



LANDSCAPE DESIGN GUIDE

CHAPTER 1: SITE CHARACTERISTICS

An Introduction to Diversifying Urban Landscapes in Fort Collins



CHAPTER 1

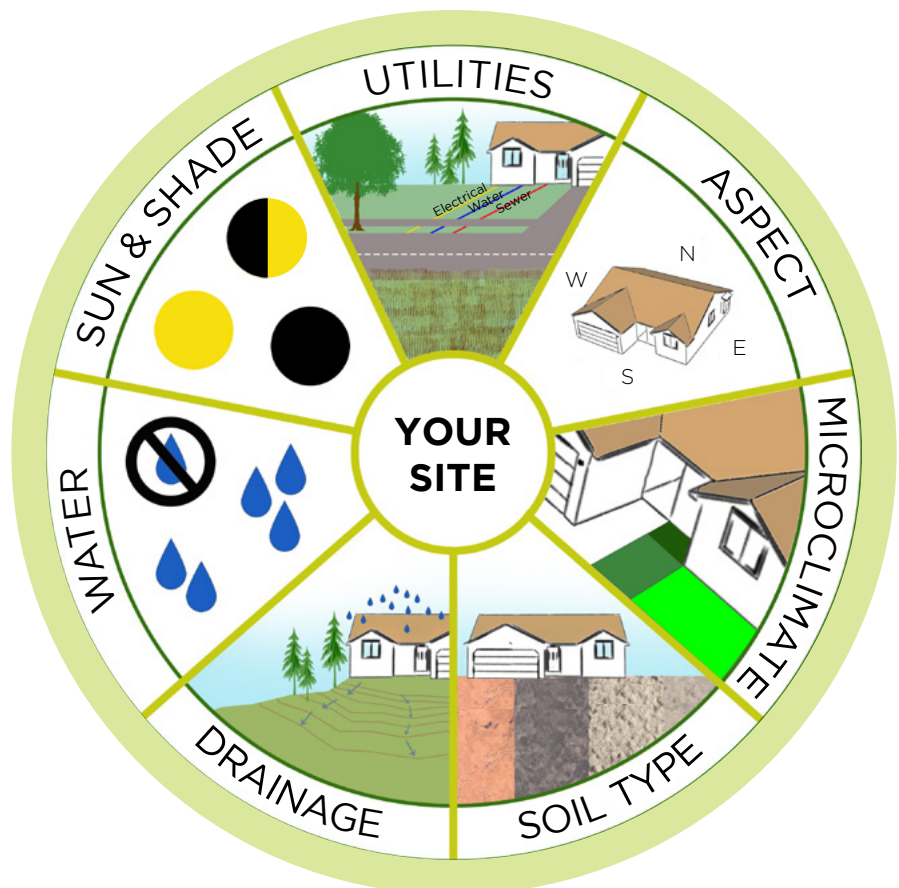
Site Characteristics and Planning

Before starting any landscaping project, familiarize yourself with the project site by observing the site's characteristics. Create a map of your site (to scale) showing how the different site characteristics interact with each other. Once you understand your site, you can use this map to begin planning out your project. These characteristics apply to any size project area.

SITE CHARACTERISTICS

The characteristics of your site will determine which plants can thrive in your space. There are seven key characteristics for you to consider:

1. Soils
2. Drainage
3. Water
4. Sun and Shade
5. Microclimates
6. Aspect
7. Utilities



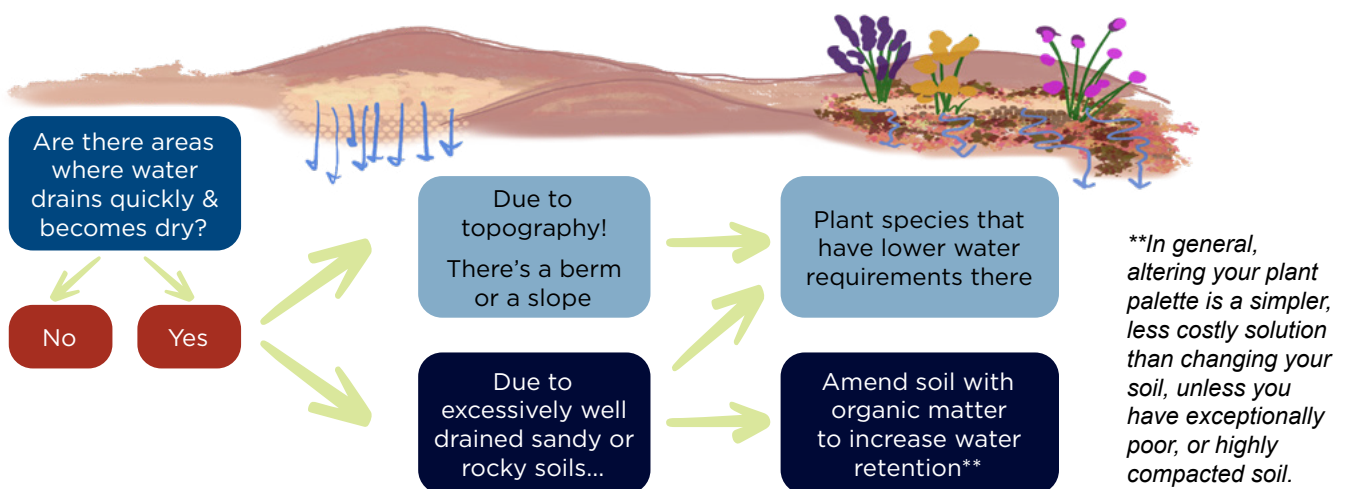
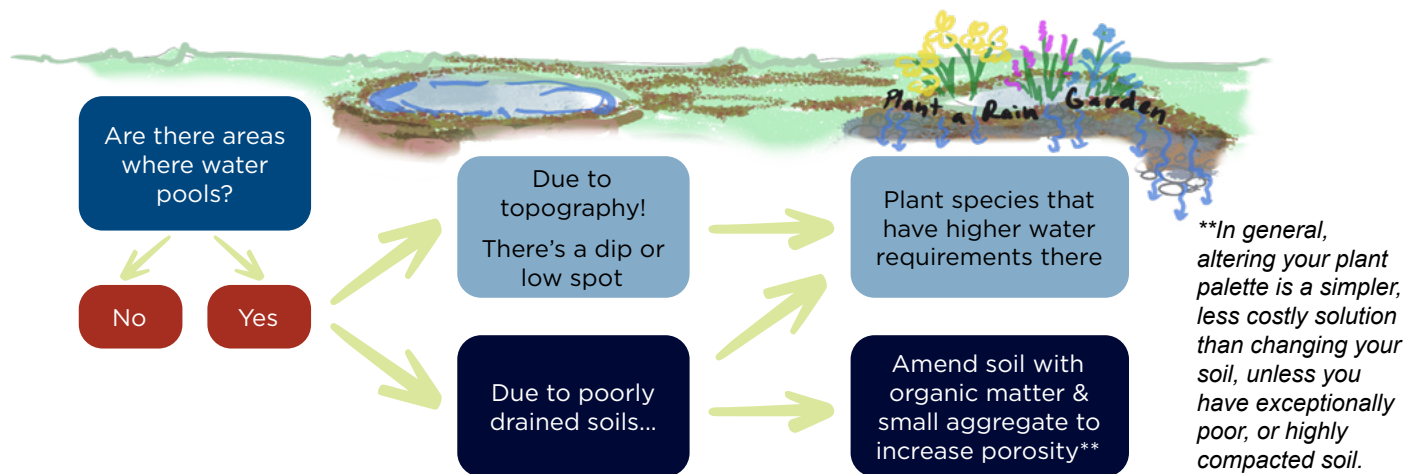
SOILS

