Modernizing landscape design extension resource

by

Jianqiao Luan

B.Agr., Beijing Forestry University, 2014

A REPORT

submitted in partial fulfillment of the requirements for the degree

MASTER OF SCIENCE

Department of Horticulture and Natural Resources
College of Agriculture

KANSAS STATE UNIVERSITY
Manhattan, Kansas

2018

Approved by:

Co-Major Professor
Cheryl Boyer

Approved by:

Co-Major Professor
Gregory Davis

Copyright

Abstract

Kansas State University Research and Extension is an educational network sharing unbiased, research-based information and expertise with Kansas residents. To improve quality of life, residential landscape design is an important educational topic for homeowners. The objective of this project is to update a Kansas State University Research and Extension Publication, *Residential Landscape Design* (publication number: S-4), which was published in 1980. Content, text and graphics need to be updated to address contemporary learner needs. An updated resource also needs to display a modern aesthetic, since the original graphics were created almost four decades ago. In order to understand the process and experience of updating an educational landscape design resource, similar publications from other land-grant universities were reviewed. This study discusses, compares, and contrasts the contents, range of page numbers, graphic styles, color, publication versions, and publication date among other similar types of university Extension publications.

Table of Contents

List of Figures

List of Tables

Introduction

Many homeowners find landscape design challenging because they lack skills and understanding to complete complex tasks associated with design work. Extension publications can be a good option for many people to learn skills or knowledge because they area relatively inexpensive (many of them are free), easier to access (visit institution websites and click related links), and more understandable (clear graphics, simple design approaches and concise texts) than professional landscape design books. Land-grant universities and/or colleges are the origin of Extension publications. The Association of Public and Land-grant Universities website (aplu.org) gives the definition of a land-grant university and its functions. A land-grant institution was founded by state legislatures or Congress in every state and overseas territory of the United State of America, receiving benefits of the Morrill Acts. Land-grant universities had the mission of teaching agriculture, military tactics and the mechanic arts. In 1887, the Hatch Act created an agricultural experiment station as an important component of the land-grant system. In 1914, the Smith-Lever Act created a Cooperative Extension Service associated with each land-grant institution (APLU, 2017). The total number of land-grant universities/colleges receiving Morrill Act benefit of 1862 was 58, including the areas of Northern Marianas, Guam, Federal States of Micronesia, American Samoa, Puerto Rico, and U.S. Virgin Islands (USDA, 2014).

The purpose of the Extension service is to spread academic knowledge, and improve quality and standard of life. Extension organizes a statewide network of educators to share unbiased, research-based expertise to the public. Educators share information face to face, such as holding workshops and trainings. Written materials are also a method to share information. Internet technology, such as a webinars and websites can offer information fast and conveniently (KSRE, 2017). Home gardening publications, which include plant recommendations, landscape

design, principles, construction, maintenance, etc. are important resources provided by many institutions with Extension responsibilities.

Websites of all current 58 land-grant institutions were evaluated for Extension publications that are relevant to landscape design. These publications were collected from 23 universities (Figure 1.1). There are no publications for landscape design in the remaining 35 land-grant universities (Table 1.1). All of these publications were analyzed for different publication aspects (Table 1.2), for example, introduction of different content of residential landscape design:

1. Landscape design method, and principles
2. Site analysis
3. Planting design
4. Style, color and texture
5. Rainwater solutions
6. Extra functions in landscape
7. Other topics and tips

Chapter 1 - Contents

Purpose of landscape design publication

The primary purpose of a landscape design publication is to help people design and arrange a home landscape. This chapter will discuss how and what current university Extension publications focus on for teaching landscape design (Figure 1.2).

Design methods and principles

First, it is necessary to know why people develop a home garden, in other words, the value of a landscape. The goal of landscape design is to connect permanent artificial structure to nature (Nolting and Boyer, 2010). Alabama A&M University and Auburn University (2013) describes landscape value in four ways: aesthetic, economic, functional, and environmental. Landscapes bring benefits to people, such as an increase in the land value, improve home appearance, lower crime, etc., however the landscape must be designed and implemented first, which means that developing a garden requires time, money, and resources.

There are differences in methods of teaching landscape design among publications. A number of institutions introduce their design methods by offering several steps of a design process. For instance, Kansas State University Cooperative Extension Service lists eight steps (Van Der Hoeven, 1980), Iowa State University (2007) lists twelve steps of a design process, and North Carolina University lists six steps (Powell, 2002). Teaching step by step is a basic, but effective method for people who have no background in landscape design. Steps can provide clear directions and people can correct mistakes before they move to the next step to prevent serious final consequences. Summarized from all university publications, there are several steps

that are common: collecting information about the space to be designed, understanding family needs, beginning to draft a design, composing the final master plan and other additional graphics.

During the process of creating a landscape, design principles are essential to help guide people to create a visually pleasing garden and prevent mistakes (Hansen, 2010). However, different publications present design principles in different ways. Some are general or abstract, such as the three principles: balance, unity, and interest, given by University of Missouri (Trinklein, 2016). Fewer words appear easier to read, but usually lack information. Other publications present too many principles, such as "*Residential Landscape Design*" from Kansas State University (1980). This publication lists 15 principles: proportion and scale, balance, unity, elegance of line and shape, rectangular pattern, angles, circular forms, free curves, arc and tangent combined patterns, contrast and harmony, focal point, rhythm, simplicity, and variety. Readers can easily find what they want from this relatively large number of categories, but they often appear overwhelming and some principles introduce similar concepts, which can be combined as one principle. An example of a list of design principles that is too short or too long is the University of Florida IFAS (The Institute of Food and Agricultural Sciences) landscape publication (Hansen, 2010). Only four principles are given, but with subheadings. This layout presents information more clearly since it has primary and secondary lists. From all publications that have introduced design principles, the most common items are balance, unity, focal points, and scale. Other less common items are simplicity, perspectives (or angles), forms and lines, order (can be the same idea to balance or rhythm), etc.

Publications for specific topics

Most residential landscape design publications introduce the design process step by step, but there are also publications that illustrate specific steps or other topics, such as planting design,

water conservation, color guide, etc. This section will discuss publications introducing specific topics.

Site analysis

As the beginning step, site inventory cannot be ignored in a design process. The amount of effort put into site analysis usually determines if the final landscape design is successful (Berle, 2013 b). Site analysis means the physical and visual analysis that includes both natural and manmade features, in and around properties (Wilson, et al., 2017). The first step is drawing a current site map with property lines and angles, and indicating the location of the house, driveways, utilities, easement, and limitations (Powell, 2002). When measuring a site, one or two tape measures (100 or 200 ft. in length) and a screwdriver will be needed. The common measurement methods are: 1. Point-to-point. 2. Baseline measurements. 3. Triangulation. 4. Grid measurements (Hansen & Alvarez, 2010 c). After this, several copies of current site map should be prepares for inventory. Hand drawing and computer software are ways to document base information, which usually includes existing plants, soil type, drainage, sun and shade, landform (topography), etc. Iowa State University (2007) and the University of Florida (Hansen & Alvarez, 2010 a) also mention the house in aspects of its color, style, different rooms in the house, and views from the windows. Sound, such as traffic noise, can be also a consideration according to North Carolina State University (Spafford, et al., 2015). University of Georgia (Berle, 2013 b) lists wildlife and wind, which are factors that may also influence the landscape.

Planting design

Plants are essential elements in the landscape because they provide interest, variety and aesthetic appeal by their form, texture, color, size, and seasonal change (Hansen and Alvarez, 2010 a). They can also provide food, scent, space, pollution-and-noise-control, etc.

Similar to structures, plants can be arranged to create different spaces with their size, form and shape. For instance, evergreen plants can be used to form "walls" to enhance the edges of your property, while turf grass can be used to create an open space (Brzuszek, 2017 d). Planting design should also coordinate with the structure on the property, like a house. Plants should be in harmony with the structure and can also control people's movement within the outdoor spaces (Cervelli, 2005). In other words, dense shrubs and shrubs with thorns may keep people away, but a tree allee looks comfortable to walk through, and a pavilion with grape vines is attractive to sit and harvest grapes.

Selecting inappropriate plants may result in poor consequences. For example, growing plants in the wrong environment can lead to disease and plant death, some plants with dense leaves and branches can block pleasant views and access, and some large and sprawling plants can cause uncomfortable experiences when walking in gardens. Understanding ecological principles may assist one in choosing plants: topography and hydrology, woodland succession, physiographic regions, and forest community types. In addition, native plants are often recommended because exotic plants may be invasive and can possibly change the structure of local ecological communities (Brzuszek, 2017 a). Exotic plants may also not be able to tolerate local climates and die in the end, which is wastes money and labor. There is one principle, which mixes science and art: "right plant, right place" (Hansen, 2012). Lists of commonly recommended plants for landscapes can be found in most land-grant institution Extension publications.

To enjoy the beauty of plants, knowing when they express ornamental characteristics is necessary. Planting designs with plants that sprout, flower, fruit, change leaf color, and defoliate

at different times of the year will create seasonal aesthetic interests in the same garden (Brzuszek, 2017 b).

Using water wisely

As up to 50% of rainwater runoff comes from private properties, it is important to use and collect water wisely because water is limiting and using water efficiently helps protect freshwater resources (Brown et al., 2014). Water use can be reduced by selecting drought-tolerant plants, scheduling irrigation systems efficiently, grouping plants of similar water requirements, using paving materials, and using sandy soils in appropriate places (Cerny, et al., 2002). Another way to conserve water is to collect or harvest rainwater. Precipitation provides a water source for drinking, landscape, and agricultural use. Recently, rainwater collection for landscape use has become popular (Waterfall, 2004). Before managing the landscape to collect more water, knowledge of local climate (sun, wind, precipitation, etc.), topography, vegetation, and geology should be inventoried (Himelick, 2004). The main benefits of collecting rainwater are reducing costs and saving natural water sources (Keane, 1995; Paul, et al., 2017).

In recent years, rain gardens have become popular. Rain gardens are small and shallow areas with aesthetic and functional features for the landscape, designed to capture rainwater from roofs, driveways and other areas, resulting in reduced runoff from the property (Franti and Rodie, 2013). Rain gardens also manage stormwater and recharge water tables, filter pollutants, beautify the landscape, and attract wildlife (Pineo and Barton, 2009 b). Pineo and Barton (2009 b) suggest that rain gardens should be roughly 10-20% the size of the property and should be located at places with gently sloping ground, about a 1-10% gradient. Plants in the rain garden need to be able to tolerate relatively wet and dry conditions.

Designing a rain garden is similar to designing a regular landscape, which should follow steps (draw site map, site analysis, planting design, etc.) and principles (balance, unity, focal point, etc.) of landscape design (Cerny et al., 2002). The difference, however, is more focused on water management choices for different regions in order to calculate slope, drain area, rainfall depth, garden depth and so on according to local climate and geography characteristics (Franti and Rodie, 2013).

Style, color, and texture

Landscapes can be designed in many styles, such as French, English, Islamic, Chinese, Japanese, naturalistic, etc. To integrate the design with its context, people should consider the living place, the architecture style of your home, the plant and form you like, and the shape of your yard. When determining a style, people can get inspiration from websites, neighborhoods, books, etc. (Hansen and Alvarez, 2010 b). However, there are not many university publications specifically about introducing a landscape theme and style. One publication, Naturalistic Landscaping (Van Der Hoeven, 1977) introduces how to build a home on a site that has a natural landscape. In other words, it introduces how to integrate human construction with nature. Van Der Hoeven describes the design process and principles as being roughly the same as designing a regular garden. But in a naturalistic garden, more native plants should be used, along with naturalistic-looking hardscape materials, curving lines instead of straight lines, etc. Naturalistic landscape styles should harmonize human homes with nature, creating a different type of view in your yard to protect local habitat, and so on.

Color is the most attractive element in the landscape and it usually draws a lot of attention, although color may not last very long (Hansen and Alvarez, 2010 a). Meanwhile, color is also the most challenging element to work with in landscape because colors can directly

influence visual pleasure. Besides drawing attention, a good color arrangement also creates mood, provides interest in different seasons, and attracts animals and insects (Brzuszek, 2017 e). Color usually is provided through flowers, leaves, fruit, and barks. Color can be also found in rocks, buildings, and paving materials.

