitations:

- Space / Time and need or other contractor operations.
- Cost vs environmental benefit

Wet periods and overly moist soil:

- Options for overly tight schedule must be in specification
- Require covered storage (breathable fabric not plastic film)

Contractor / owner resistance to new ideas:

- Education
- Pre bid and preconstruction meetings
- Need to do it a few times with better contractors to convince the hold-out contractors

See **http://www.buildingsoil.org/tools/When_to_Amend.pdf**

Soil Maintenance

Using mulches after planting and for annual maintenance

BENEFITS:

Mulches limit weed growth, and make weeds that sprout easier to pull or cultivate.

Mulches conserve water, moderate soil temperature, and reduce erosion.

Mulches replenish soil organic matter, enhancing soil biodiversity, structure, and nutrient cycling
= increased plant vigor.

Mulching

WHEN After planting, and once every year or two:
- Spring or fall on trees and shrubs to prevent weeds.
- Early summer on gardens. (Let soil warm up.)
- Fall on beds to prevent erosion and compaction.

WHERE Whole beds, paths, 3 ft. or larger ring around trees & shrubs in lawns.

HOW Remove weeds & grass before spreading mulch. Keep mulch away from plant stems. Use cardboard weed barrier (not fabric) to control aggressive weeds.

Mulching

WHAT

Woody mulches (arborist wood chips, bark) for woody plants (trees & shrubs).

Non woody mulches (compost, leaves, grass clippings, composted manure or biosolids) for non-woody plants (annuals, perennials, berries, roses).

HOW MUCH

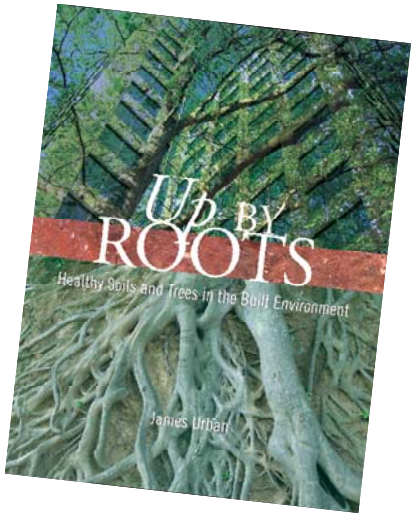
Compost, leaves, sawdust, fine bark, grass clippings: 1-2” deep.

Wood chips or coarse bark: 2-4” deep.

Other Soil Maintenance Practices

- Leave plant litter, recycle fall leaves and chipped prunings into mulch on site.

- Base all fertilizer applications on soil tests (every 1-3 years on most sites).
  Learn about soil testing at
  www.puyallup.wsu.edu/soilmgmt/Soils.html
  See videos and factsheets on "Collecting a soil sample", " "Determining soil texture by hand", and "Understanding soil test results".



- More urban soil remediation & maintenance strategies in *Up by Roots* by James Urban.

Soil and the Design Process – SITES Benchmarks

best practices for every project

SITES Guidelines = Best soil practices for every project

Site Selection

Prereq's. 1.1-1.4:
Limit Development on Farmland, Protect Floodplain, Wetland and Habitat Functions

Credits 1.5-1.6:
Redevelop Degraded Sites, Locate Within Existing Developed Areas

- Protect existing high quality soils
- Select already-impacted sites where possible
- Restore degraded soil and vegetation functions

SITES Guidelines = Best soil practices for every project

Pre-Design Assessment and Planning

Prereq's 2.1-2.3 : Conduct a Pre-Design Site Assessment,

Use an Integrated Design Process,

Designate Vegetation and Soil Protection Zones.