Your soil is the most valuable asset you have in your landscape. Understanding what kind of soil you have is key to the success of your landscaping process. Start your project by learning about your soil – soil testing kits are available at most nurseries and CSU Extension offers comprehensive soil testing at a reasonable price (e.g., \$35 for homeowner test as of 2021). Basic soil tests will reveal the texture and drainage qualities, and measure pH and nutrients like magnesium, calcium, phosphorus, and potassium. Most soil labs will help you interpret these results and what they mean for selecting and siting your native plants.

Colorado soils are typically low in organic matter and high in pH (i.e., alkaline). Fortunately, native plants evolved with these soil conditions and usually can be successfully grown in unamended soils. However, some amendments may be needed depending on your soil test results and what kind of plants you want to grow.

DRAINAGE

It is important to understand how water moves on your site. It will give you clues about the topography of your site, the condition of your soils, and where to strategically place plants with different water requirements. Use the flow charts below to understand how you can alter or take advantage of your drainage.



If you are converting your space from a high-water use landscape (e.g., irrigated turf) to a low-water use landscape (e.g., native, xeric), observe the area after you have transitioned the irrigation. You may no longer have pooling water once you are applying less water to the landscape.

WATER

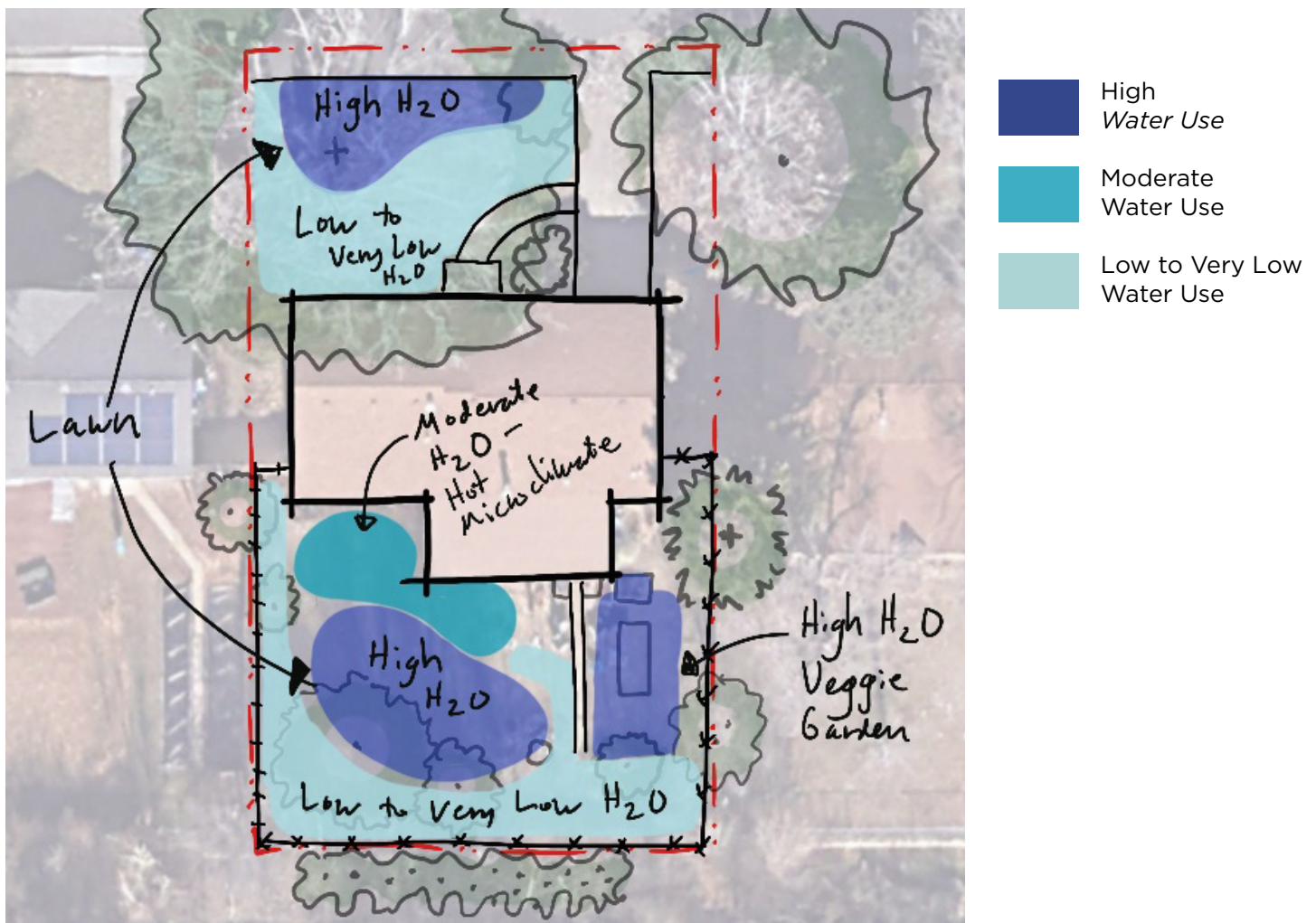
All plants require some amount of water to live and this amount varies depending on the plant. Water requirements can be classified into four categories:

- **Very Low:** 3 gallons/square feet/season
- **Low:** 8 gallons/square feet/season
- **Moderate:** 14 gallons/square feet/season
- **High:** 18 gallons/square feet/season

You will want to check the water requirements for each species of plant. It is best practice to design your space so that plants with similar watering requirements are in the same area, this is called a **hydrozone** – this will make watering your landscape easier and more efficient. (For more information on irrigating, check out page 11.)

As you create your plant layout consider placing plants with higher water requirements near water sources such as downspouts, or in areas where water naturally pools such as a low spot beneath trees. These areas often have part shade that can keep areas wetter longer.

Please keep in mind that plants that with Very Low and Low watering requirements will still need to be watered regularly while they are getting established and their roots are developing. They can be slowly weaned off supplemental water over time. Recommended watering schedules are provided in following chapters.