There are three primary colors: red, yellow, and blue, three secondary colors: orange, purple, and green, and six tertiary colors: amber, vermillion, magenta, navy, teal, and chartreuse. Color has tints and shades by adding white and black, respectively, and it also has intensity or saturation (Wong, 2006). Using a color wheel is a good way to help arrange colors. Hansen and Alvarez (2010 a) give several common color schemes: monochromatic scheme, analogous, and complementary, which can be found and defined in the color wheel.

Color design has four principles: unity, focal point, balance, and rhythm (Brzuszek, 2017 e). A well-designed color combination is good, but designers should know the different feelings, symbolism, and cultural meanings of different color to prevent unpleasant results (Wong, 2006).

Plant textures range from fine to medium to coarse, determined by leaf size, flowers, and seeds (Cornell University, 2017). Plant textures are also affected by light, shadow, and distance. Paving materials, water features, and even animals and insects can also provide different textures, which designers should use and work with in landscape design.

Function of providing food and preventing wildfire

Some people may feel their property values will go down due to a farm-like look by growing edible plants (foodscape). However this is not true as edibles can enhance landscape by providing seasonal interest, health, and economic benefits (Arthur, 2017). To design an edible garden, the design process can be similar as the regular landscape designing process: decide what should an edible garden have, determine the use areas, and draw the plan (Boekelheide and

Bradley, 2015). Food garden design tends to be focused on a planting design because the key to gardening for multi-season interest is to mix evergreen plants, flowering plants and edible plants, which are suitable for the local climate (Hansen, 2013). Food gardens should be a place to grow edible plants, however, it also needs to provide places for people, children, paths, toilet facilities, fencing, storage, art, water source, etc. (Boekelheide and Bradley, 2015). Also, sustainable management is the most critical aspect in a foodscape to develop modern day living (Arthur, 2017). Irrigation water can be collected from rainwater, city water, and well water.

A landscape designed to protect structures and lower the risk of wildfire is called firescaping, which also has the functions of a regular landscape, such as aesthetic, erosion control, entertaining, etc. The goal of firescaping is to offer a defensive space against fire and enhance the property by design and plant selection (Skelly, 2017). The key of firescapeing is to reduce flammable materials in a minimum of 30 feet defensive zone (Brzuszek, 2017 c). In firescaping, open space is much more important than plants (Skelly, 2017). Here are some tips given by Skelly (2017) and Brzuszek (2017 c): 1. Reduce flammable materials and dead plants. 2. Increase non-flammable materials like stones, pebbles, and gravel. 3. Keep the roof clean of debris to prevent wildfire traveling with wind. 4. Maintain adequate space for emergency equipment. 5. Keep defensive space green and low growing.

Other topics

Other publications illustrate miscellaneous aspects of landscape design: 1. Family needs. 2. Design history. 3.How to draw a plan. 4. Groundcovers. 5. Other tips.

People need to know what their needs are prior to starting the design process. Sometimes people need new functions and sometimes they only want to improve current utilities (Trinklein, 2016). In general, family needs include aesthetic interest, vegetable gardens, space for

entertaining, space for working outside, and garbage area (Pineo and Barton, 2009 a). Homeowners can look for information and hire a professional designer online, a landscape design company, or recommendation from a neighbor. Titles of designers vary based on their educational level and service level. For instance, a landscape architect has received a college degree, has worked with a registered landscape architect, and has passed registration exams that he or she may offer service of design, engineering, plant materials, and construction. A landscape designer may have less experience than a landscape architect and may provide less expensive design service (Berle, 2013 a & d). These specialists tend to focus on residential, rather than commercial, design.

The history of landscape design is complicated, and this review is not a comprehensive discussion of landscape history. Historically, landforms are changed with the change of society in aspects of: population, religion, environment, politics, etc. This has influenced and developed landscape themes and styles. Although some old landscape styles and themes no longer play a role in modern society, they still influence modern landscape design (Wallace, 2015). There is nothing to stop people embracing new things. For example, during the period of Victorian Era (1860-1900), people in western culture started to grow plants imported from China and Japan, which meant that eastern culture gave new style to western landscape (Seymour, 2016). Historically, countries and regions that contribute to the development of landscapes include: Egypt, Assyria, Islam, Spain, China, Japan, Greek, Rome, France, England, etc. (Wallace, 2015).

When drawing a plan, whether the final design plan or the initial base map, it is needed to make it clear to read but also contain adequate information and proper scale. The plan should include all existing structures, utilities, sidewalks, and driveways. When drawing a house or building, the location of doors, windows, heating or cooling units, and water spigots should be

included. North direction and scale are essential. Sometimes there are several other features, such as rocks, streams, and ditches that are important to locate on a plan. We can use hand drawing and computer software. The different hardness of pencils and varieties of ink pens can help people to show the hierarchy, materials, and other information. Commonly used scales are 1:4, 1:5, 1:10, 1:16, and 1:20. The scale, such as 1:10, means 1 inch on paper equals to 10 feet on site (Berle, 2013 c). Rendering materials include color pencils, watercolor, mark pens, etc. If homeowners use computer software, results will be more realistic but the cost might be higher. Common computer programs are SmartDraw, HGTV Home and Landscape Platinum Suite, Showoff, Garden Planner 3, Dynascape, etc. (Hansen, et al., 2015) Finally, print several copies for making changes.

Groundcovers in landscapes are valuable for the areas where turf is difficult to maintain, such as the shaded area under tree canopy, edge of flowerbeds, and steep banks. Groundcover materials include but are not limited to: wood chips, plants, and rocks. Groundcovers will give a smooth transition from one texture or material to another texture or material, and hold soil (Van Der Hoeven, 1978).

Graphic, layout, and print

Appearance of landscape design publications

The graphics, layout and print will also influence the efficacy and mood when used as a learning tool. For example, a resource with full color compared to one in grey scale elicits different feelings from readers. However, their cost to print may vary. In this chapter, the appearance of existing university landscape design extension publications will be discussed.

If the font size or graphics are not well designed, generally, content dramatically determines the page number. According to the American Society for Horticultural Science (ASHS, 2017), a leaflet has 1 to 8 pages, a factsheet has 9 to 30 pages, a bulletin is between 31to100 pages, and if the publication is over 100 pages, it is considered a book. The number of pages may influence the reader's choice. A longer publication may have relatively more information but compared to shorter resources it may take more time to read. Among publications from land-grant institutions, more than half of them are leaflet, almost 1/3 of them are factsheet, and the rest of them are bulletins or books (Figure 1.3). Thus, the majority of landscape publications have fewer pages than 30 pages.

Graphic depiction of learning concepts works well in design because a picture can deliver complicated information that many words cannot express as well. Among university landscape design publications, nearly 1/3 of them use hand-drawn graphics, while about 1/6 of them have no graphics at all. Six publications have computer drawing and photograph examples. Nearly 1/4 of all publications have 2 or more types of graphics (Figure 1.4). Hand drawings are more traditional to create. However, computer drawings can be more realistic looking. Since this is the time of computer and technology, digital drawing will be implemented more and more.

Next is talking about using color, which has great relation to graphics. Using color in layout and printing can be complicated. Here the publications are only distinguished by the color use in two ways: three or more colors, and two or less colors. Some publications are saved as PDF files from websites, and content may have no graphics, or the graphics are less than two colors, but there are colored advertisements outside of the main content. In this case, these publications were counted into 2 or less colors. In university Extension, the two color methods almost take the same weight (Figure 1.5), which shows that the color may not influence much in

landscape design publications, authors may not pay attention on publications with more colors, or most likely printing cost is an important factor for sharing with stakeholders.

Currently people have more than paper or hardcopy to read and study. There are many versions of reading materials. Very few universities offer a hardcopy version of landscape design publications. The reason for this could be that they can be exported to PDF, which can be printed into hardcopy by the recipient. More than half of the publications are available in Web page version (HTML); (figure 1.6), which means the reader can read it online, and select any individual publication by clicking a hyperlink, like University of Florida (*http://edis.ifas.ufl.edu/topic_landscape_design*). The advantage is that people can read it on their smart phone at the working site if it is mobile-ready. There is one unique PDF version from University of Nebraska-Lincoln (Franti and Rodie, 2013), that videos are inserted into the PDF file. People can watch the videos when they are connected to the Internet. If the publication is downloaded, people still have to access to Internet to watch the videos because the videos are attached with You Tube (*https://www.youtube.com/watch?v=NajZyk2AMzE*). The remainder of the publications is common PDF or having both versions of webpage and PDF.

Finally, the last discussion is the publication date. It is easy to understand that people have different challenges at different periods of time. The more recent publications may solve present problems effectively. In these publications, more than 2/3 of them were published or revised after the year of 2000. Two publications were published before 1980, both from Kansas State University (Figure 1.7). This can cause problems because old educational materials could be perceived as being outdated and may not be able to teach new concepts and solve contemporary problems. In addition, an updated publication can have different versions to address different learning styles.

Summary

This review discussed the content and appearances of landscape design publications from 23 different land-grant universities. The majority of this review discussed what the purpose was of each publication. There are different topics around landscape design. The principles determine if the landscape design fits the site and if it will be successful and beautiful. The design steps deliver information in a clear order. Other specific topics, like rainwater conservation, planting design, color and texture, etc. give details of design, helping designer and homeowner produce garden with more interests and functions. The appearance of publication resource determines the mood and efficacy when read. The publication should have adequate knowledge, good quality, and interesting looking graphics. This review will give direction to the project of updating an old landscape design publication at Kansas State University.

