

Mulching Matters

❖ What is mulch?

- Mulch can be any organic (from living or once-living) or inorganic (from non-living) material used to cover garden areas
- Mulches that work best for trees and woody ornamental landscapes are not always the best choices for vegetable gardens, annuals or newly planted perennials.

❖ What are the benefits of mulching gardens?

- Improve growth of plants (i.e., trees, shrubs, perennials, vegetables etc.)
- Inhibit weed growth and weed seed germination
- Reduce water lost through evaporation and improve water infiltration
- Minimize soil erosion from wind, rain, spring snow melt, etc., (Fig. 1)
- Moderate soil temperatures
 - Provide **winter** protection, e.g. protect plants with shallow roots, or plants on the margin of being viable in your zone and reduce frost heaves (plant roots pushed upward out of soil)
 - Provide **summer** protection: e.g., prevent damage to roots caused by periods of hot & dry weather.
- Improve soil structure and quality overtime, (e.g., organic mulches decompose and return nutrients to the soil)
- Reduce or prevent compaction from foot traffic and rain
- Prevent mechanical injury to shrubs and tree trunks from mowers and string trimmers (Fig. 2)
- Reduce the spread of soil borne pathogens by preventing spores in soil from splashing onto plants during rainstorms and watering
- Encourage the growth of beneficial soil microorganisms
- Increase biodiversity
- Neutralize pollutants
- Improve appearance by creating a unifying effect, especially in new garden areas when plants are small



Figure 1 - Bare soil left over winter can show the effects of erosion from wind, rain and snow melts; resulting in poorer soil, seemingly filled with rocks



Figure 2 - Damage from string trimmers or mowers can leave plants susceptible to pests and disease. Creating a circle of mulch surrounding the trunk can prevent this from occurring.

➤ When should you mulch?

- When adding new plants to the garden
- In spring, (as plants emerge) for already established plantings; since organic mulches break-down, the mulch may need to be replaced annually
- In the summer vegetable garden, to protect roots from prolonged hot, dry weather or to prevent the spread of disease caused by organisms being splashed onto the leaves during rain or from watering
- In fall, for plants that may be sensitive to a long, cold winter and/or have roots up near the soil surface (e.g., Japanese Maples)
- In fall, to improve soil (e.g., decrease compaction, effects of erosion, improve soil structure, etc.)
- *“While mulches offer a great number of benefits to gardeners, it must be remembered that they can interfere with the habitat of arthropods (insects, spiders etc.). With 70% of native bees nesting in the ground and many of their habitats threatened, mulch can significantly interfere with survival. Care should be taken to leave bare soil throughout the garden. Consider NOT mulching behind shrubs, at the back of the border, and leaving some gardens to fill in completely with plants.”*

Janet Mackey – Halton Master Gardener



Fig. 3: Ground nesting bee emerging from nest

➤ How to mulch?

- Be sure to remove any perennial weeds before applying mulch
- Do not allow the mulch to be in contact with the crowns/stems of plants (trees, shrubs, perennials or annuals). This can rot the outer layer and make the plant susceptible to disease and pests.
- Generally, 5-8 cm or 2-3 inches is sufficient (less if using compost). Dr. Linda Chalker-Scott recommends 10-15 cm (4-6 inches) of arborist wood chips for ornamental sites and 20- 30 cm (8-12 inches) for restoration sites (i.e., where there’s been soil compaction due to use of heavy construction equipment). A thicker layer of mulch is not necessarily better.
- ◆ *“When mulch builds up over 10cm (four inches) it can become hydrophobic, or water repellent. When this happens water simply sheds off the top of the mulch rather than soaking in to the soil below, leaving plants thirsty. Thick layers of mulch can also suffocate plant roots. We don’t often think about the role of air in the soil, but roots need air to survive. Burying root systems under excessive layers of mulch reduces the amount of air in the soil, causing plants to decline. This decline is usually slow, often taking years for plants to die from over mulching.”*

¹ Glen, Charlotte *Can Too Much Mulch Kill Plants?* North Carolina Co-op Extension, <https://pender.ces.ncsu.edu/2012/10/can-too-much-mulch-kill-plants/>, 2012

➤ How to mulch trees?