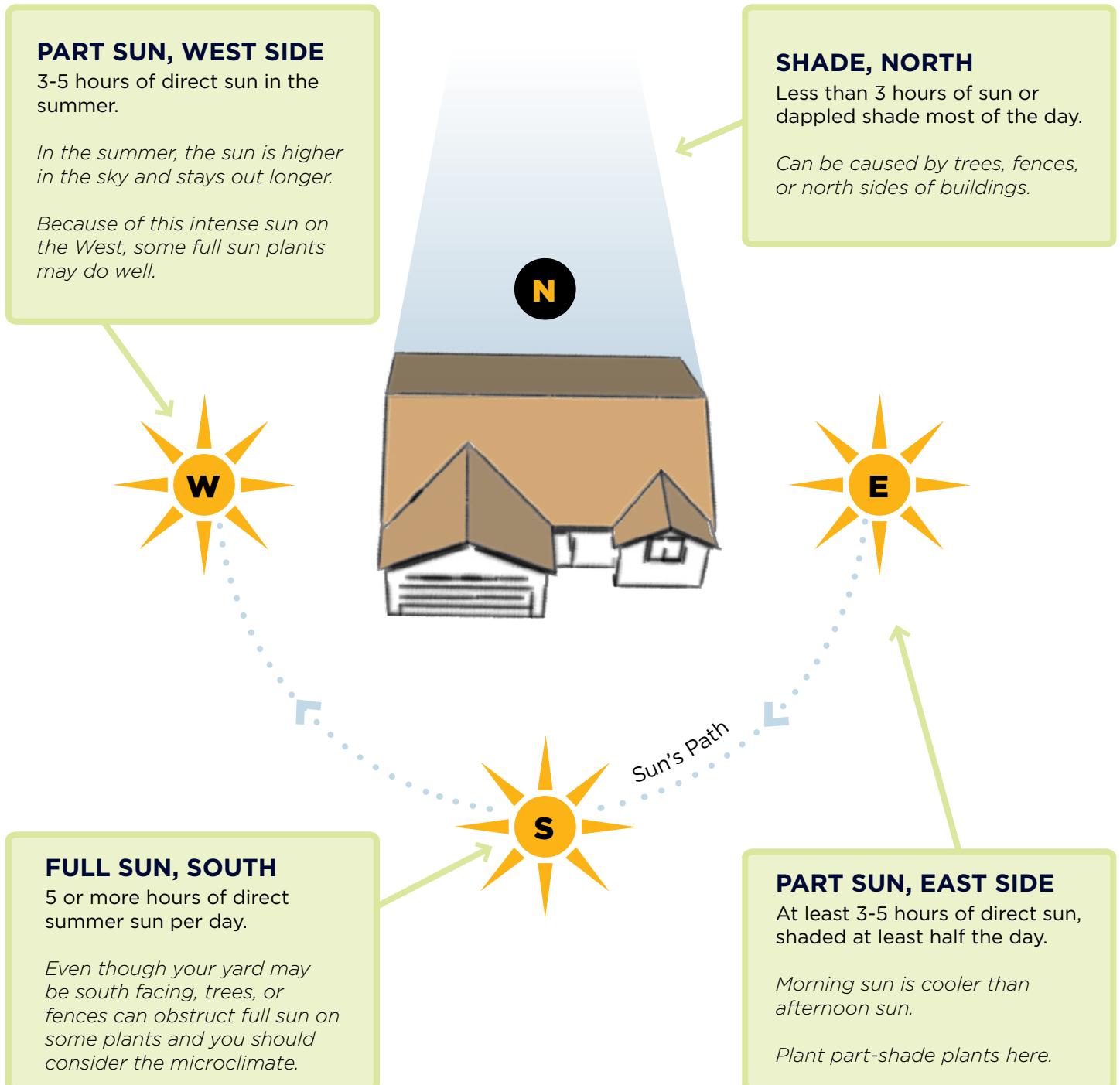
Hydrozones are areas where plants are grouped together based on their water needs to prevent over or under watering. If you have an irrigation system, each zone should correspond to a specific hydrozone.

SUN & SHADE REQUIREMENTS

Almost all plants need sun to perform photosynthesis to live, however the amount of light different plant species require varies. Sun and shade requirements can be classified into three categories:

- **Full Sun:** 5+ hours of direct sun light per day
- **Part Sun:** 3 – 5 hours of direct sun light per day
- **Shade:** Less than 3 hours of direct sun light per day

Keep in mind that the amount of sun an area is exposed to will change during the year as the sun moves higher/lower in the sky and as trees leaf-out. You will want to focus on where the sun is during the growing season, roughly May – October.



ASPECT

The aspect is the direction your site is facing - north, south, east, west. Buildings, trees, fences and other structures will affect the aspect of your site. Aspect is important since it will influence the amount of sun, wind, and the temperature of your site.

TYPICAL CHARACTERISTIC OF EACH ASPECT ARE AS FOLLOWS:

- **South:** Often receives sun all day and may be protected from cold north winds. Typically, the hottest and driest aspect. Plants native to the Colorado Plains, Southwest, and Mediterranean should thrive.
- **West:** Receives afternoon sun which is more intense and may be exposed to cold north winds. Typically, the second hottest aspect.
- **East:** Receives morning sun which is less intense and may be protected from cold north winds. Typically, the second coldest aspect.
- **North:** Often shaded and receives less sun which leaves the soil damp longer. Generally exposed to strong cold winds which reduces the humidity. Typically, the coldest and wettest aspect. Plants native to the Colorado foothills and mountains should do well.



Small changes in aspect can make a big difference to growing conditions.