Figures

Figure 1.1: Land-grant universities that provide landscape design publications

Figure 1.2: Primary contents of 61 Extension landscape design publications

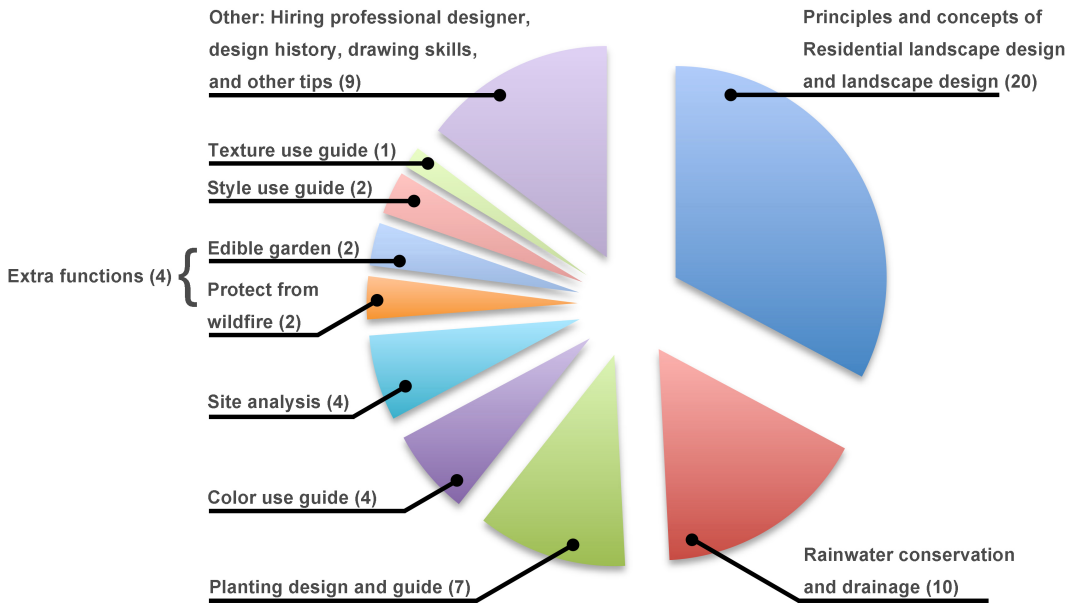


Figure 1.3: Number of pages of 61 Extension landscape design publications

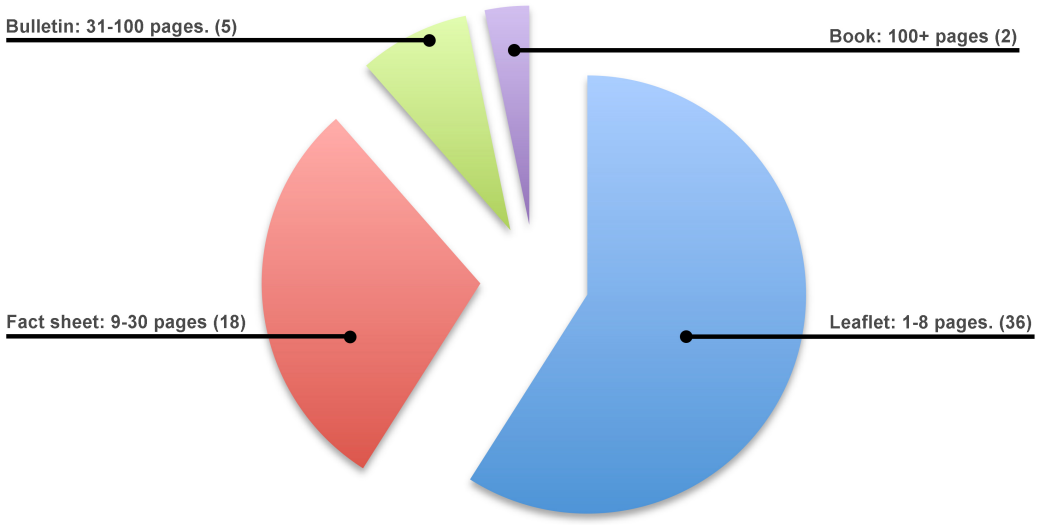


Figure 1.4: Graphic styles of 61 Extension landscape design publications

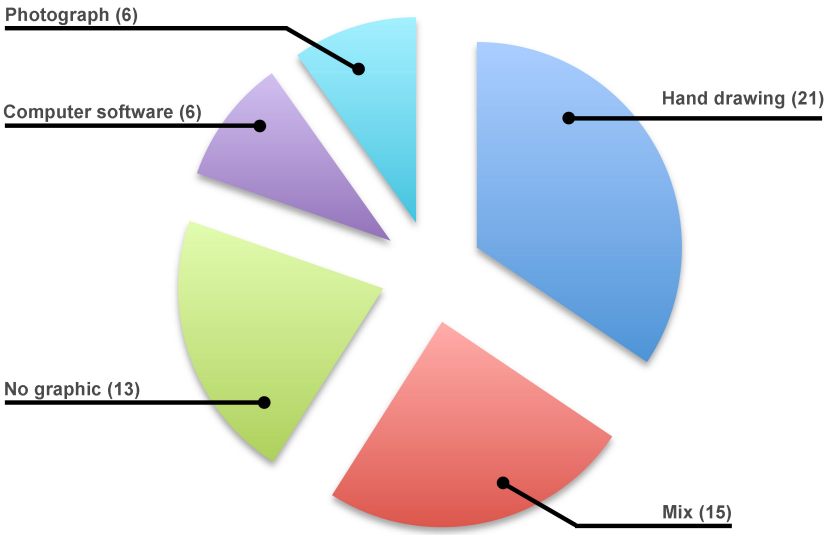


Figure 1.5: Color uses of 61 Extension landscape design publications

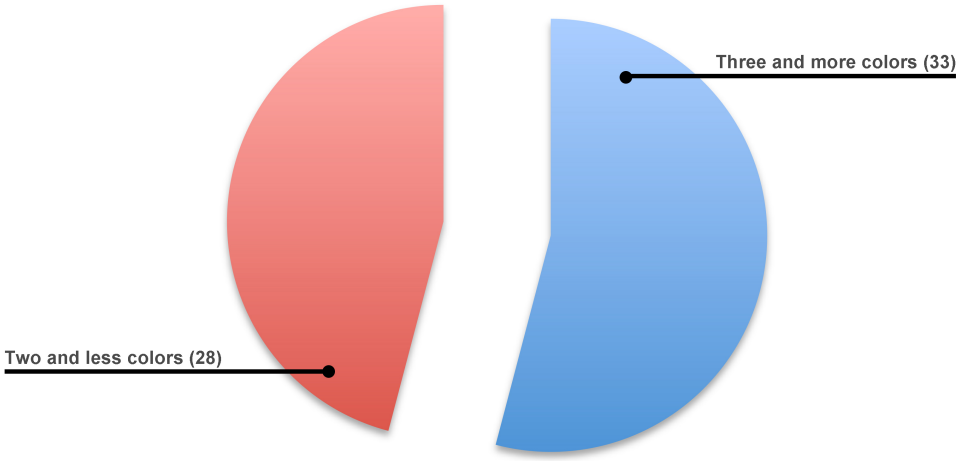


Figure 1.6: Availability of 61 Extension landscape design publications

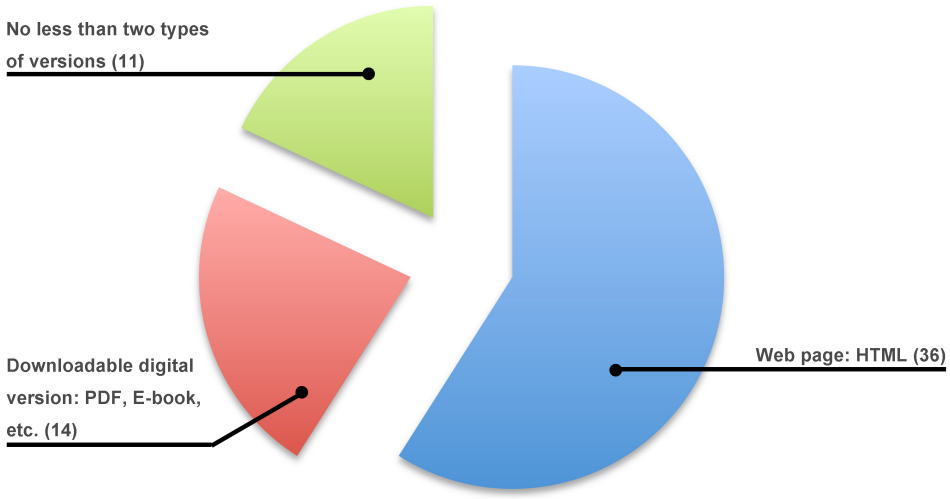
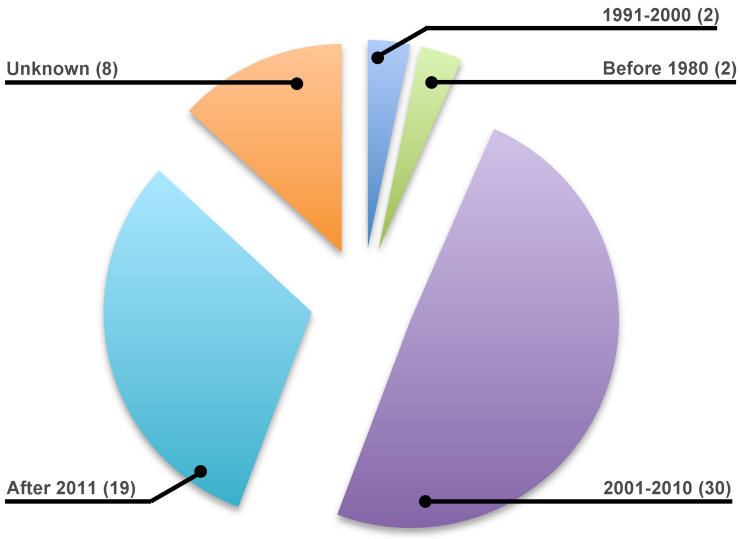


Figure 1.7: Published dates of 61 Extension landscape design publications



Tables

Table 1.1: Landscape design publications from 58 land-grant universities

State	Land-Grant Universities (1862)	Publication		Version of Publication	Website	Notes
		Horticulture	Landscape			
1.Alabama	Auburn University	✔	✔	PDF, HTML	http://www.aces.edu/home-garden/lawn-garden/	
2.Alaska	University of Alaska	✔	✔	PDF	https://www.uaf.edu/ces/gardening/	
3.Arizona	University of Arizona	✔	✔	PDF	https://extension.arizona.edu/gardening	
4.Arkansas	University of Arkansas	✔	✔	PDF, PowerPoint	http://www.uaex.edu/yard-garden/	
5.California	University of California	✔	✔	PDF, Paperback, Card Set	http://anrcatalog.ucanr.edu/Items.aspx?hierId=2000	
6.Colorado	Colorado State University	✔	✔	PDF	http://extension.colostate.edu/topic-areas/yard-garden/	
7.Connecticut	University of Connecticut	✔	✔	PDF	http://www.extension.uconn.edu/root/archives.php	
8.Delaware	University of Delaware	✔	✔	PDF, HTML	http://extension.udel.edu/lawngarden/	
9.District of Columbia	University of District of Columbia	No Result	No Result	_	http://dev.udc.edu/rimi/publications	No information of Horticulture and Landscape has been found.
10.Florida	University of Florida	✔	✔	HTML	http://solutionsforyourlife.ufl.edu/lawn_and_garden/	
11.Georgia	University of Georgia	✔	✔	PDF, HTML	http://extension.uga.edu/publications/index.cfm	
12.Hawaii	University of Hawaii	✔	✔	PDF, Videos	http://www.ctahr.hawaii.edu/site/Info.aspx	
13.Idaho	University of Idaho	✔	✔	PDF, HTML, Paperback	http://www.cals.uidaho.edu/edComm/catalog.aspx?category1=Gardening	
14.Illinois	University of Illinois	✔	✔	Paperback, Color Photo	https://pubsplus.illinois.edu/browsegardening.html	

15.Indiana	Purdue University	✔	✔	PDF, Paperback	https://mdc.itap.purdue.edu/category.asp?CatID=4	
16.Iowa	Iowa State University	✔	✔	PDF, Paperback	https://store.extension.iastate.edu	
17.Kansas	Kansas State University	✔	✔	PDF	http://www.bookstore.ksre.ksu.edu	
18.Kentucky	University of Kentucky	✔	✔	PDF	http://dept.ca.uky.edu/agc/pub_area.asp?area=ANR	
19.Louisiana	Louisiana State University	✔	✔	PDF	http://www.lsuagcenter.com/portals/communications/publications/publications_catalog/lawn%20and%20garden	
20.Maine	University of Maine	✔	✔	PDF, Paperback	http://extensionpubs.umext.maine.edu/ePOS?this_category=19&store=413&form=shared3%2fgm%2fmain%2ehtml&design=413	
21.Maryland	University of Maryland College Park	✔	✔	PDF	http://extension.umd.edu/hgic	
22.Massachusetts	University of Massachusetts	✔	✔	PDF, HTML, Paperback	http://ag.umass.edu	
23.Michigan	Michigan State University	✔	✔	PDF, HTML	http://msue.anr.msu.edu	
24.Minnesota	University of Minnesota	✔	✔	HTML	http://www.extension.umn.edu/garden/	
25.Mississippi	Mississippi State University	✔	✔	PDF	http://extension.msstate.edu/lawn-and-garden	
26.Missouri	University of Missouri	✔	✔	PDF, HTML	http://extension.missouri.edu/main/DisplayCategory.aspx?C=2	
27.Montana	Montana State University	✔	✔	PDF, Paperback	http://msuextension.org/category.cfm?Cid=5	
28.Nebraska	University of Nebraska	✔	✔	PDF, HTML	http://extensionpubs.unl.edu/search/?category=LGA	
29.Nevada	University of Nevada	✔	✔	PDF	http://www.unce.unr.edu/publications/index.asp?Topic=Horticulture&Searchby=categorysearch&Searchtext=HO	
30.New Hampshire	University of New Hampshire	✔	✔	PDF, Posters	https://extension.unh.edu/Gardening-Resources	
31.New Jersey	Rutgers University	✔	✔	PDF	http://njaes.rutgers.edu/garden/	

32.New Mexico	New Mexico State University	✔	✔	PDF, HTML	http://aces.nmsu.edu/pubs/	
33.New York	Cornell University	✔	✔	HTML	https://hort.cals.cornell.edu/extension-outreach	
34.North Carolina	North Carolina State University	✔	✔	PDF, HTML	https://content.ces.ncsu.edu	
35.North Dakota	North Dakota State University	✔	✔	PDF, HTML	https://www.ag.ndsu.edu/horticulture	
36.Ohio	Ohio State University	✔	✔	PDF, Paperback	http://estore.osu-extension.org/Lawn-and-Garden-C1045.aspx	
37.Oklahoma	Oklahoma State University	✔	✔	PDF, HTML	http://www.oces.okstate.edu/gardening-insects-pest-management	
38.Oregon	Oregon State University	✔	✔	PDF, HTML	http://extension.oregonstate.edu/gardening/	
39.Pennsylvania	Pennsylvania State University	✔	✔	PDF, HTML	http://extension.psu.edu/plants/gardening/publications	
40.Rhode Island	University of Rhode Island	No Result	No Result	_	http://web.uri.edu/cels/outreach/	Extension website does not exist
41.South Carolina	Clemson University	✔	✔	PDF, HTML	http://www.clemson.edu/extension/publications/index.html	
42.South Dakota	South Dakota State University	✔	✔	PDF	http://igrow.org/gardens/	
43.Tennessee	University of Tennessee	✔	✔	PDF	https://extension.tennessee.edu/publications/Pages/default.aspx	
44.Texas	Texas A&M University	✔	✔	PDF, HTML	http://agrilifeextension.tamu.edu/browse/featured-solutions/#gardening	
45.Utah	Utah State University	✔	✔	PDF	http://digitalcommons.usu.edu/extension_curgarden/	
46.Vermont	University of Vermont	✔	✔	HTML	http://www.uvm.edu/extension	
47.Virginia	Virginia Tech	✔	✔	PDF	http://ext.vt.edu/lawn-garden.html	
48.Washington	Washington State University	✔	✔	PDF	https://pubs.wsu.edu/ListCategories.aspx?TopicID=6	
49.West Virginia	West Virginia University	✔	✔	HTML	http://www.ext.wvu.edu/lawn_garden	