- Visually inspect soil profile (borings)
- Test each different soil area on site
  - bulk density
  - OM
  - pH
  - nutrients
  - CEC
  - salts (EC) in arid zones

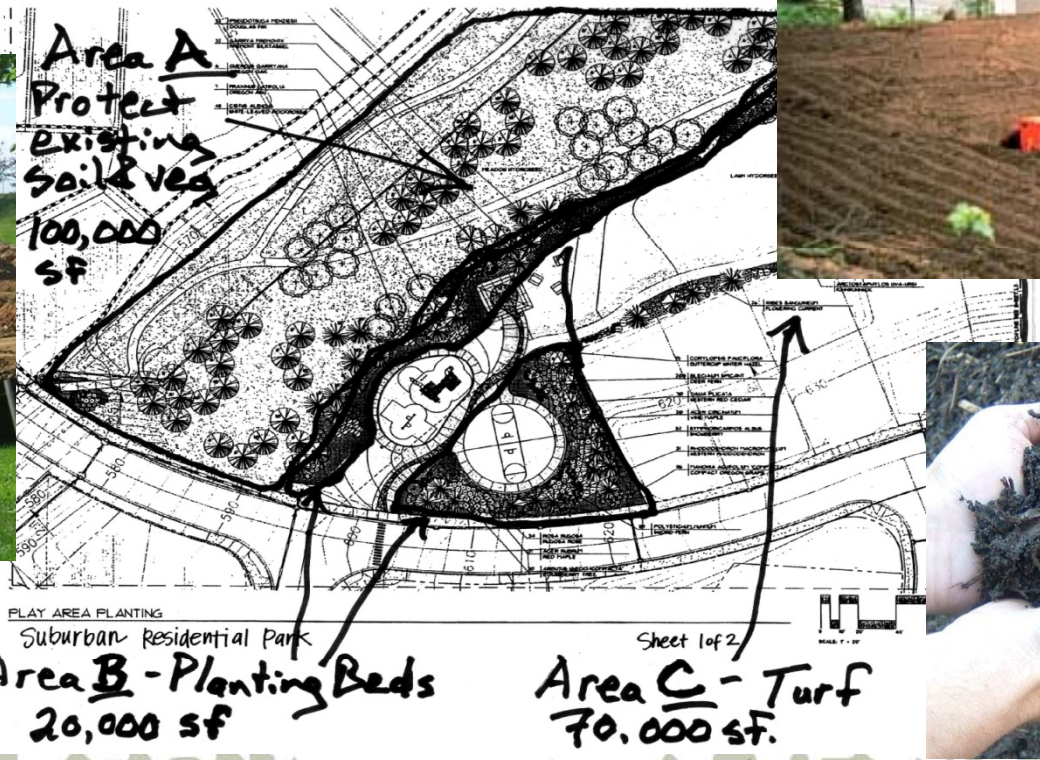
- Identify Reference Soils as standards for restoration.
- Involve soil, tree, and plant experts early in design, to identify issues/solutions, and Vegetation and Soil Protection Zones.

SITES Guidelines = Best soil practices for every project

Site Design – Water

Prereq's 3.1-3.2: Reduce Irrigation Water Use; Manage Rainfall Onsite

- Preserve and restore soils – the most cost-effective way to reduce irrigation and manage storm water onsite



Site Design – Soil and Vegetation

Prereq 4.3: Create a Soil Management Plan

Credits 4.4-4.7: Preserve or Restore Existing Healthy Soils and Vegetation

Create a Soil Mgmt. Plan during site design:

- Designate protection (VSPZ) and restoration Zones
- Show soil protection and restoration zones and practices on Soil Mgmt. Plan and in specifications
  - Restore soils compacted, stripped or graded during current project,
  - Look for opportunities to restore previously disturbed soils.
  - Basic restoration is de-compacting (12'' min. depth, 18-24 is better) and mixing 10-25% compost by volume into upper 8-12 inches.
  - Minimize grading and soil export/import – just amend site soils with mature compost.
  - Develop soil restoration practices appropriate to the intended vegetation.
  - Provide adequate soil volume strategies for trees
- Plan details and specifications become part of the contract documents

SITES Guidelines = Best soil practices for every project

Construction

Prereq 7.3 Restore Soils Disturbed by Construction

Credit 7.4 Restore Previously Disturbed Soils

Credit 7.6 Divert reusable vegetation, rocks, and soil from disposal.