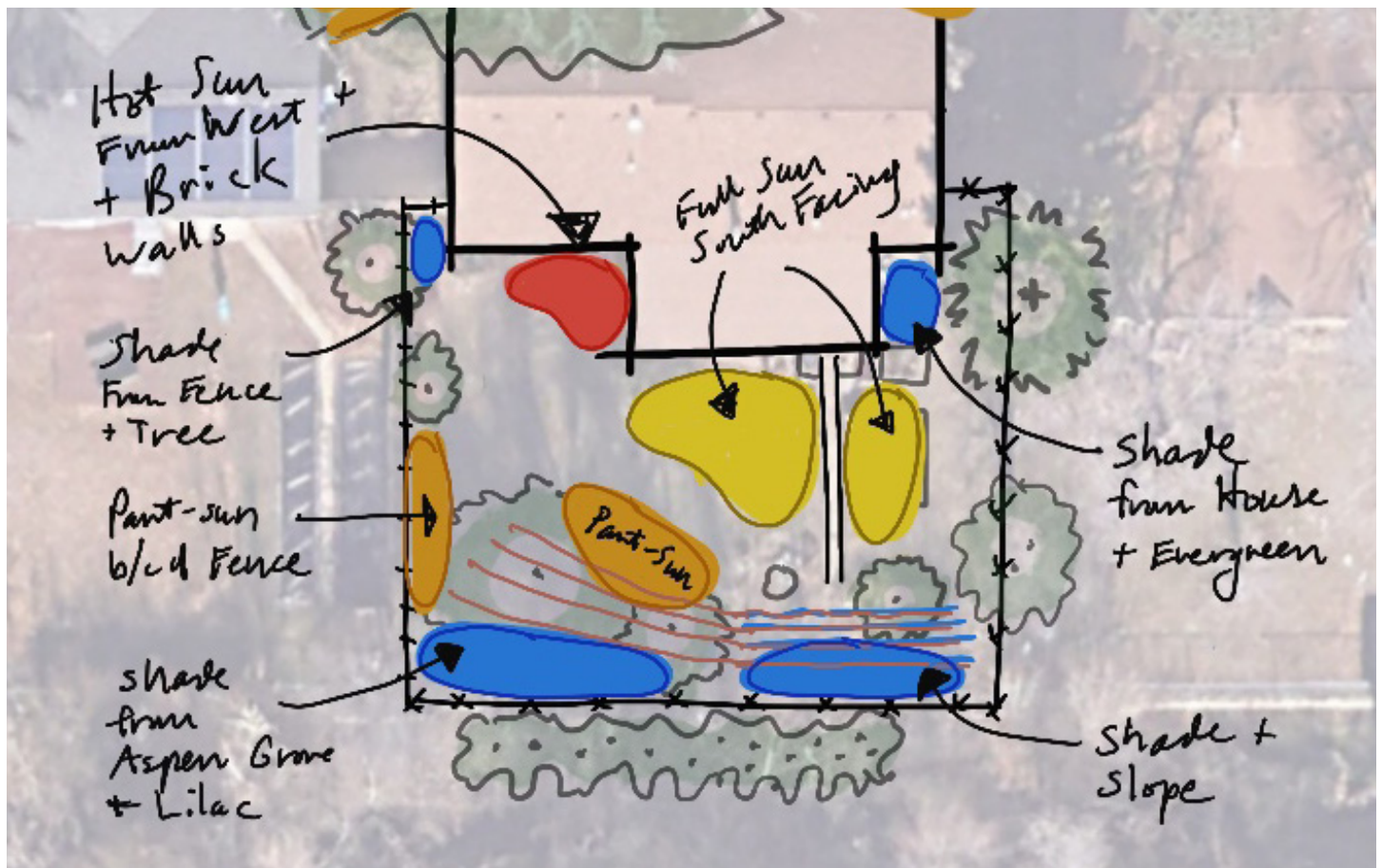


MICROCLIMATES

Microclimates are small areas that have a different climate than the overall climate of a site. They can be created by structures, topography, water, boulders, and impervious surfaces, to name a few examples. It is important to note where you have microclimates in your space so you can select plants best adapted to the conditions of each microclimate. They can also be exploited to expand your plant palette. Typical microclimates include:

- Hot areas: These are often next to pavement, up against the south or west side of a building, or on south facing slopes. You will want to pick plants that enjoy heat and need less water for these spaces, such as plants in the beardtongues (*Penstemon*), buckwheat (*Eriogonum*) or cacti (*Opuntia*).
- Wet areas: These are often in topographic depressions where water might collect after rain, snow, or watering. They can also be at the bottom of a downspout or another spot where water runs off an impervious surface. Wet microclimates are great places to put plants that have higher water requirements such as Rocky Mountain iris (*Iris missouriensis*), marsh milkweed (*Asclepias incarnata*), or many shrub species.
- Cold areas: These are often in spots with dense shade, like on the north side of a structure or under trees. Cold areas also have less temperature fluctuations which may benefit some types of plants. You will want to plant species that like cooler conditions or shade in these microclimates such as cut-leaved anemone (*Anemone multifida*), Oregon grape (*Berberis repens*), or geraniums (*Geranium*).

 Hot Microclimate	 Full Sun Microclimate	 Part-Sun Microclimate	 Shady/Cool Microclimate
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UTILITIES

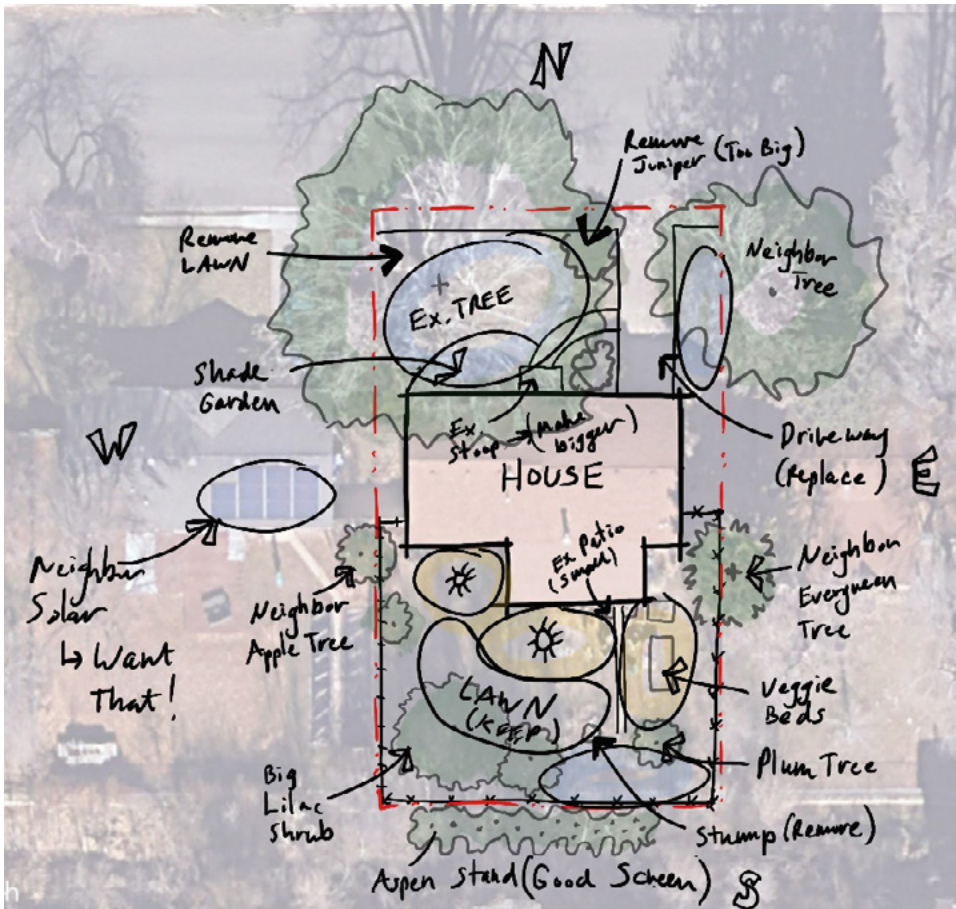
It is vitally important to map where your utilities are located for the safety of you and your neighbors. Beyond immediate safety concerns, be sure to place large, deep-rooted trees sufficiently far from underground utilities for two reasons: 1) so that roots don't grow into pipes, and 2) so that your high value items are not dug up should maintenance need to be performed on the utilities. Be sure to locate your utilities **before** you start digging! The City recommends offsetting deep-rooted plants 10-feet from water, sanitary sewer, and gas lines, and 5-feet from electric, cable, and fiber lines. Also be sure to offset plants away from above ground utilities including fire hydrants, electrical boxes, and light poles. One free provider is Colorado 811¹ - you can request for them to come locate and mark where your utilities are in your project space.