50.Wisconsin	University of Wisconsin	✔	✔	PDF, HTML	http://fyi.uwex.edu/topic/garden/	
51.Wyoming	University of Wyoming	✔	✔	PDF, HTML, E-Book	http://www.wyoextension.org/publications/	
Oversea territory	**Land-Grant Universities (1862)**	**Horticulture**	**Landscape**	**Version of publication**	**Website**	**Notes**
1.American Samoa	American Samoa Community College	No Result	No Result	_	http://www.amsamoa.edu/institution/publications.html	No information of Horticulture and Landscape has been founded.
2.Guam	University of Guam	✔	No Result	PDF	http://cnas-re.uog.edu/useful-cnas-documents-posters/	There are agricultural publications
3.Micronesia	College of Micronesia	✔	No Result	PDF	http://www.comfsm.fm/?q=vpcre-publications	There are agricultural publications
4.Northern Marianas	Northern Marianas College	No Result	No Result	_	No Result	No extension and publication information has been founded
5.Puerto Rico	University of Puerto Rico	No Result	No Result	_	http://www.upr.edu/publicaciones/	Language of the website is Spanish
6.Vergin Island	University of the Virgin Islands	✔	No Result	HTLM	http://www.uvi.edu/research/agricultural-experiment-station/horticulture-home/default.aspx	
Source: NIFA LAND-GRANT COLLEGES AND UNIVERSITIES. USDA, June 2014. https://nifa.usda.gov/sites/default/files/resource/lgu_map_6_25_2014_0.pdf						**All websites, including USDA website were accessed in February 2017.**

Table 1.2: Summary of various aspects of reviewed 61 landscape design publications

Contents		**Number of publications**
Residential landscape design, landscape design, principles, and concepts		20
Rainwater conservation and drainage		10
Planting design and guide		7
Color guide		4
Site analysis		4
Extra functions	Protect from wildfire	2
	Edible garden	2
Style guide		2
Texture guide		1
Other: Hiring professional designer, design history, drawing skills, and other tips		9
Total		**61**

Ranges of page number	**Number of publications**
1 to 8 (Leaflet)	36
9 to 30 (Fact sheet)	18
31 to 100 (Bulletin)	5
100+ (Book)	2
Total	**61**

Graphic styles	**Number of publications**
Hand drawing	21
Mix	15
No graphic	13
Computer software	6
Photograph	6
Total	**61**

Color	**Number of publication**
3 and more colors	33
2 and less colors	28
Total	61

Year of being published	**Number of publication**
—1980	2
1981—1990	0
1991—2000	2

2001—2010	30
2011—present	19
Unknown	8
Total	61
Version	**Number of publication**
Web page	36
Digital (PDF, E-book, etc.)	14
More than one types of version	11
Total	61

References

Alabama A&M University and Auburn University (2013). *Residential Landscape Design* (pp. 1-6). Alabama Cooperative Extension System.

Arthur, B. (2017). *The Foodscape Revolution*. Retrieved 12 August 2017, from http://www.gpnmag.com/article/the-foodscape-revolution/

APLU (2017*) What is a land-grant university?. Aplu.org*. Retrieved 10 August 2017, from http://www.aplu.org/about-us/history-of-aplu/what-is-a-land-grant-university/

ASHS. (2017) *Extension Division Education Materials Award. Ashs.org*. Retrieved 6 April 2017, from http://www.ashs.org/?page=ExtensionDivEMA

Berle, D. (2013) a. *Landscape Design Choosing a Landscape Design Professional*. The University of Georgia Cooperative Extension.

Berle, D. (2013) b. *Landscape Design Drawing a Landscape Plan: Site Analysis*. The University of Georgia Cooperative Extension.

Berle, D. (2013) c. *Landscape Design Drawing a Landscape Plan: The Base Map*. The University of Georgia Cooperative Extension.

Berle, D. (2013) d. *Landscape Design Working with a Garden Designer*. The University of Georgia Cooperative Extension.

Boekelheide, D., and L. Bradley, (2015). *Food Garden Design*. North Carolina State University and North Carolina A&T State University Cooperative Extension.

Brown, H.L., D.G. Bos, C.J. Walsh, T.D. Fletcher, and D. RossRakesh, (2014). *More than money: how multiple factors influence householder participate in at-source stormwater management*. J. Environ. Plann. Manage. (2014), pp. 1-19

Brzuszek, R., (N.D.) a. *Designing with Native Plants and Naturalistic Landscapes*. Mississippi State University Extension Service (N.D.). Retrieved 12 August 2017, from http://extension.msstate.edu/node/26997

Brzuszek, R., (N.D.) b. *Developing a Plant Schedule for your Landscape*. Mississippi State University Extension Service. Retrieved 12 August 2017, from http://extension.msstate.edu/node/26993

Brzuszek, R., (N.D.) c. *Landscape Design to Protect from Wildfires*. Mississippi State University Extension Service. Retrieved 12 August 2017, from http://extension.msstate.edu/node/26994

Brzuszek, R., (N.D.) d. *Planting Design Fundamentals* (pp. 1, 5-6). Mississippi State University Extension Service. Retrieved 12 August 2017, from http://extension.msstate.edu/node/26995

Brzuszek, R., (N.D.) e. *Using Color in the Landscape* (pp. 1-4). Mississippi State University Extension Service. Retrieved 12 August 2017, from http://extension.msstate.edu/node/26996

Cerny, T., K. L. Kopp, M. Wolf, and D. Amundsen, (2002). *Design A Low Water Use Landscape*. The Utah Cooperative Extension Service.

Cervelli, J.A. (2005). *Landscape Design with Plants: Creating Outdoor Rooms*. University of Kentucky Cooperative Extension Service.

Cornell University (N.D.). *Using Texture in Flower Gardens*. Cornell Cooperative Extension. Retrieved 6 April 2017, from http://www.gardening.cornell.edu/homegardening/scene43bf.html

Franti, T. G., and S.N. Rodie, (2013). *Rain Garden Design And Selection Guide* (pp. 4, 6, 11-25). Lincoln, Nebraska: University of Nebraska-Lincoln Extension.

Hansen, G. (2010). *Basic Principles of Landscape Design*. Gainesville, Florida: University of Florida IFAS Extension.

Hansen, G. (2012). *Landscape Design: Drawing a Planting Plan*. Gainesville, Florida: University of Florida IFAS Extension.

Hansen, G. (2013). *Landscape Design with Edibles*. Gainesville, Florida: University of Florida IFAS Extension.

Hansen, G., and E. Alvarez, (2010) a. *Color in the Landscape: Finding Inspiration for a Color Theme*. Gainesville, Florida: University of Florida IFAS Extension.

Hansen, G., and E. Alvarez, (2010) b. *Landscape Design: Finding Inspiration for a Design Theme*. Gainesville, Florida: University of Florida IFAS Extension.

Hansen, G., and E. Alvarez, (2010) c. *Landscape Design: Putting Your Yard on Paper – Site Measurement and Base Maps*. Gainesville, Florida: University of Florida IFAS Extension.

Hansen, G., S. Watkins, and S.P. Brown, (2015). *Landscape Design Software: Evaluation and Recommendations for Homeowners*. Gainesville, Florida: University of Florida IFAS Extension.

Himelick, K. (2004). *Landscape Design For Water Conservation*. Delaware Cooperative Extension.

Iowa State University. (2007). *Home Landscape Planning Worksheet: 12 steps to a functional design.* Ames, Iowa: Iowa State University Extension and Outreach.

K-State Research and Extension (2017). *Ksre.k-state.edu* Retrieved 10 August 2017, from http://www.ksre.k-state.edu

Keane, T. (1995). *Water-Wise Landscaping*. The Utah Cooperative Extension Service.

Nolting, E., and C. Boyer, (2010). *Landscape Design* (p. 1). Manhattan, Kansas: Kansas State University Agricultural Experiment Station and Cooperative Extension Service.

Paul, J.R., S.G.W. Nicholas, D.F. Tim, and F. Claire, (2017). Can raingardens produce food and retain stormwater? Effects of substrates and stormwater application method on plant water use, stormwater retention and yield. Ecological Engineering, March 2017, vol. 100, pp. 165-174

Pineo, R., and S. Barton, (2009) a. *Designing A Sustainable Landscape To Serve Your Needs*. Delaware Cooperative Extension.

Pineo, R., and S. Barton, (2009) b. *Rain Gardens*. Delaware Cooperative Extension.

Powell, K. (2002). *Residential Landscaping*. North Carolina State University and North Carolina A&T State University Cooperative Extension.

Seymour, M. (2016). *Landscape Design for Homes of the Lante Victorian Era (1860-1900)*. Mississippi State University Extension Service.

Skelly, J. *Firescaping Landscape Design For Defensible Space*. University of Nevada Cooperative Extension (N.D.).

Retrieved 12 August 2017, from http://www.unce.unr.edu/publications/files/ho/2001/fs0133.pdf

Spafford, A., M. Wallace, C. Lauderdale, L. Bradley, and K. Moore, (2015). *Extension Gardener Handbook - 19. Landscape Design* (pp. 3-6). North Carolina State University and North Carolina A&T State University Cooperative Extension.

Trinklein, D. H. (2016). *Residential Landscaping* (pp. 6). University of Missouri Extension.

United States Department of Agriculture (USDA). (2014). *NIFA Land-Grant Colleges and Universities*. United States Department of Agriculture (USDA).

Van der Hoeven, G.A. (1977). *Naturalistic Landscaping* (pp. 3-8). Kansas State University Agricultural Experiment Station and Cooperative Extension Service.

Van der Hoeven, G.A. (1978). *Ground Covers Rock Garden Plants and Ornamental Grasses* (pp. 1-4). Manhattan, Kansas: Kansas State University Agricultural Experiment Station and Cooperative Extension Service.

Van der Hoeven, G.A. (1980). *Residential Landscape Design* (pp. 3, 24-28). Manhattan, Kansas: Kansas State University Cooperative Extension Service.

Wallace, M. (2015). *Extension Gardener Handbook – Appendix F. History of Landscape Design*. North Carolina State University and North Carolina A&T State University Cooperative Extension.

Waterfall. P. (2004). *Harvesting Rainwater for Landscape Use (Second Edition)* (pp. 1-3). Extension Agent, University of Arizona Cooperative Extension/Low 4 Program.

Wilson, D., T. Wilson, and W. Tlusty, (2017). *Planning and Designing Your Home Landscape*. Madison, Wisconsin: University of Wisconsin-Extension, Cooperative Extension.

Wong, M. (2006). *Color Basics for Landscapes*. University of Hawaii Cooperative Extension Service.

Appendix A - Updated publication

Note: As an important part of Master Degree project, Jianqiao Luan has completed the work of this updated publication. It is formatted in Adobe InDesign. Other computer programs include Adobe Photoshop, Google Map, etc. Drawing methods include freehand drawing, and mark pen, colored pencil and watercolor rendering. The font sizes and style may be different to this report because the publication is for artistic purpose, for publisher to edit and homeowners to read. To not break the updated publication apart, the document will start in next page.