- Do not allow mulch layers to build up over tree roots. Some trees are not tolerant of changes in soil/mulch level on their roots, negatively affecting their ability to 'breathe'.
- While "mulch volcanoes" are commonly seen, this is NOT good practice and could cause your plant to be short-lived. (See Fig. 4 & 5). Keep mulch 6" or 16 cm away from the base of trees/plants
- Do not allow mulch to hide the trunk flare at the base of trees. (See Fig. 6 & 7)



Figure 4-A tree properly mulched to the dripline using coarse woodchips. -notice the depression (bowl-shape) closer to the trunk



Figure 5- Mulch Volcanoes can weaken and ultimately kill a plant by allowing pathogens to enter the tree where the mulch is in contact with the outer epidermal layer or bark.



Figure 6 - The curve at the base of the tree on the left indicates the location of the root flare.

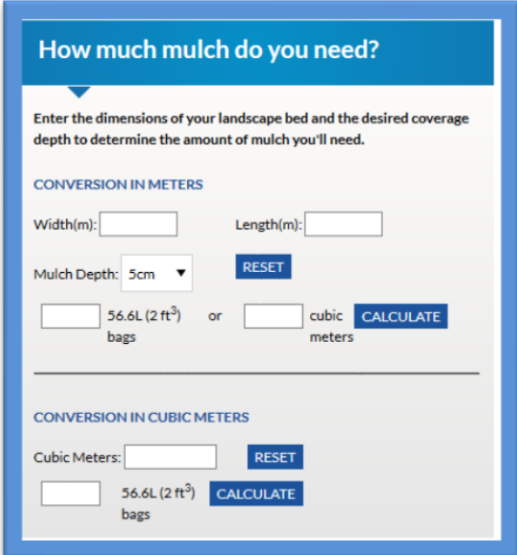


Figure 7- The mulch/soil around this tree has buried the trunk flare and the tree is in decline.

❖ Shopping for Mulch

➤ Calculating Amount

- [Here's a Great Mulch Calculator](#) to determine how much mulch is needed to cover a garden area.
- If a large amount is required, it is generally more economical to purchase the mulch in bulk, rather than individual bags.



The screenshot shows a web form titled "How much mulch do you need?". It asks the user to enter the dimensions of their landscape bed and the desired coverage depth. The form includes input fields for "Width(m)", "Length(m)", and a dropdown menu for "Mulch Depth" (set to 5cm). There are "RESET" and "CALCULATE" buttons. Below the form, it shows conversion options: "56.6L (2 ft³) bags" and "cubic meters". A second section titled "CONVERSION IN CUBIC METERS" has a "Cubic Meters" input field and another "CALCULATE" button.

➤ Sourcing



- While there is a Mulch and Soil Council in the United States, there is no comparable organization in Canada due to the relatively small size of the industry. The Canada Consumer Product Safety Act requires the following on a package: name of the product, the product's net quantity, and the business' name and address. It does not make it mandatory to list ingredients but if ingredients are listed it requires that the list be truthful.²
- Carefully read packaging or descriptions (i.e., when ordering in bulk), to determine if the mulch will meet your needs.

➤ Alternatives to purchasing commercially available mulch

- Check City Work Yards for arborist mulch (shredded wood).
- Ask friends if you can collect needles from under pine trees
- Make Your Own Mulch
 - [Here's a video](#) about how to use fallen leaves in your gardens.
 - [Here's a video](#) about using mown grass to create your own mulch.
 - Create mulch using pet bedding material to insulate plants (e.g., strawberries & garlic) in early Spring [See Video Here](#)

❖ Types of Mulches

“There is a great deal of conflicting information regarding mulches. Much of what is reported is from single studies or, is anecdotal. There are also so many factors that affect how a mulch will behave in a given situation (including underlying soil conditions, moisture, microbes, invertebrates, weather, etc.). This makes generalizing from studies done in particular locations on particular species problematic.”