PLANNING

Now that you are familiar with your site characteristics, you can start planning. Planning your landscape out from the beginning will save you time in the long run and help you estimate costs, maintenance needs, and irrigation requirements. However, you do not need to have every detail figured out to start. Managing landscapes is a dynamic, iterative process - there will be surprises and mistakes, and that is okay! Here are a few topics to plan out beforehand that can help you get started and set your landscape up for success:

- Time and Money Investment
- Plant Selection
- Maintenance
- Desired and Intended Uses
- Irrigation



A site analysis map can help you understand your site according to the site characteristics. You might even consider creating a different map for each characteristic. Use lots of labels and let it be messy.

1. Fort Collins 811 website: colorado811.org/colorado-811-fort-collins

TIME AND MONEY INVESTMENT

One of the first things you need to decide is how much effort and financial input you are able to invest into your landscape. Virtually all landscapes require some amount of management in our altered urban ecosystem, especially during the initial establishment period. Consider how much you want to water, mow, prune, plant, weed, or mulch – in general, how much time do you want to put into your landscape? The answer to this question should influence how you plan out your landscape.

A native-dominant yard will take less maintenance over the long term, but the initial level of effort can be significant. Substantial preparation is necessary before planting anything, and watering and weed management require close attention in the first 2-3 years. But be diligent – that initial work rewards you with a beautiful, low maintenance, low water landscape you can enjoy for many years to come.

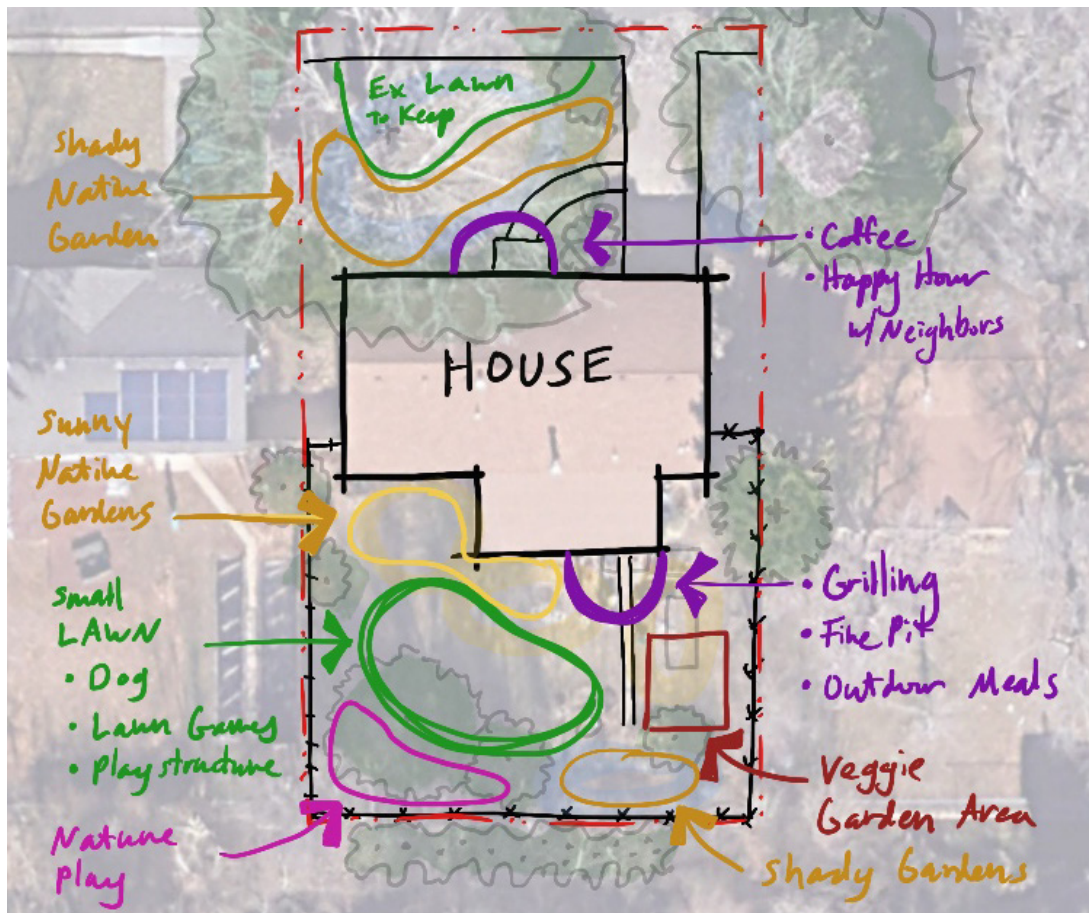
DESIRED AND INTENDED USES

When planning your site, consider how you intend the site to be used. Will there be substantial foot traffic (e.g., kids playing)? Do you hope to do a lot of entertaining, or plan to store tools and equipment? Do you anticipate that most foot traffic will be concentrated along a certain path, or would you like to guide traffic along a particular path? During the planning stage is the time to consider these factors.

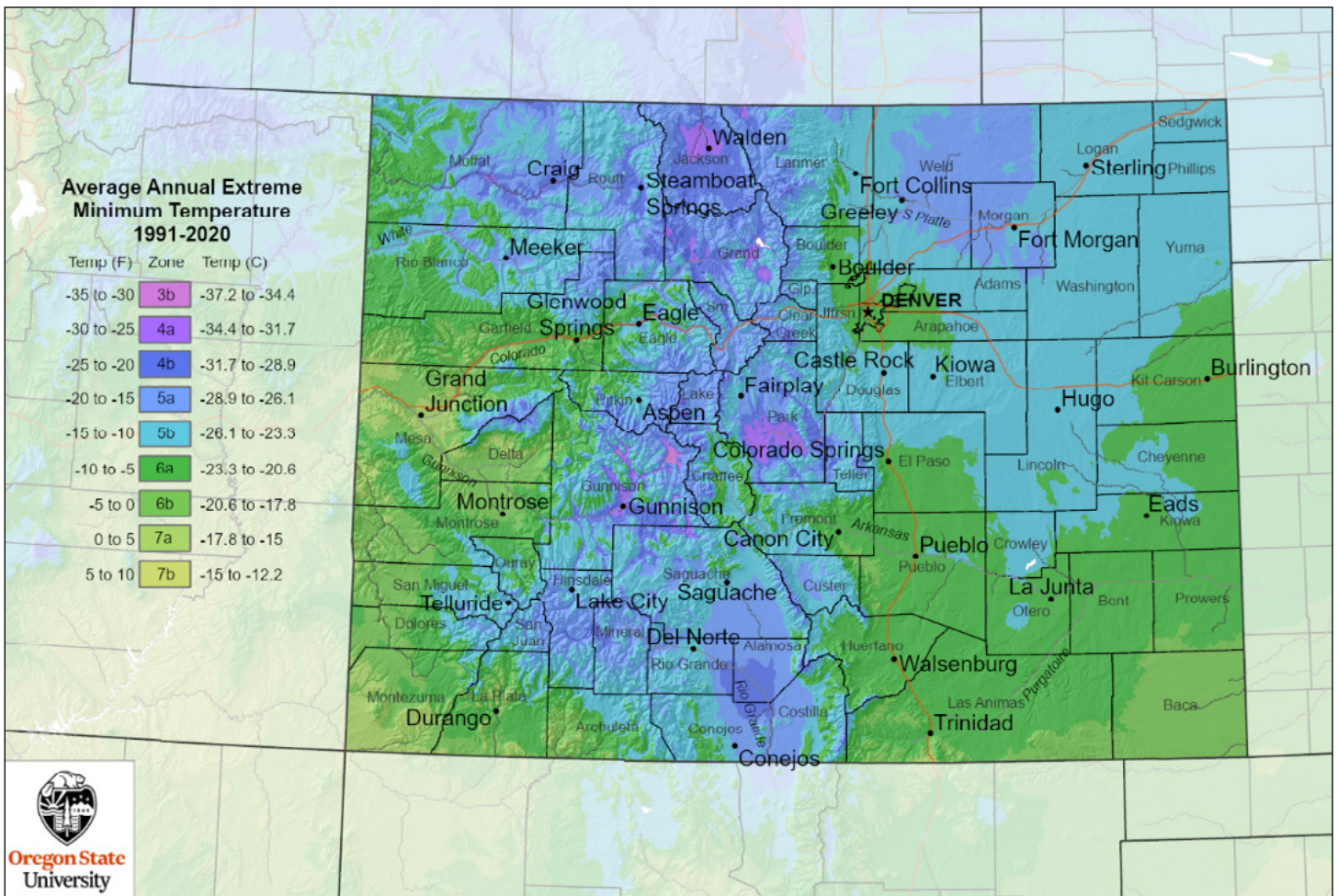
Hardscapes like walkways, patios, decks, and sheds provide wonderful atmosphere and amenities that allow you to make the most of your landscape.