Table of Contents

6. Draw A Master Plan
- Determine the scale of your plan
- Start with a draft
- Draw a plan with clear levels
- Draw additional graphics for more information
- Rendering
- Computer Software

Part Three: Examples Of Residential Landscape Design

Part Four: Resources

Part One: Basic Concepts

1. Why Develop Your Landscape?

Historically, the primary purpose of developing a landscape has been for food supply. These days, providing food can be one function, but residential landscapes are more about pleasure (Figure 1.1.1). If your site is near an undeveloped or less developed place, your landscape is also a green space that softens and harmonizes the relationship between artificial construction, like your house and the natural environment (Figure 1.1.2). Residential landscapes in different places have different design methods and elements, however in general, residential landscapes have 4 values: Aesthetic, environmental, functional, and economic. Aesthetic value comes from the texture, color, light and shade, etc., which are provided by landscape plants, paving materials, landscape features, and so on. Landscaping improves the living environment in residential areas, enriching plant and animal biodiversity, and creating a microclimate. Landscaping has functions such as providing a pleasant view, offering outdoor spaces for activities, growing vegetables, fruits, herbs, and keeping wildfire away. Residential landscaping also lowers the noise from city roads, reduces dust, and decreases summer temperature around your house. Landscaping has a huge potential to help you to have a better living environment, lowering crime, and increase property value.

Figure 1.1.1: Residential landscape (photograph by Jianqiao Luan, in Jardine Terrace Apartments, Manhattan, Kansas)

Figure 1.2.1: A residential site in a natural place (photograph by Jianqiao Luan, in Washington Marlatt Memorial Park, Manhattan, Kansas)

2. Cost of landscape development

It is important to know the cost of developing a landscape because money invested dramatically influences the quality and function of outdoor space. Expenses may come from several areats, including landscape design, construction, maintenance, etc.

A design created by homeowners themselves will save money in the design process. Homeowners can follow their own ideas and thoughts. However, homeowners without experience designing and building landscapes may miss potential problems (drainage issues, code violation, etc.) that experienced landscape designers are aware of, and the final work maybe not as satisfying as they have imagined in the beginning. Working with professional designers costs more money, but experienced designers help prevent mistakes, find more ways to solve problems and address needs, and create a more beautiful green space. Costs vary by location, and can be influenced by cost of materials, such as paving materials, plants, and different functional facilities and landscape features. Generally, however, developing a residential landscape in Kansas may cost 10-20% of the total cost of house and lot. Developing a landscape in phases can save money. Maintenance requires money too, but expense of maintenance depends on size and current status of your yard, types of facilities and features, and the final quality desired. Maintenance is also a long-term project. To have your beautiful yard last a long time, you need to keep plants healthy, remove dead and diseased plants (Figure 1.2.1), change equipment (irrigation, light, pump in water feature, etc.), fix damages caused by people, animals, natural disasters, etc.

Designing and building a landscape can be finished in different phases. For example, some people grow trees first because trees need a longer time to grow to provide shaded areas, others improve the soil first since they think soil is more important, and some people only finish a part of the yard for instant functions. This is also good for people who are short on budget but want to get started with a landscape in the yard.

Figure 1.2.1: An old oak tree needing maintenance (photograph by Jianqiao Luan, in Kansas State University)

3. Principles of landscape design.

The word principle may sound boring, but it will guide you to design a more successful and visually pleasant landscape, and communicate with designers better. After classifying and summarizing, 6 principles will be discussed here: **proportion and scale**, **balance**, **focal point**, **unity**, **rhythm and form**, and **simplicity and variety**.

Proportion and Scale

In brief, one subject will look different with different comparison (Figure 1.3.1). Proportion and scale are relations among length, breadth and height that determine if your site looks comfortable. They affect the site in a holistic way and also in details. The features, plants, and other elements in a yard should have certain ranges of size to cooperate with the house, or view of the site will look inharmonious (Figure 1.3.2, 3, 4).

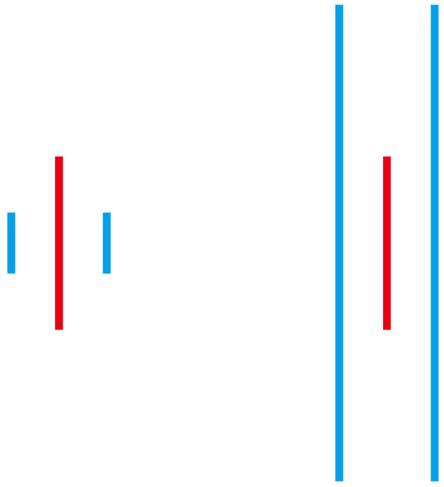


Figure 1.3.1: The same red line looks longer with short lines and looks shorter with longer lines.

Figure 1.3.2: A house with several tiny plants does not look beautiful

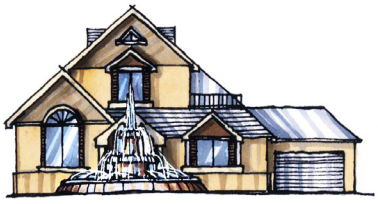


Figure 1.3.3: A giant fountain does not fit a regular house

Figure 1.3.4: A huge pavilion does not fit a regular house

Plants are important because they create the outdoor spaces and they are continually growing. Sizes of plants influence the visual effect of the house (Figure 1.3.5, 6, 7). Therefore, the planting design should use mature plant sizes, or use sizes that you can control with extra maintenance. This will help plants grow naturally and create a better view. For instance, a Japanese maple (*Acer palmatum*) may grow up to 6 feet tall, but you can trim it to keep it smaller.

Figure 1.3.5: Small plants make a house look larger

Figure 1.3.6: Large plants make a house look smaller

Figure 1.3.7: Larger plants in the back help emphasize the house

Balance

Balance is a factor that influences the look of your site as well. Balance can be achieved by carefully distributing landscape elements (plants, features, materials, colors, textures, etc.) throughout an area without necessarily spacing them equally (Figure 1.3.8). Balance can be abstract. Sometimes it has an axis, like a path in the middle (Figure 1.3.9), sometime there is no typical axis, but the balance still exists (Figure 1.3.10, 11), and sometime more than two types of elements influence the balance (Figure 1.3.12, 13). A site without balance may look lopsided and uncomfortable (Figure 1.3.14, 15). Here are several examples of balance in reality (Figure 1.3.16,17,18,19,20).

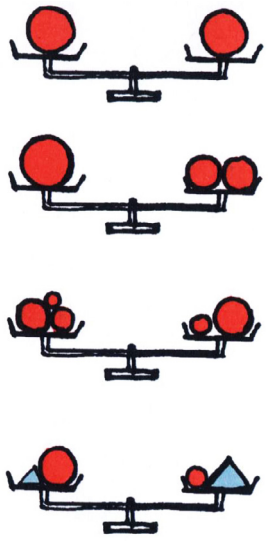


Figure 1.3.8: Balance can have multiple types

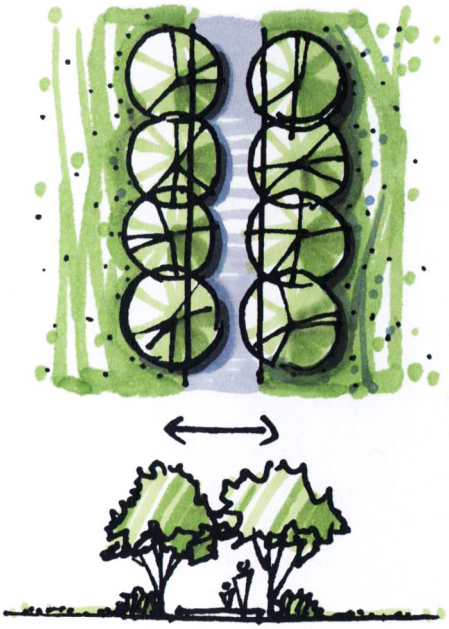


Figure 1.3.9: A typical axis presented by a path

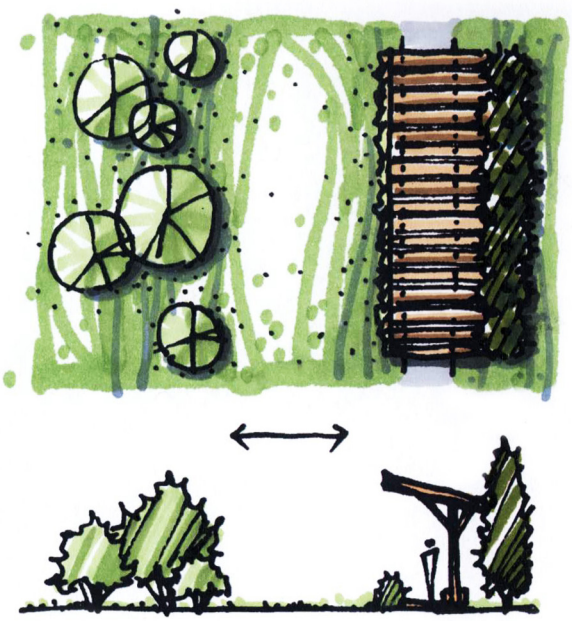


Figure 1.3.10: Axis does not need same elements on its two sides

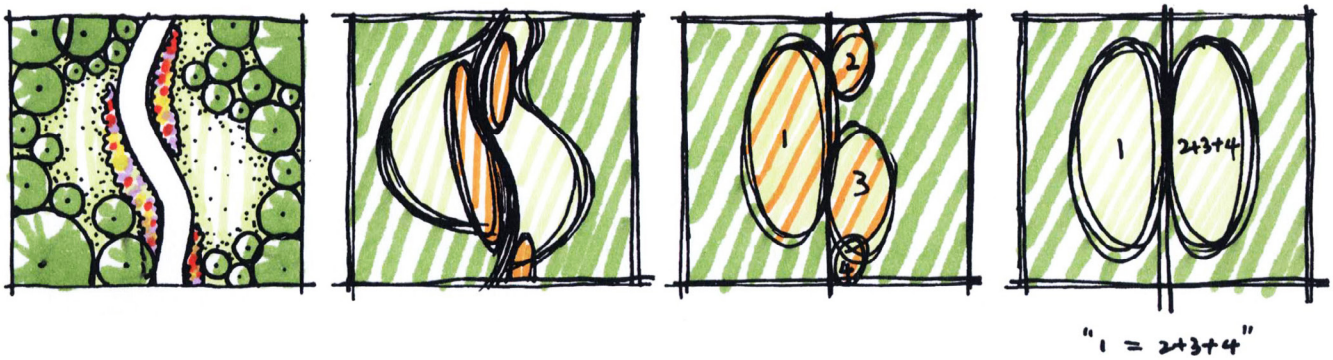


Figure 1.3.11: An atypical axis presented by an "S" shaped path. The spaces on both sides of the path are balanced. The balance is easier to explain by simplification and geometrization.

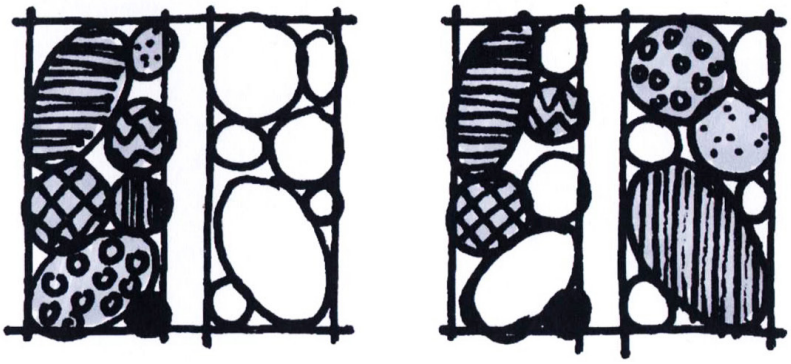


Figure 1.3.12: A balance between patterns with textures and without texture

Figure 1.3.13: A balance among colors in planting design. The figure in left side is not balanced, but the figure in right side is balanced