Implement your Soil Management Plan:

- Communicate SMP to contractors & subs
- Monitor & enforce Vegetation and Soil Protection Zones, especially tree root zone protections
- Keep construction traffic on road bases: protect site soil
- Manage grading for effective storage and reuse of topsoil
- Consider bringing compost onsite as erosion control cover, then till in per the SMP before planting

SITES Guidelines = Best soil practices for every project

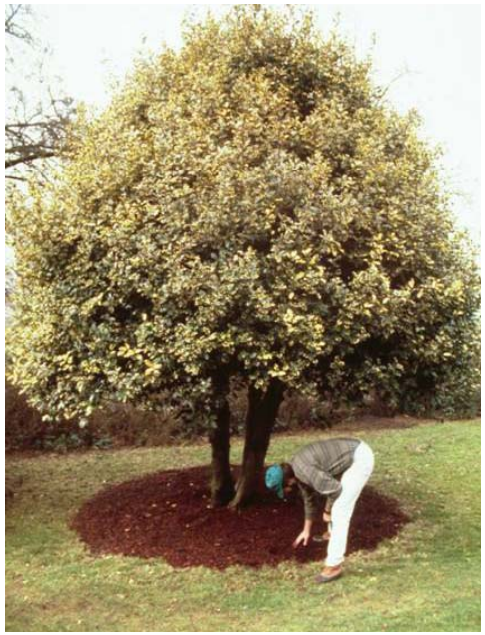
Operations and Maintenance

Prereq 8.1 Plan for Sustainable Site Maintenance

Credit 8.3 Recycle Organic Matter

Create a Landscape Management Plan

- Guides maintenance: IPM, mulching, soil protection and restoration.
- Reuse site organics as mulch, grasscycling or compost, to maintain soil health

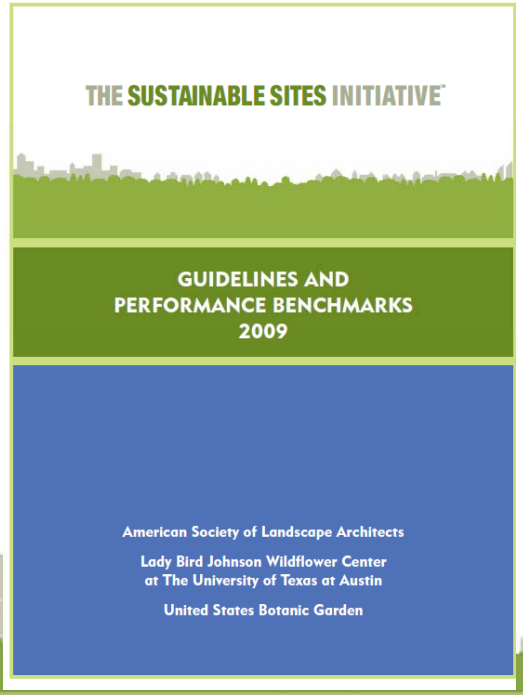


SITES Guidelines = Best soil practices for every project

Education & Performance Monitoring

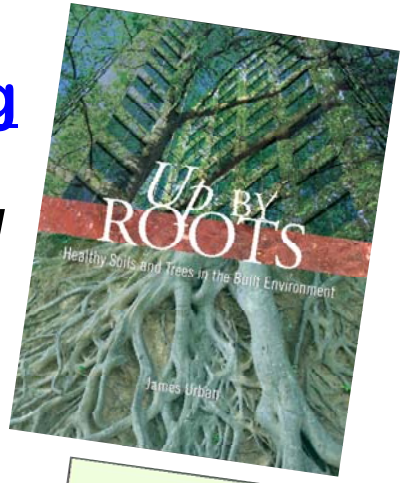
Prereq 9.1, Credit 9.2
Monitor Site Performance; Develop a Case Study

- Monitor plant health
- Test soils in case of plant problems
- Adaptively manage soil health through mulching, protection from compaction and de-compaction techniques, and organic additions
- Educate maintenance staff, owners & users