They can also prevent excessive wear on grasses that do not tolerate much traffic and be used in other ways to complement your plants. Plan out where you want your hardscapes first (if applicable), then design your vegetative landscaping around it.

A special use to consider are pets as they can be a real challenge to establishing and maintaining healthy plants. Will there be dogs using your site? Chickens? Consider dedicating part of your landscape as a 'run' and do not fret about the condition of the plants there.



How do you plan to use your outdoor space? Create loose bubbles and use lots of labels, or simply make a list.



Graphic from U.S. Department of Agriculture planthardiness.ars.usda.gov/system/files/CO150_HS.png
 You can also use this website to download a Plant Hardiness Zone Map that is tailored to your zip code.

PLANT SELECTION

When selecting plants to grow in your landscape, there are many different factors to consider. However, perhaps the most important is selecting species of plants that can handle the conditions of your site. The first thing to check is the USDA Plant Hardiness category of a species, which will tell you the cold hardiness of a plant. Fort Collins is in Zone 5b (map below), so be sure your plant falls into that range. Next, you will want to think about the specifics of your site. For example, don't pick a full-sun plant for a space that gets full-shade; or a plant that likes wet feet for a well-drained slope. Some of this you will find out with trial-and-error, but it is best to try and match plant requirements with the conditions of your site. Not sure about the requirements of your plants? Search for the plant in the City's [Plant Database](#).

The old adage, 'the right plant in the right place', is a powerful idea to keep in mind. Some plants tolerate a wide array of conditions while others require very specific conditions. If you place a plant with specific conditions where it doesn't have those conditions, you'll end up pouring significant effort into that plant or you'll lose that plant. Similarly, every plant wants to express itself in a specific way – some plants are tall, some are wide, some spread more aggressively than others. It is important to keep in mind the end condition that the plant will continually strive for. If you fall in love with a certain species of tree that can grow quite tall, but you don't want it to grow too tall because of site constraints, you'll be pruning that tree forevermore, and the tree will not be able to thrive.

Once you have selected which species you want to grow, you will need to obtain them. There are many ways to get plants – you can look at your local nursery, grow them from seed, go to a specialty plant sale, or join a plant swap. One thing to consider when picking out plants is that the younger the plant, the quicker and more easily it will be able to adapt to your site.

Perhaps the most fun part of selecting plants is thinking about your landscape design. When selecting plants, you will want to think about the plant's:

- Color
- Texture
- Height

Keep in mind certain design principles, such as putting complementary colors next to each other. Or that warm colors and coarse textures make a space feel closer while cool colors and fine textures make a space feel further away. There are many fantastic resources on landscape design that delve deep into the science and art of the process ([like this one!](#)²). However, the true master of landscape design is nature. Go spend some time in nature and make note of what colors look good together, which plants like to hang out with each other, and how the different textures interact. Or use the landscape designs in this guide that have been created by professionals specifically for the northern Colorado Front Range³.



When choosing plants at a nursery, often it is the younger plant that will establish more quickly on your site.

2 Basics of Landscape Design by CSU: youtu.be/Me4NlKmkwDc?si=Qaw1b_VXzdXE6sC

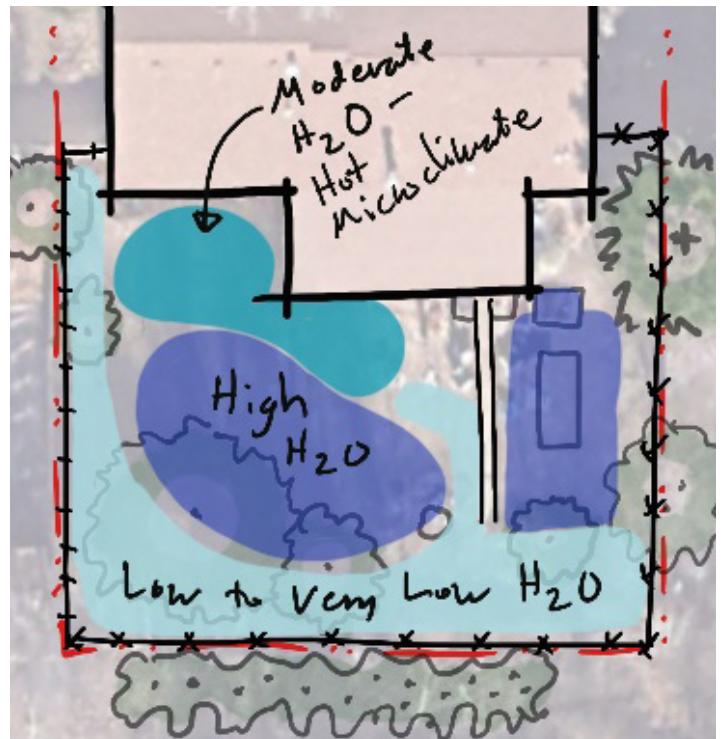
3. List of places to find Colorado Native Plants fcgov.com/vegetation/

IRRIGATION

While the goal is to minimize irrigation to conserve water, some irrigation will be required for the establishment phase at a minimum. Designing your landscape to be planted in hydrozones simplifies and increases the efficiency of your irrigation system. Hydrozones are areas where plants with similar water needs are grouped together - low water need together with low water, medium with medium, high with high. Planting by hydrozone allows the efficiency of irrigation systems to be maximized and prevents low water need plants from being overwatered and higher water need plants from getting too little water. The City has defined hydrozones (see table below) that can also help you plan your total annual water use.