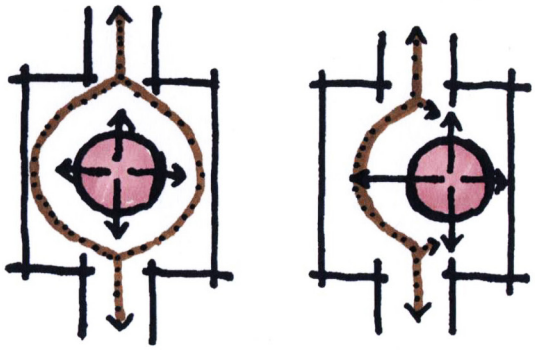


Figure 1.3.14: Balance influences circulation

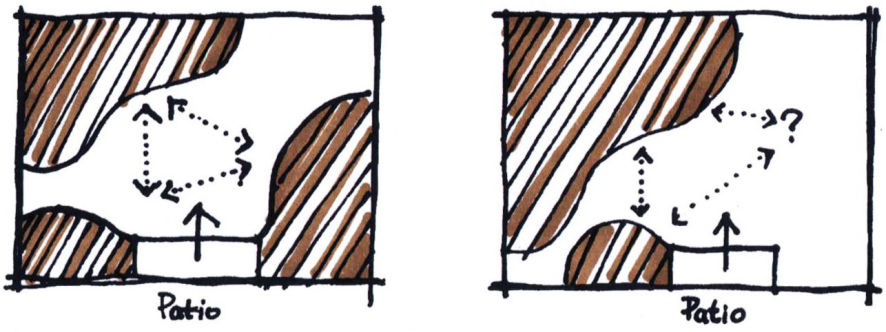


Figure 1.3.15: A yard without balance looks lopsided

Figure 1.3.16: Balance on two sides of a path

Figure 1.3.17: Balance between one larger wooden chair and two smaller wooden chairs

Figure 1.3.18: Balance of two flowerbeds in front of a house entrance

Figure 1.3.19: Balance of same elements in both side of a path

Figure 1.3.20: Three plantingbeds keep a balance in a turf space

Visual Direction and Focal Point

Visual directing guides sight by arranging landscape elements, such as plants, landscape features, construction, and so on (Figure 1.3.21). There are many ways to guide people's sight (Figure 1.3.22, 23, 24, 25, 26, 27), but focal point is the most common method. A focal point is the center of interest. A focal point draws much more attention over other parts of the yard. In a residential landscape, the main entrance of the house is usually the focal point (Figure 1.3.28, 29), so is it necessary to create ample space to welcome your guests. The focal point can also be a unique plant or a unique group of plants, a rock, a water fountain, etc. (Figure 1.3.30, 31). In a relatively small garden, one or two focal points are enough. If there are two focal points designed, one of them should take more weight than the other one. A garden with too many focal points will look tiring.

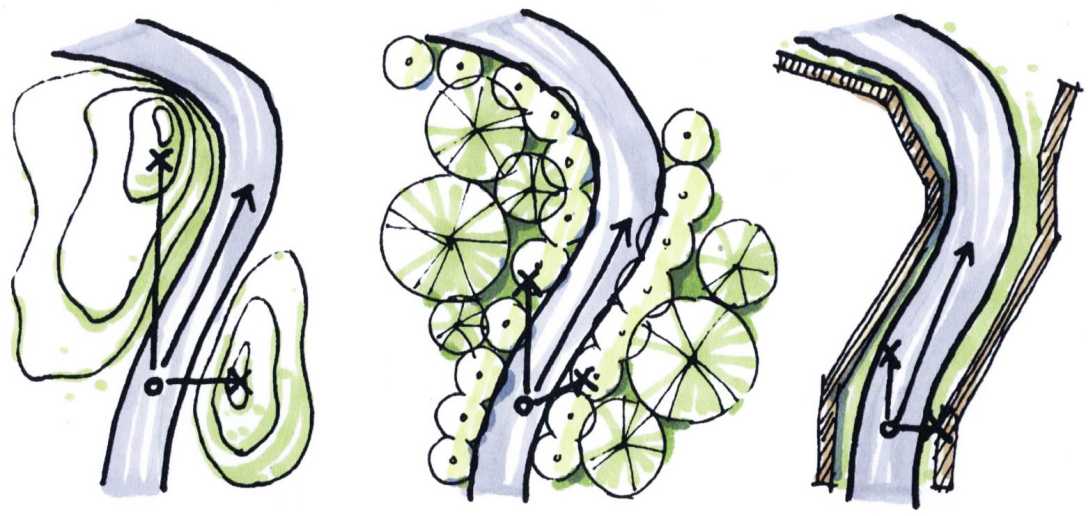


Figure 1.3.21: Sight guided by landform, plants, and landscape construction (walls)

Figure 1.3.22: People can look through if the trees are tall

Figure 1.3.23: Tall trees provide space under their canopy to look through

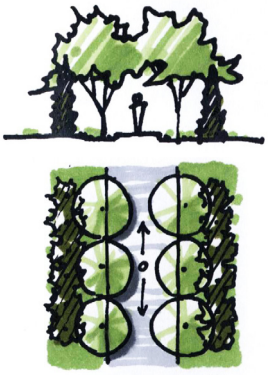


Figure 1.3.24: Evergreen plants can block people's sight

Figure 1.3.25: An open space draws people's sight

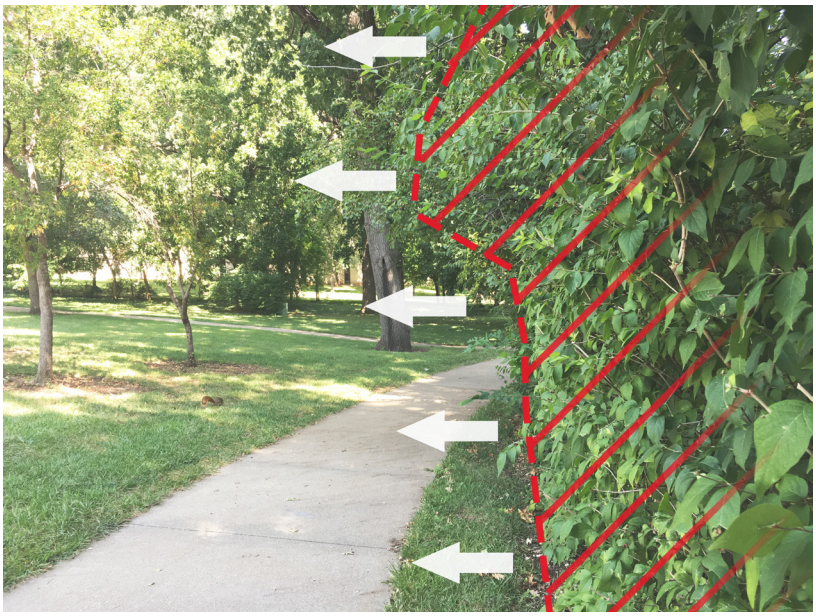


Figure 1.3.26: Shrubs with dense leaves block sight, and open space draws people's sight

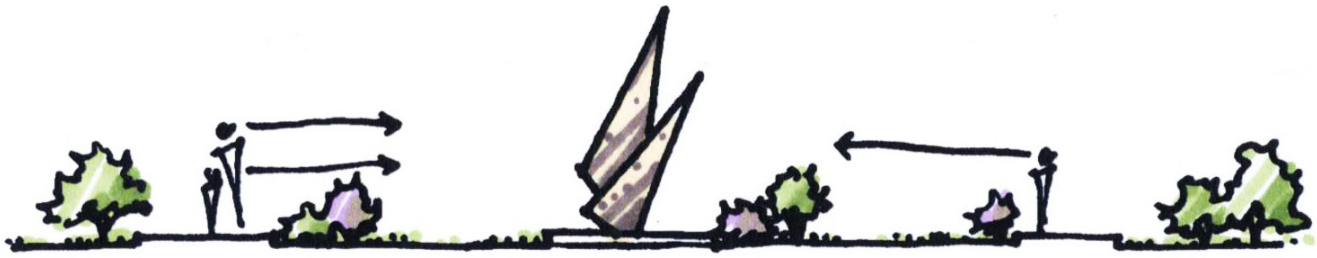


Figure 1.3.27: A sculpture draws people's sight

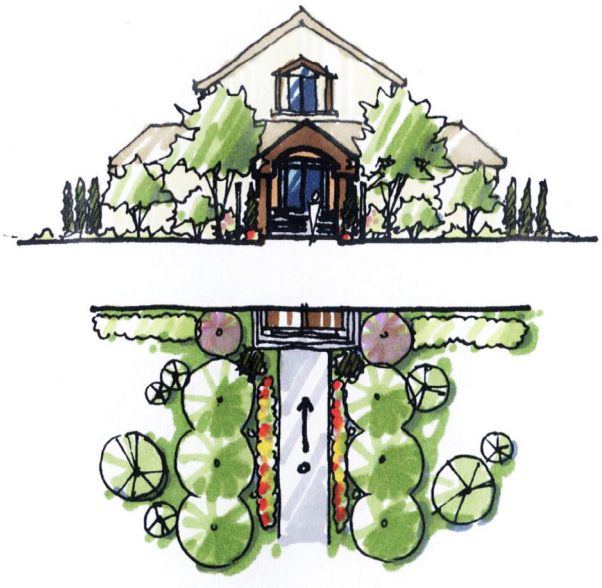


Figure 1.3.28: A main entrance can be focal point

Figure 1.3.29: A focal point of an entrance

Figure 1.3.30: A special tree can be a focal point

Figure 1.3.31: A group of rocks can be focal point

Form and Rhythm

Form is geometric and abstract. Three forms are common in landscape: points, lines, and planes. Point is easy to understand (Figure 1.3.32, 33, 34). It is a dot element in landscape, such as a tree, a small landscape feature, a rock, etc. Lines have three types: straight line, curved line, and angled line (Figure 1.3.35, 36, 37, 38). Straight lines usually turn with the angle of 90°. Angled line can turn in many angles but angles less than 90°are avoided because they are sharp and pointed, which may make people uncomfortable. People may step on the sharp angle of planting bed to make walking easier, and destroy the plants (Figure 1.3.39, 40). Same idea with sharp angled line, curved lines should not turn too fast. A plane can be geometric (circle, triangle, rectangular, pentagon, etc.) or irregular (Figure 1.3.41). Plane in landscape can be a paved ground, an area with one groundcover plant, water, etc. Plane can provide textures, such as textures from groundcover plants (Figure 1.3.42, 43). In landscape design, using single form or several forms creates patterns. A regulated pattern unifies the whole site (Figure 1.3.44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54).

Figure 1.3.32: Points, and examples of trees and rocks

Figure 1.3.33: Pavement in Point style

Figure 1.3.34: Plants provide a scene of points/dots

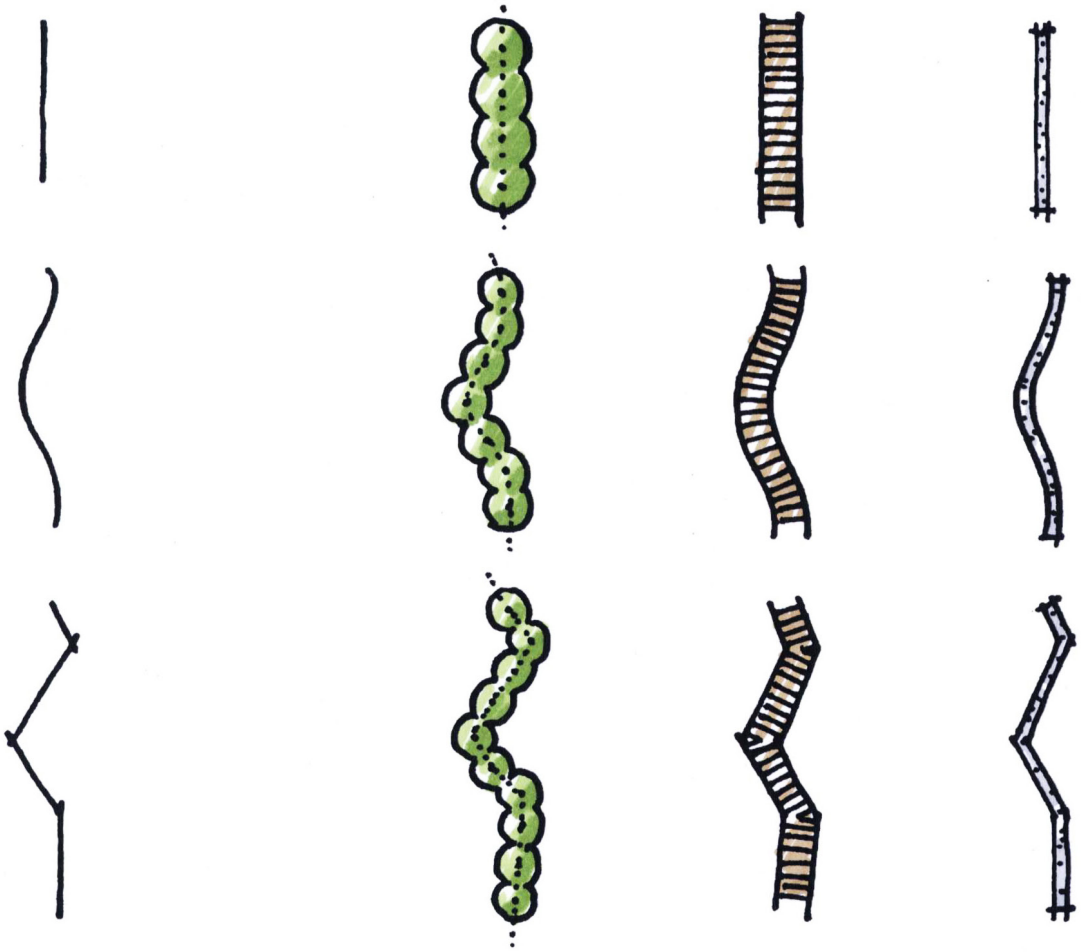


Figure 1.3.35: Straight line, curve line, and angled line with examples of trees, paths, and walls