C. Kavassalis (Halton Master Gardeners)

➤ Organic Mulches

Mulch	Pros	Cons	Comments
<p>Natural Wood Chips and/ or Shredded Wood</p> <p>May include arborist mulch-produced from heartwood</p>	<ul style="list-style-type: none"> • Readily available, inexpensive and sometimes free (through city or private arborist companies) • Keeps soil cool & moist • Coarser materials won't mat and allow air and water to transfer to and from soil • An excellent choice for around woody shrubs and trees • Excellent material to re-build texture after compaction due to construction/heavy use • Fresh mulch is especially useful for creating pathways 	<ul style="list-style-type: none"> • Can potentially result in temporary nutrient deficiencies at the mulch/soil interface, therefore, wood chips are not recommended around annual beds or vegetable gardens where plants do not have deep, extensive root systems • Coarse texture may not lend itself to formal settings • Can potentially harbour pathogens like Armillaria and Sphaeropsis tip blight, so should not be incorporated into soils or used up against tree trunks • May promote the growth of slime moulds, mushrooms and other fungi 	<ul style="list-style-type: none"> • Never pile up mulch at the base of a woody plant (see “mulch volcano” Fig 3) • Use a thin layer of compost under the mulch to alleviate concerns about nutrient depletion • While mulch made from diseased trees is unlikely to affect healthy trees, avoid incorporating it into the soil. • Soft woods (e.g. pines, firs, cedars.) decompose more slowly than hardwoods (e.g. maples, ash.) • Some trees, such as Black Walnut, may produce chemicals that affect plant growth, though recent research suggests this may not be as much of a concern as thought in the past • During especially wet years, anaerobic fermentation can produce sour mulch that can damage plants. Always smell bagged mulch and do not purchase if unpleasant
<p>Bark: (nuggets, or shredded)</p> <p>May include both hardwood and softwood by-products or lumber and paper industry</p>	<ul style="list-style-type: none"> • Decorative • Provides good weed control • Moderates soil temperatures • Can protect soil from compaction from rain and foot traffic • Excellent for paths 	<ul style="list-style-type: none"> • As mentioned above, high carbon wood chips, in this case bark, may cause a temporary nitrogen deficiency in the upper soil surface • Bark naturally contains waxes and resins that prevent absorption and release of water in landscapes • Chips and shavings are prone to matting and can prevent air and water movement • May float away in heavy rain 	<ul style="list-style-type: none"> • See above • Coarser mulches out-perform finer-textured material • Always smell bagged mulch and do not purchase if there is an unpleasant odour