Scale, cost, and effort are important considerations when planning how you'll water your landscape. Existing irrigation systems can be retrofitted to more efficient systems like drip or high-efficiency spray heads, and it is easiest to make those changes during the installation process. Irrigating by hand is also an option, and passive watering devices (e.g., watering bags, pots) are feasible options for trees and shrubs. Proper planning can also allow you to take advantage of moist microclimates from downspouts, snowmelts, minor elevation changes, and the toes of slopes.

Hand watering is ideal for smaller projects and is the cheapest option but requires the most time and effort in the long run.² Drip and spray systems are appropriate for large projects but can also be useful on small projects, however they are generally more expensive and require more effort initially and maintenance long term.



Hydrozone	Water Need (gallons per square feet)
High	18
Medium	14
Low	8
Very Low	3

MAINTENANCE

**“MAINTENANCE IS LIKE LAUNDRY –
IT’S ALWAYS THERE, AND IT WILL PILE UP IF
IT ISN’T TENDED TO REGULARLY”**

– Ellefson and Winger 2013

While different landscapes have different maintenance needs, all landscapes require some level of maintenance. Have an idea of how much maintenance you are willing to do before deciding on your landscape. For example, a shrub and turf grass dominant landscape is going to have a relatively lower maintenance requirement than a perennial pollinator garden landscape. However, there are a few ways to plan any landscape that may reduce your maintenance overall.

2. Irrigating by hand helpful guidance: https://youtu.be/5ID_bHJjCE4?si=3XpDhM0RC7ziVsJ2

MULCHING

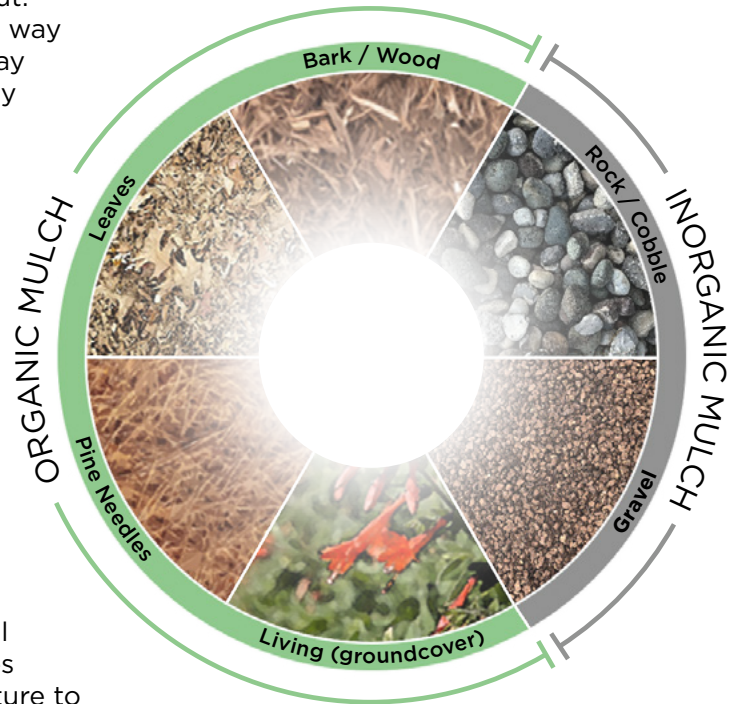
Weed management is key when establishing a new landscape as weeds can out compete new plants and choke them out. Managing existing weeds prior to installation is a great way to reduce weed pressure post-installation. The best way to preventively suppress weeds is by using a mulch. Lay down 4 inches of mulch on your landscape. However, keep wood mulch away from the base of your shrubs and trees as this can cause disease. Mulch also helps conserve soil moisture. New mulch may be needed every few years. As your landscape matures and your plants grow to their full size, they may shade the soil enough that mulch is no longer needed.

There are two types of mulch you can use - organic and inorganic:

Organic mulches include shredded bark, wood chips, pine needles, shredded leaves, and living mulch. As organic mulch breaks down it will also help enrich the soil with organic matter and increase its ability to hold moisture. You can also use creeping perennial groundcovers to create a living mulch that fill in open spaces in your garden. This practice suppresses weeds, retains moisture, and can add new color or texture to your garden.

Inorganic mulches are rock or gravel. Rock and gravel mulch help eliminate run-off, by allowing fast falling rain to percolate quickly through to the soil. Inorganic mulches can increase the temperature of your site and create a hotter microclimate.

Weed Barrier is highly discouraged! Weed barriers disconnect your soil from the natural processes that keep it, and your plants, healthy. In addition, the rich organic material that inevitably ends up decomposing on top of the weed barrier makes a perfect bed for all those weeds you are trying to get rid of. Weed barrier creates more work in the long run. Rubber or plastic based mulches are also discouraged. They can lead to soil contamination, create a serious fire hazard, and increase the temperature of a site.



WEEDS & INTEGRATED PEST MANAGEMENT

When the weeds appear, use the principles of Integrated Pest Management (IPM). IPM is a holistic approach to managing pests which can include insects, weeds, and diseases. IPM uses a variety of tools to prevent and control pest infestations using the least toxic methods possible. Reducing our use of chemicals helps prevent pesticide resistance and protects the health of humans and ecosystems.

When utilizing IPM, you will learn about the pests in your garden and what environmental conditions they need to thrive. Using this information you can create conditions that are unfavorable for the pest. These are the steps in the IPM process:

- **Step 1:** Identify the pest and its lifecycle.
- **Step 2:** Monitor pest population.
- **Step 3:** Determine action threshold.
- **Step 4:** Choose the least toxic or least invasive management method(s):
See graphic and list of control methods on the following page.
- **Step 5:** Continue to monitor and take action if necessary.

PRUNING

Woody plants like shrubs and trees will eventually require some pruning. However, this should be limited if you carefully selected the right plant for the right place, as discussed previously. Proper pruning can promote a more open plant, abundant flowering, maintain vigor, increase sunlight to plants underneath, and keep wayward branches from interfering with walkways. The timing of pruning can vary depending on the desired results and type of plant (i.e., spring blooming vs. summer blooming shrubs). PlantTalk Colorado, a part of CSU Extension, has useful guides, resources, and videos to guide your pruning efforts.³

LAYOUT

The layout of your landscape also influences the amount maintenance needed. Keep common sense landscaping principles in mind:

- Plant in hydrozones.
- Plant high water need plants near the water source.
- Do not design the space in very narrow or small triangular spaces that will be hard to maintain or mow around (if needed).
- Minimize erosion opportunities with dry stream beds, rain gardens, and/or mulching.

MAINTENANCE LEVEL

The best way to reduce the amount of maintenance your landscape needs is to do less maintenance. That might sound like a silly statement, but it is true. Decide that you are comfortable with a 'messy' yard – let those leaves stay in your yard and decompose into fertilizer. Don't trim back tall ornamental grass and stems that provide critical overwintering habitat for insects. Ornamental grasses can also add winter interest that provides beautiful color through the cold months. Let your turf grass go dormant earlier in the year and save on your water bill. A 'messy' yard is often, actually, a 'healthy' yard. The graphic below demonstrates how elements such as dead logs, old stems, and bunch grasses are homes for insects over the winter. These insects provide pollination and act as a critical food source for many species.