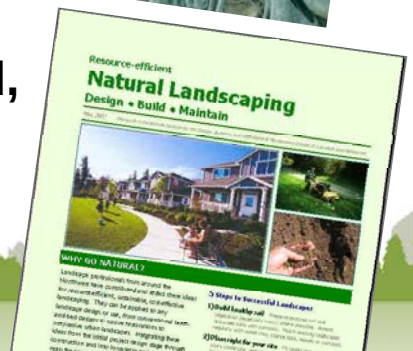


www.sustainablesites.org

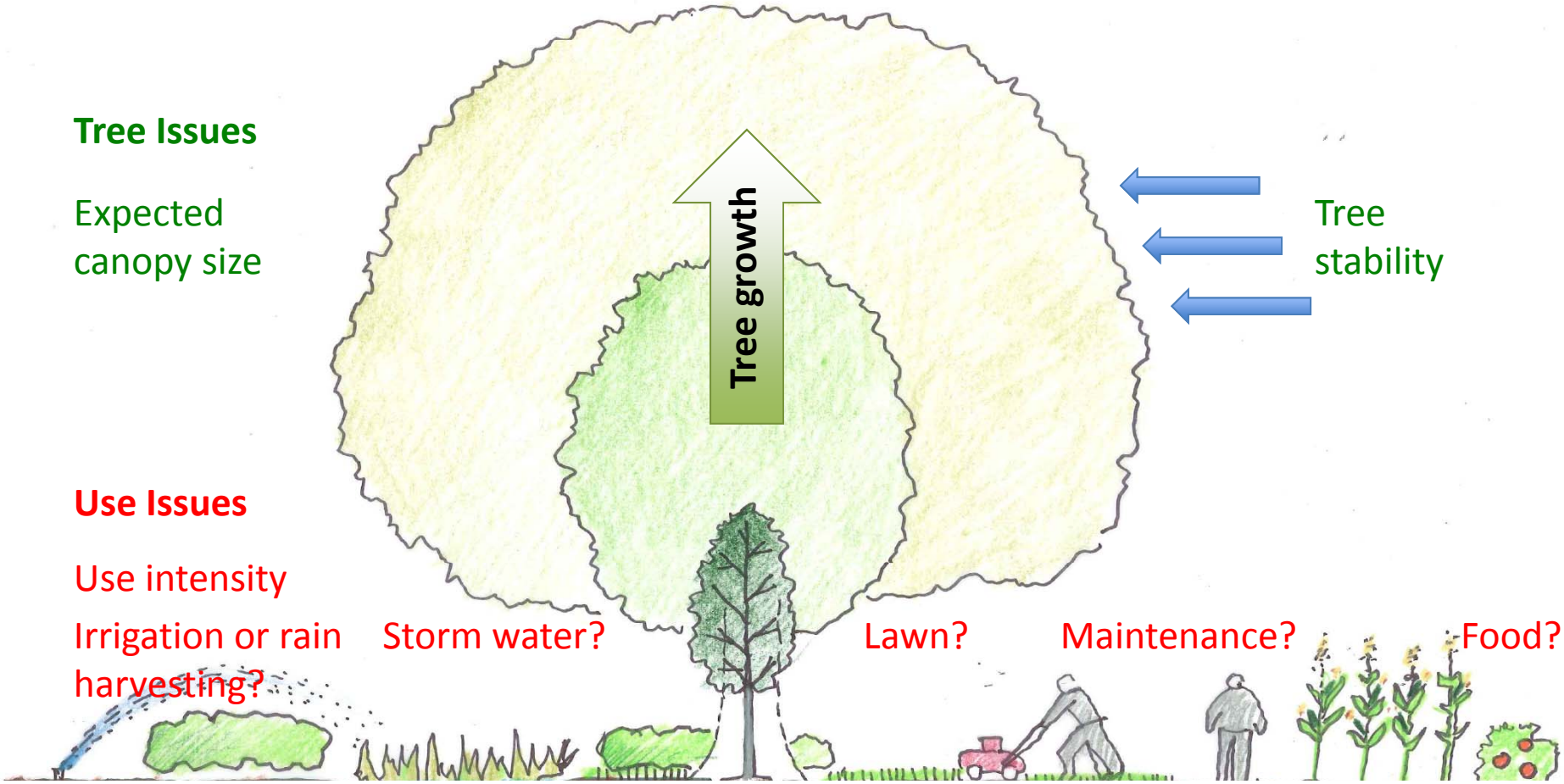
Up By Roots: *Healthy Soils and Trees in the Built Environment*
By James Urban, available at Amazon.com



Natural Landscaping: Design, Build, Maintain and other resources at www.buildingsoil.org



Soil Goals and Requirements – ***Right plant, right place, <u>right</u> <u>soil</u>!***



Soil Issues

Soil drainage

Space for roots and trunk flare

Sufficient soil volume

Imported soil sources

Existing soil conditions

Grading