Mulch	Pros	Cons	Comments
		<ul style="list-style-type: none"> As above, can potentially harbour pathogens, so should not be incorporated into soils As above, may promote the growth of slime moulds, mushrooms and other fungi 	
Coloured Wood Products	<ul style="list-style-type: none"> Provides a uniform colour useful for decorative applications Decomposes more slowly than untreated wood 	<ul style="list-style-type: none"> Carbon-based dyes and iron oxide-based dyes may wash off as the season progresses and become less attractive Source of materials is often not clear Products can be contaminated with various chemicals, such as creosote and CCA (chromated copper arsenate) As above, may harbour pathogens and promote fungi and slime molds 	<ul style="list-style-type: none"> Wood used for making colored mulch can come from recycled wood, e.g., wood scraps, wood pallets, reclaimed construction and demolition waste See comments for arborist chips and bark
Sawdust	<ul style="list-style-type: none"> Inexpensive Slow to decompose 	<ul style="list-style-type: none"> May tie up nitrogen in the upper soil surface Slow water penetration Prone to matting and can prevent air and water movement 	<ul style="list-style-type: none"> Let weather a few months before using See comments for arborist chips and bark
Cocoa Shells	<ul style="list-style-type: none"> Good for small plants, flowers, and vegetable gardens Smells like chocolate 	<ul style="list-style-type: none"> Toxic to dogs Can float or blow away if placed in windy, exposed areas Expensive May mould 	<ul style="list-style-type: none"> Stays in place if kept wet and as it ages Wash away any mould that appears
Hay/Straw	<ul style="list-style-type: none"> Great winter insulator for bulbs, vegetables and perennials Useful in garden paths, around strawberries and larger vegetables 	<ul style="list-style-type: none"> Contains a large amount of weed seed, (straw usually has less) Can blow around when dry Potentially flammable 	<ul style="list-style-type: none"> Apply 10-20cm (4 to 6-inch) layer Select late season hay harvested before it goes to seed
Grass Clippings	<ul style="list-style-type: none"> Great use for unwanted lawn clippings Free and serves as supplemental fertilizer Useful in vegetable gardens 	<ul style="list-style-type: none"> Decomposes quickly Can contain weed seeds 	<ul style="list-style-type: none"> Mixing with peat moss or wood chips will slow decomposition rate Do not use clippings from herbicide and/or insecticide treated lawns Apply an 8-10cm (3 to 4-inch) layer. Fluff up if clippings begin to smell Here's an instructional video
Pine Needles	<ul style="list-style-type: none"> Good for acid-loving plants Winter mulch for strawberries Contains high amounts of nitrogen, a nutrient often needed in gardens Allows excellent transfer of air and water 	<ul style="list-style-type: none"> Only available to those who have access to pine trees. Pine needles can temporarily increase soil's surface acidity level (good for blueberries) 	<ul style="list-style-type: none"> Although pine straw is slightly acidic, as it breaks down it has little long-term impact on soil acidity Slow decomposition rate, so add organic matter to the soil before mulching if level is low

Mulch	Pros	Cons	Comments
Leaves	<ul style="list-style-type: none"> Inexpensive if using local fallen leaves Good winter insulator Contains plant nutrients 	<ul style="list-style-type: none"> Can blow around when dry Some leaves can pack together and lead to anerobic conditions that may harm certain plants 	<ul style="list-style-type: none"> Apply a 2 to 4-inch layer in garden beds Use your mower to mulch fallen leaves, providing nutrients and improving soil structure to lawns and garden beds Chopped leaves do not blow around as easily and look more attractive Rate of decomposition depends on the physical and chemical traits of various species e.g. thick oak leaves decompose more slowly than maple. Mulching leaves or adding to compost, speeds the decomposition process Avoid using diseased leaves as this can spread pathogens
Newspaper	<ul style="list-style-type: none"> Excellent weed suppresser (overlap edges) Inexpensive and readily available 	<ul style="list-style-type: none"> Can prevent the exchange of gases and water between the soil and air which creates anaerobic conditions (unhealthy for plants) Contains small amount of carcinogens Flammable when dry Needs to be covered with other mulch to stop it from blowing away 	<ul style="list-style-type: none"> Dyes are vegetable based and no longer contain lead. Avoid glossy or coloured inks Put in vegetable garden paths and top with hay or wood chips. Use at least 2 layers There are biodegradable paper mulch weed barriers, sold in rolls for landscaping purposes. These decompose in a season.
Cardboard	<ul style="list-style-type: none"> Inexpensive and readily available Excellent weed suppresser – make sure to overlap edges 	<ul style="list-style-type: none"> Creates anerobic conditions (no exchange of gases and water between the soil and air) Termites prefer cardboard over wood Not very attractive unless covered with soil or other mulch 	<ul style="list-style-type: none"> Cardboard can be effectively used to suppress growth of sod in order to extend or create new garden areas through sheet mulching Watch this VIDEO to see how to use sheet mulching techniques to create new garden areas
Compost - organic matter that has decomposed	<ul style="list-style-type: none"> Improves soil structure Provides nutrients and makes existing nutrients more readily available to plants Improves water movement in sands and clays Improves soil health and may help suppress diseases <p>(See Compost fundamentals)</p>	<ul style="list-style-type: none"> Immature compost may cause a nutrient imbalance and/or contain high soluble salts Composts can contain weed seeds Providing too high a nutrient load with composts, particularly manures, can cause plant health problems and may reduce flowers or fruit on some species Deep compost layers can prevent air from reaching roots and can cause roots to grow above soil surface 	<ul style="list-style-type: none"> Compost is ready when raw materials are decomposed and not readily recognizable Use no more than 2-3cm (under 1.5 inches) for mulching purposes, particularly around tree species sensitive to grade changes (e.g., maples) Native topsoil contains about 5% organic matter by weight; higher levels can cause plant health problems Certain plants like irises and peonies may stop blooming if buried too deeply with compost