Figure 1.3.36: Paths are paving of Line style

Figure 1.3.37: Grass provides interests of Line-1

Figure 1.3.38: Grass provides interests of Line-2

Figure 1.3.39: Possible bad results of angles less than 90°

Figure 1.3.40: People step through a corner

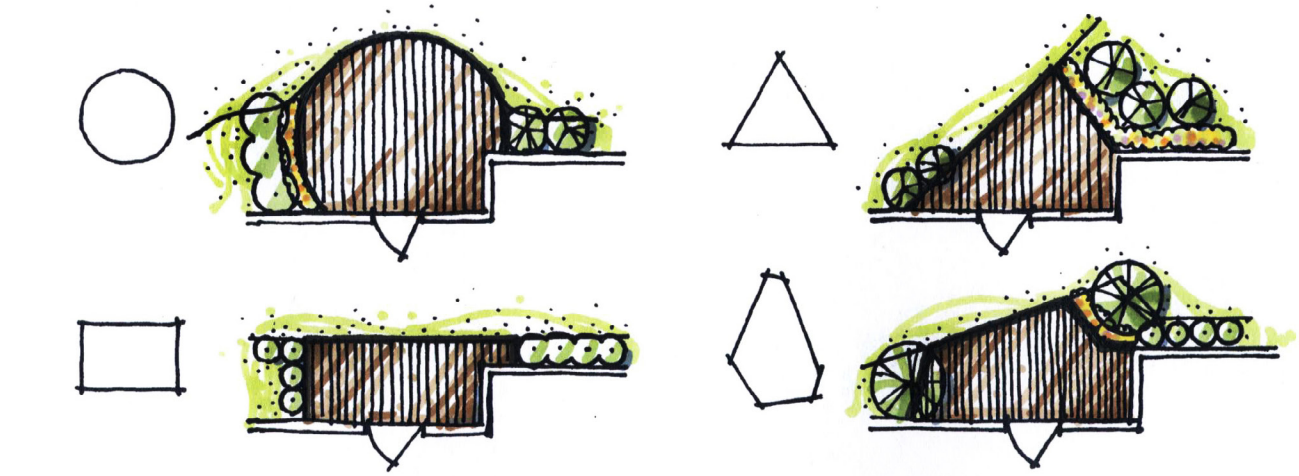


Figure 1.3.41: Circle, triangle, rectangle, and irregular planes with example of patio

Figure 1.3.42: A plane created by a paved ground

Figure 1.3.43: Different plants create a plane with different textures

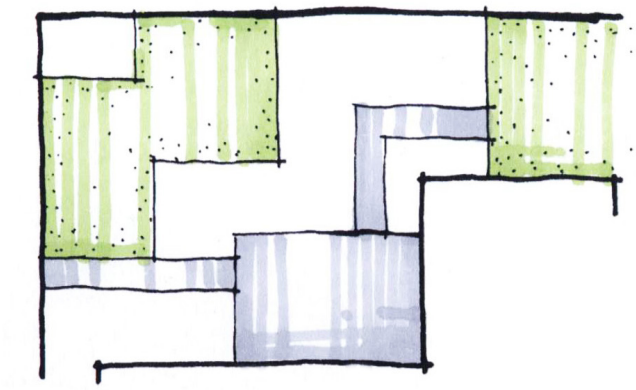


Figure 1.3.44: Rectangular pattern

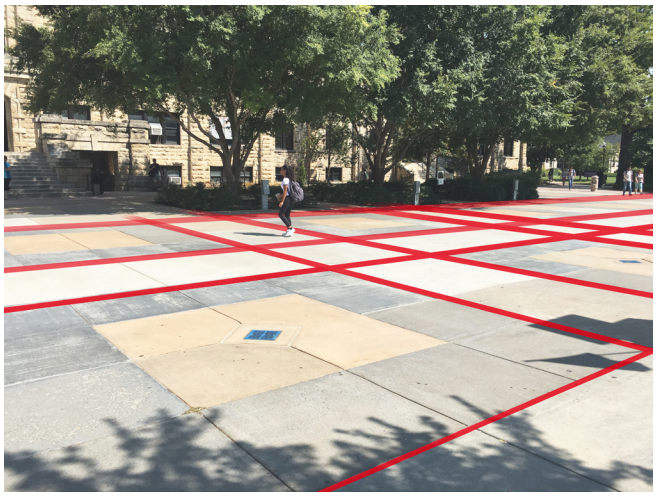


Figure 1.3.45: Rectangular pattern in reality

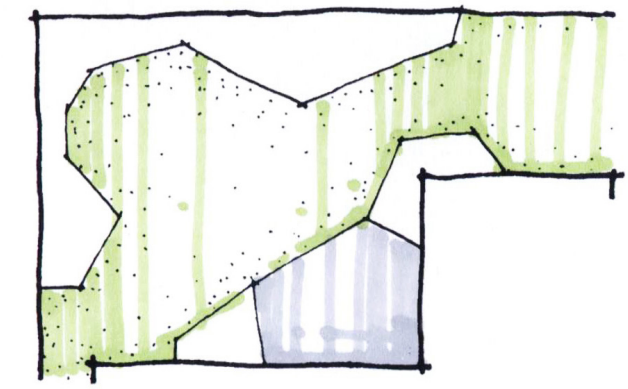


Figure 1.3.46: Angular pattern

Figure 1.3.47: Angular pattern in reality

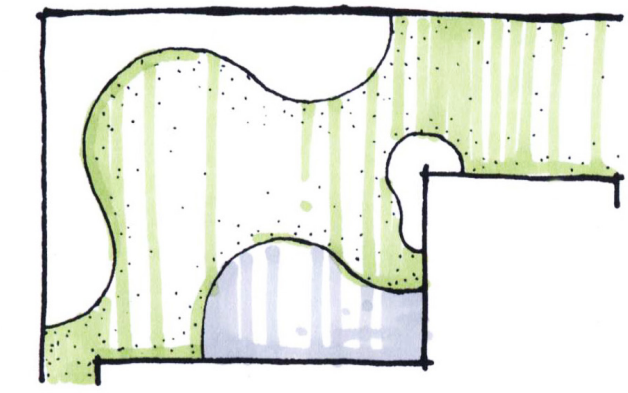


Figure 1.3.48: Circular pattern

Figure 1.3.49: Circular pattern in reality

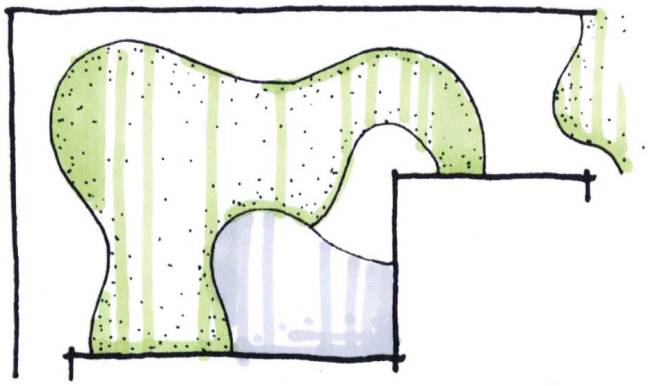


Figure 1.3.50: Free curve pattern

Figure 1.3.51: Free curve pattern in reality

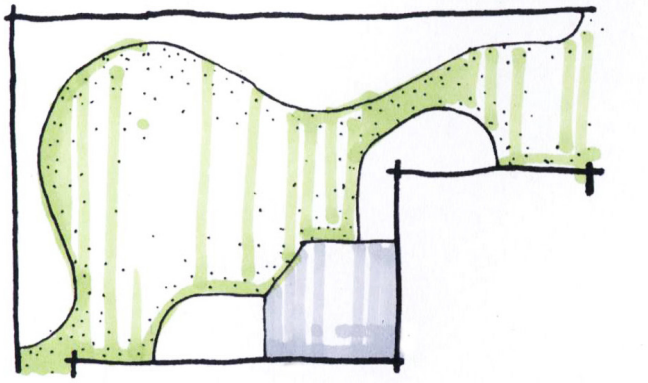


Figure 1.3.52: A pattern mixed with curve lines and angular lines

Figure 1.3.53: A pattern mixed with curve lines and angular lines in reality

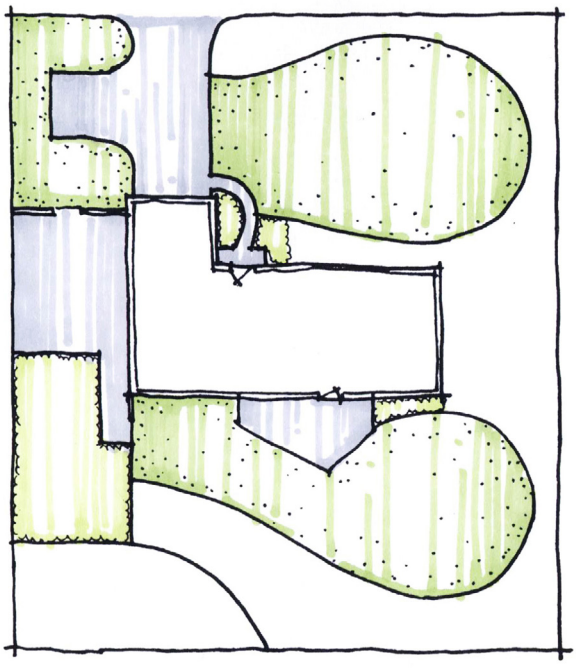


Figure 1.3.54: A combination of different design patterns to create functional space division

Repeating elements in a certain sequence will create rhythm. Rhythm adds interest in the garden. A rhythm is usually linear because it needs distance to show the sequence (i.e. people walk on a path or looking at a long site). Arranging colors, paving materials, landscape features, and plants in order can show rhythm (Figure 1.3.55). Rhythm can be regular and also irregular, but the distance between two accents in an irregular rhythm should not be too long or too short (Figure 1.3.56, 57).