A 'messy' yard is often, actually, a 'healthy' yard.



3. PlantTalk Colorado: planttalk.colostate.edu/topics/trees-shrubs-vines/1713-pruning-shrubs

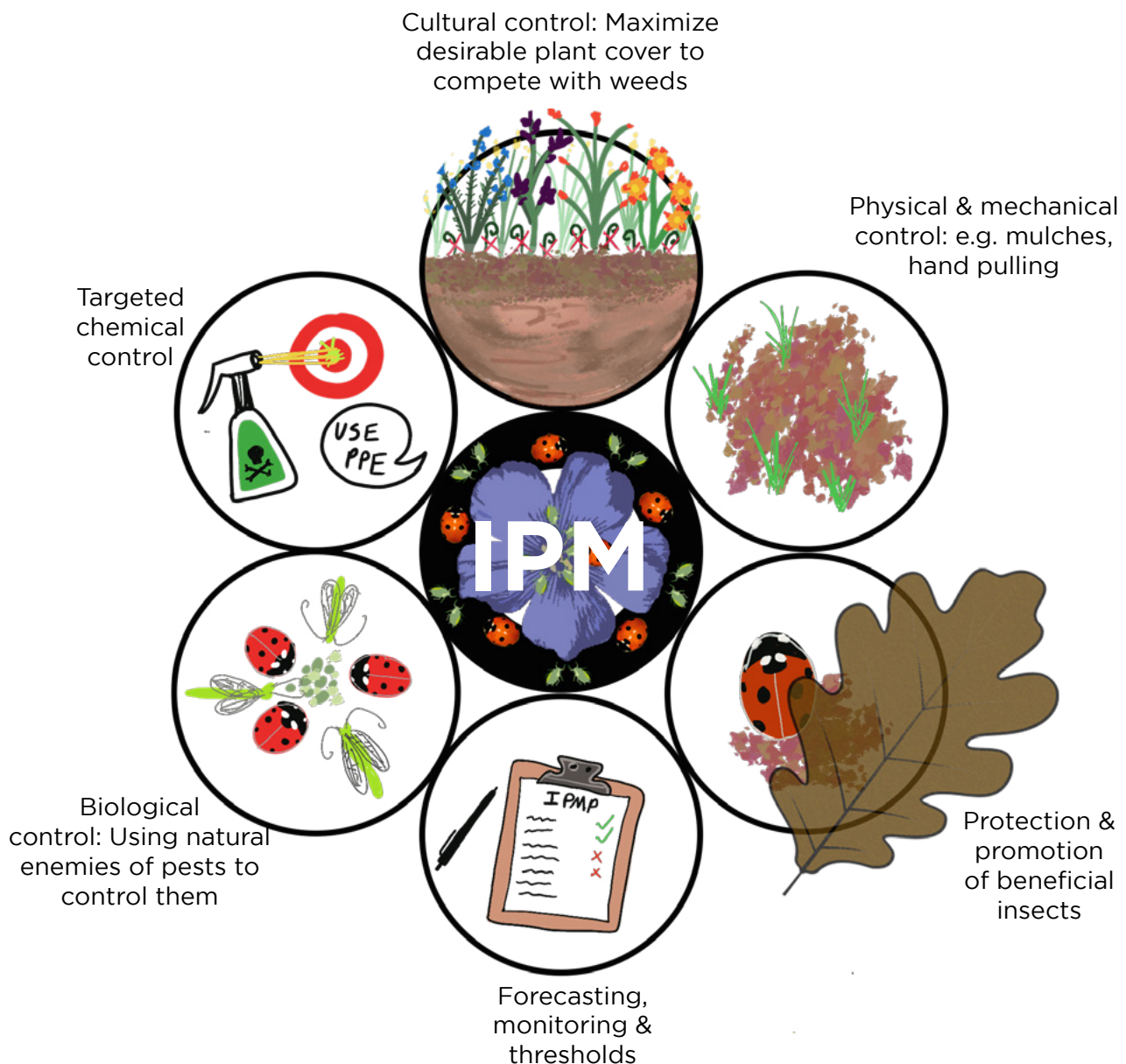
MANAGEMENT METHODS

Cultural controls are practices that reduce pest reproduction and survival. For example, decreasing irrigation or changing fertilization regimes can reduce the amount or type of weeds that are able to establish in your garden.

Biological controls are the practice of using the natural enemies of pests to control them. This includes using beneficial predator insects, parasites, pathogens, and competitors to control pests.

Mechanical and physical controls kill a pest directly, block pests out, or make the environment unsuitable for it. Traps for slugs and hand weeding are examples of mechanical controls. Physical controls include mulches for weed management and solarization of soil for disease management.

Chemical control is the use of pesticides. Pesticides include insecticides, herbicides, and fungicides. In Integrated Pest Management (IPM), pesticides are used only when needed and in combination with other approaches for long-term control. Pesticides are selected and applied in a way that minimizes their possible harm to people, non-target organisms, and the environment. Using IPM you will choose the least toxic pesticide available and apply the smallest amount needed. For example: spot spray weeds instead of broadcast spraying an entire area. It is important to read the safety labels on each pesticide container and follow all directions- the label is the law!



GARDEN PLANNING EXERCISE

<p>SPRING</p> <p>GROUND COVER</p> <p>1. _____</p> <p>2. _____</p> <p>2-3 FT</p> <p>1. _____</p> <p>2. _____</p> <p>3. _____</p> <p>3-6'</p> <p>1. _____</p> <p>2. _____</p>	<p>SPRING-SUMMER</p> <p>GROUND COVER</p> <p>1. _____</p> <p>2. _____</p> <p>2-3 FT</p> <p>1. _____</p> <p>2. _____</p> <p>3. _____</p> <p>3-6'</p> <p>1. _____</p> <p>2. _____</p>
<p>SUMMER</p> <p>GROUND COVER</p> <p>1. _____</p> <p>2. _____</p> <p>2-3 FT</p> <p>1. _____</p> <p>2. _____</p> <p>3. _____</p> <p>3-6'</p> <p>1. _____</p> <p>2. _____</p>	<p>FALL</p> <p>GROUND COVER</p> <p>1. _____</p> <p>2. _____</p> <p>2-3 FT</p> <p>1. _____</p> <p>2. _____</p> <p>3. _____</p> <p>3-6'</p> <p>1. _____</p> <p>2. _____</p>

**SITE/
HYDROZONE**

Aspect, Drainage, Sun/
Shade, Microclimates,
Soils, Water/Hydrozone,
Utility Location

Take an 8.5 x 11 sized piece of paper and fold it into quarters. Draw the above quadrant and central circle. In the central circle, write down the characteristics of your site/garden and then fill in the plants on the sheet for each of the seasons. Organizing your plant choices into seasons helps to make sure your site has plants blooming all seasons long which is not only good for you but for birds and pollinators too. There are many resources out there for choosing plants including the City's Plant Database.⁴ The Database will allow you to filter plants based on colors, height, seasons, irrigation needs and more to show you a wide variety of plants.



4. Fort Collins Plant Database: www.fcgov.com/vegetation/