➤ Inorganic Mulches

Mulch	Pros	Cons	Comments
Stone (e.g., River rock, pea gravel, limestone)	<ul style="list-style-type: none"> Does not decompose Decorative Limestone/pea gravel are durable for pathways (needs an edging to contain stone) 	<ul style="list-style-type: none"> Weeds germinate between stones, making weeding difficult Stones will sink into the soil over time Difficult to incorporate amendments into soil under stones On warm, sunny winter days, can cause some plants to come out of dormancy by warming the soil – resulting in roots dying and affecting plant health 	<ul style="list-style-type: none"> A layer of black plastic mulch or landscape fabric may help to keep stones from sinking into the soil Keep stones from touching plants Site may become too hot for some plants
Plastic	<ul style="list-style-type: none"> Most useful in the vegetable garden (produce not in contact with soil) Warms soil & retains moisture Excellent weed control 	<ul style="list-style-type: none"> Needs irrigation system or holes punched in the plastic to allow water to reach plants and soil Environmental concerns regarding use of plastics 	<ul style="list-style-type: none"> Clear is best for warming but not for weeds Black plastic mulch is good for weed suppression and to warm the soil for heat-loving vegetables A new Brown Infrared Transmitting plastic has been developed that is better for warming soils than black but still good for weed suppression White or silver plastic mulch is said to confuse insects. It can keep soil cool around the roots of crops such as peas, broccoli, cabbage, and cauliflower Silver is good for bell peppers Red colored mulch appears to increase yields of tomatoes, eggplants, peppers and basil Use blue for cantaloupes, squash and cucumbers – see Fig. 9
Recycled Rubber	<ul style="list-style-type: none"> Some types are permeable, allowing water to pass through Long lasting Good for playgrounds where elasticity is desired and dust from wood products problematic Does not attract bugs See Fig. 10 	<ul style="list-style-type: none"> Less weed control than organic mulches Broken down by microbes, allowing chemicals to be leached into soil and nearby water sources Toxicity may be a concern Can be smelly in the heat and burn bare feet Highly flammable 	<ul style="list-style-type: none"> Not recommended for gardens
Landscape Fabrics (Geotextiles)	<ul style="list-style-type: none"> Useful for soil stabilization Specially designed mats for use around trees 	<ul style="list-style-type: none"> Unattractive Requires an additional layer of mulch to cover it Does nothing to improve the soil 	<ul style="list-style-type: none"> Overlap to prevent weeds from germinating/growing between sheets There are biodegradable sheets and erosion control

Mulch	Pros	Cons	Comments
		<ul style="list-style-type: none"> Weeds and plant roots may grow through fabric – see Fig. 11 Becomes high maintenance over time as leaves or mulches on top of landscape fabric decompose providing a site for weed seeds to germinate Can be a source of microplastics in the environment 	<p>mats that do not contain synthetic materials</p>

Adapted from: <http://www.ladybug.uconn.edu/FactSheets/mulch-basics.php#>

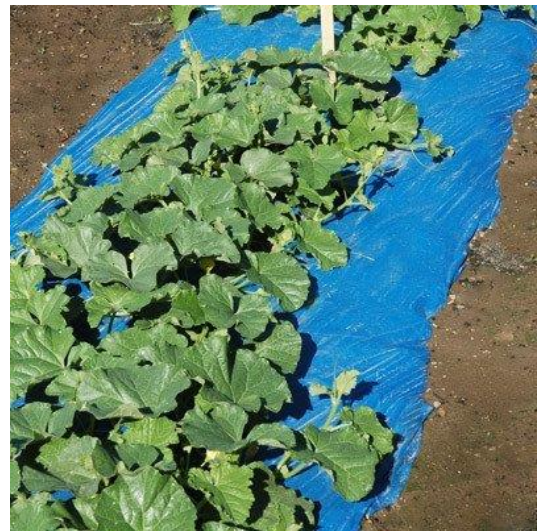


Figure 9- Blue Plastic mulch is said to be beneficial to certain crops, but concerns remain about the use of plastic in gardens

Figure 10 Rubber mulch mats are sometimes used in playgrounds

Figure 11

➤ Pests

- **Rodents** – Mulch placed next to tree trunks may invite rodents to chew, damaging the bark. There are also studies indicating that rodents can be a concern when using cardboard sheet mulching.
- **Termites** – Unfortunately, landscape mulches can provide stable, moist environments suitable for termites. One study indicated activity was highest under gravel mulch when compared to bare soil, pine bark or hardwood mulch.
 - If termites are present in the area, keep mulches at least 15 cm (6 inches) away from foundations and reduce mulch depth.
 - Woods and fibres may provide food sources, but are generally **inadequate** to support termite populations.
 - Cedar chips (*Thuja* species) contain compounds that can help to repel termites



Figure 12 -Cardboard sheet mulching in veggie garden

➤ Fungi

- **Slime Mold** (e.g., Dog Vomit, *Fuligo spetica*)
 - While it looks disgusting, it is not harmful and will dry out in a few days. If it's in a highly visible location, simply disturb the mulch by raking gently, to encourage it to dry out more quickly. If you'd like to investigate slime molds further there is a [Facebook group dedicated to the identification and discussion of Slime Molds](#) (see Fig. 8)
- **Mushrooms/Fungi**
 - Mushrooms can grow in decaying organic mulches. Again, these are not harmful (unless ingested) and are part of the process of the wood breaking down and improving your soil.



Figure 13 - Dog Vomit (*Fuligo spetica*) slime mold

“Fungi in the mulch are a good thing and indicate that moisture, temperature and organic matter are at the correct levels for high microbial activity! This is what creates a healthy soil and ensures healthy garden plantings.”³

³ Downer, Jim, Fun-Guy in Your Mulch, <http://gardenprofessors.com/fun-guy-in-your-mulch/>

❖ References

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- University of California, IPM, *How to Manage Pests in Gardens and Landscapes: Mulches, Benefits & Drawbacks*, <http://ipm.ucanr.edu/PMG/GARDEN/ENVIRON/mulchtbl.html>

➤ Photos:

- Fig 1: <https://extension.uga.edu/publications/detail.html?number=C1057&title=Using%20Cover%20Crops%20in%20the%20Home%20Garden>
- Fig. 2: <http://hyg.ipm.illinois.edu/article.php?id=808> – University of Illinois, Home, Yard & Garden Pests – *Mower and Weed-eater Damage*
- Fig 3: <https://xerces.org/providing-nest-sites-for-pollinators/>
- Fig. 4: <http://gardenprofessors.com/wp-content/uploads/2010/05/JEH-254-239-249.pdf>
- Fig. 5: <https://blog.extension.uconn.edu/2017/04/19/mulch-volcanoes-a-growing-problem-2/>
- Fig 6 & 7: Ivory Silk Tree (C. Sims)
- Fig. 8: <http://custommag.blogspot.com/2015/02/landscaping-gravel-rock-stone.html>
- Fig: 9: <https://www.amazon.com/Wall-Water-Plastic-Mulch-BLXMCH/dp/B01D8TZ7TS>
- Fig: 10: <https://perfectrubbermulch.com/product/rubber-mulch-mats/>
- Fig: 11: <https://www.gardenmyths.com/landscape-fabric-weed-barrier-cloth/>
- Fig. 12: <https://duckweedgardening.com/2012/07/13/front-yard-vegetable-gardening-with-cardboard/>
- Fig. 13: <http://gardenprofessors.com/fun-guy-in-your-mulch/>