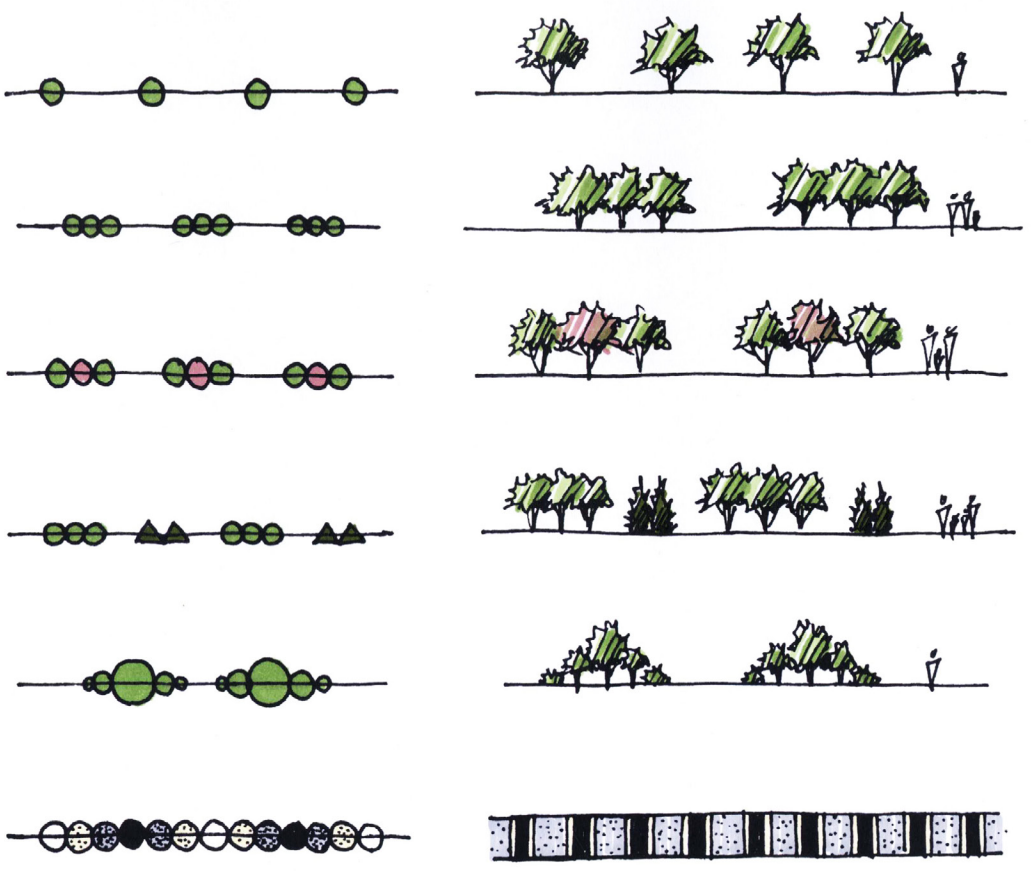


Figure 1.3.34: Different types of rhythm: numbers, colors, species, sizes, and textures

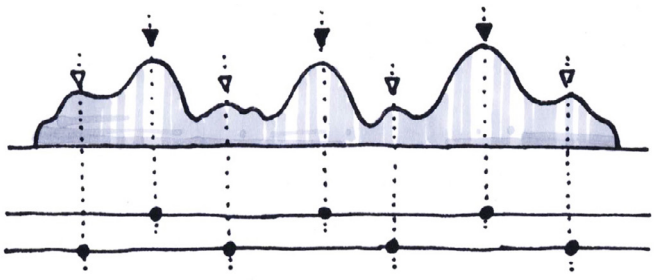


Figure 1.3.56: An irregular rhythm of an artistic wall

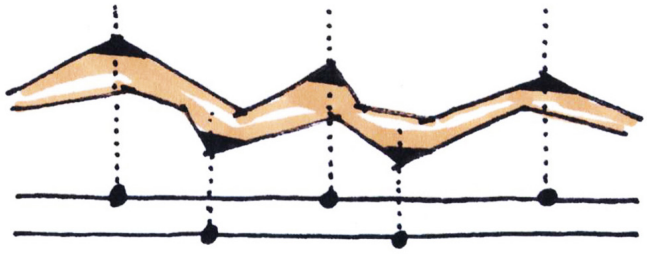


Figure 1.3.57: An irregular rhythm of seats on a path

Simplicity and Variety

These two words sound opposite, but at the same time they are connected. Simplicity means reducing extra functions and distracting elements when the designer tries to put everything in one place, while variety means adding a proper diversity when certain areas need more types of elements to create more interest and flexibility (Figure 1.3.37, 38, 39). However, simplicity is not deficiency and dullness, and variety is not complexity and disunity. It is challenging to tell when and where to use simplicity and variety, but a good balance and distribution of them create comfortable views with perfect density and spacing of landscape elements. The principle of simplicity and variety can be difficult to understand; designers need enough experience to put the right elements in the right places.

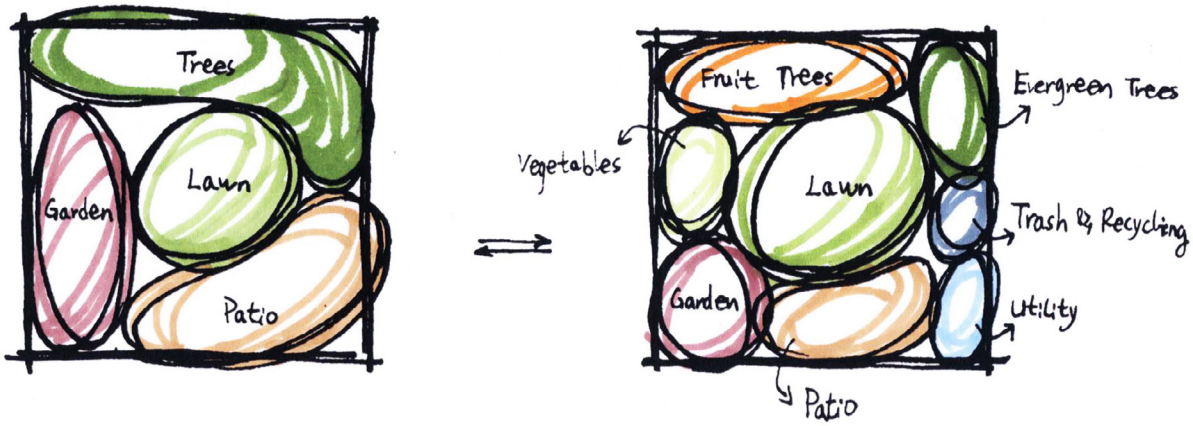


Figure 1.3.58: Simplicity and variety of functional areas

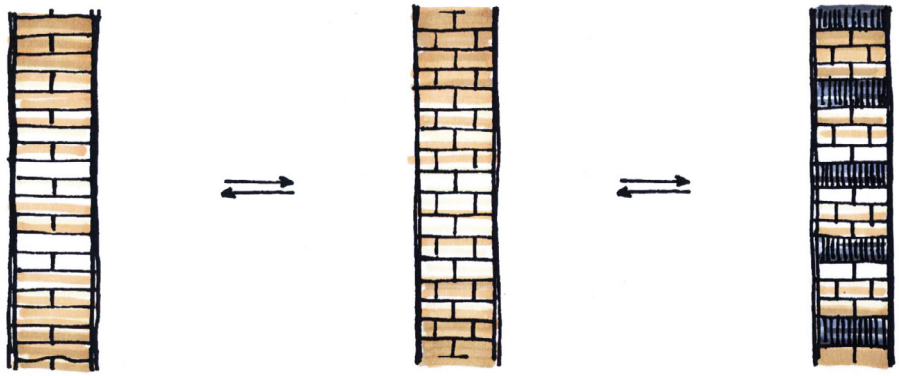


Figure 1.3.59: Simplicity and variety of paving materials

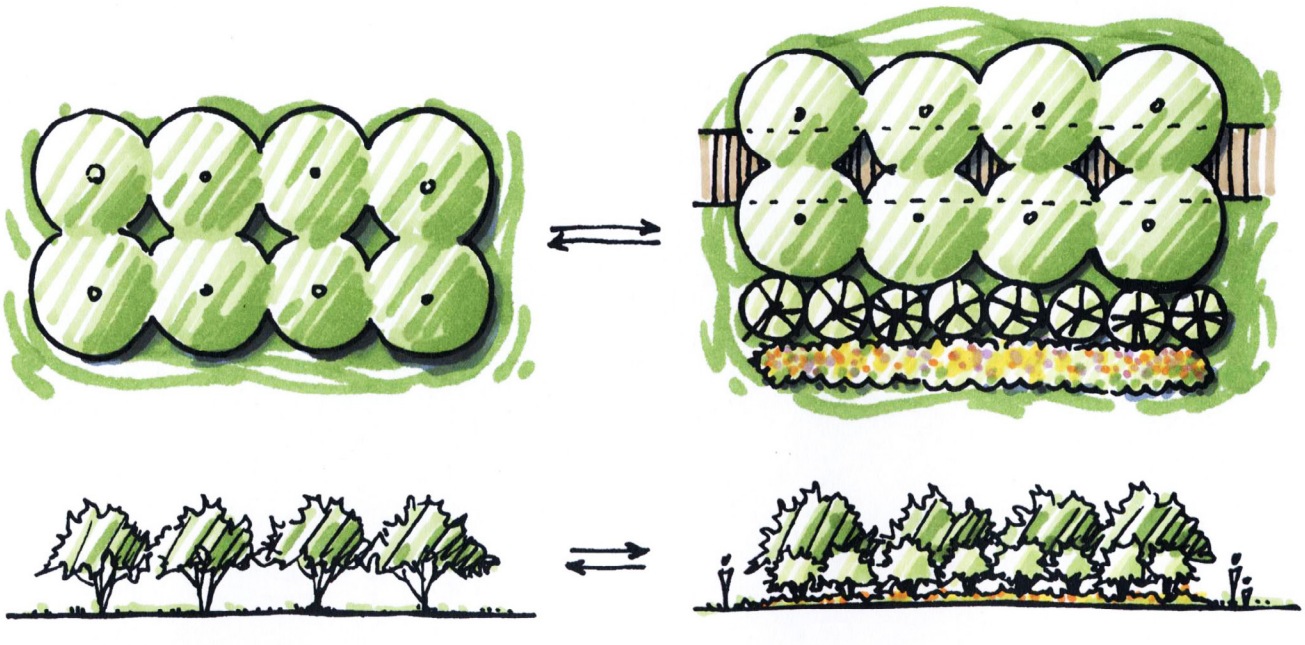


Figure 1.3.60: Simplicity (left) and variety (right) of planting design

Unity

Unity in landscape means all elements, including a house or structure, should be designed to fit each other. In other words, unity is similar to style. A relatively small residential landscape only needs one style because too many different styles in one small area look overly busy. However unity does not mean designers have to use only one type of form or a single design language. A variety of forms and diversity should also exist.

All principles are connected to each other, and there will be challenges even if one principle lost. Before designing a landscape, remember all principles will help you do a greater job and prevent mistakes. People who have no design experience and want to hire professional designers are also encouraged to know these basic concepts because communication between homeowners and professional landscape designers determines how efficient and how satisfied your landscape is being designed and built.

Part Two: 6 Steps Of Landscape Design

In this part, 6 steps will help you to design a residential landscape based on 6 principles. There may be problems and questions during the design process, but it is always wise to go out to the site frequently to seek answers and test your thoughts and ideas. The more one knows the site, the better the space is going to be.

Step 1. Site analysis

Before designing, we need to know the status of the site because site analysis determines if the design and site fit each other.

Site analysis cannot be separated with measuring and calculating. There are many ways and tools to measure your site, but homeowners may not have these advanced tools and experience. Here we introduce some basic methods to do the site analysis. The traditional methods to measure the site are point-to-point (Figure 2.1.1), baseline measurements (Figure 2.1.2), triangulation (Figure 2.1.3), and grid measurements (Figure 2.1.4). When we meet a slope or need to measure a slope, a string level is helpful (Figure 2.1.5).

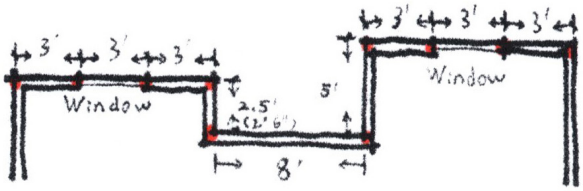


Figure 2.1.1: Point-to-point measurement

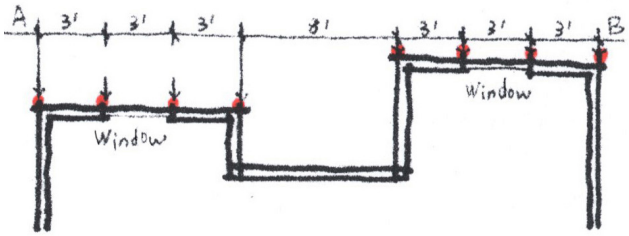


Figure 2.1.2: Baseline measurement

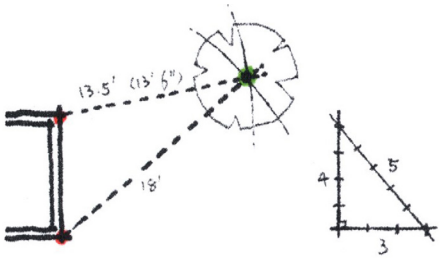


Figure 2.1.3: Triangulation measurement

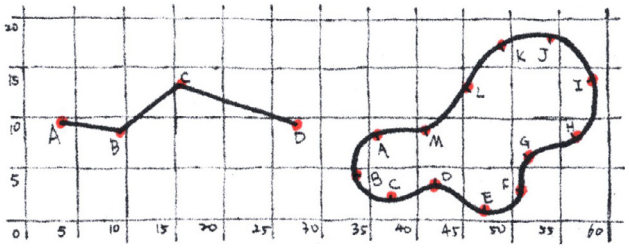


Figure 2.1.4: Grid measurement

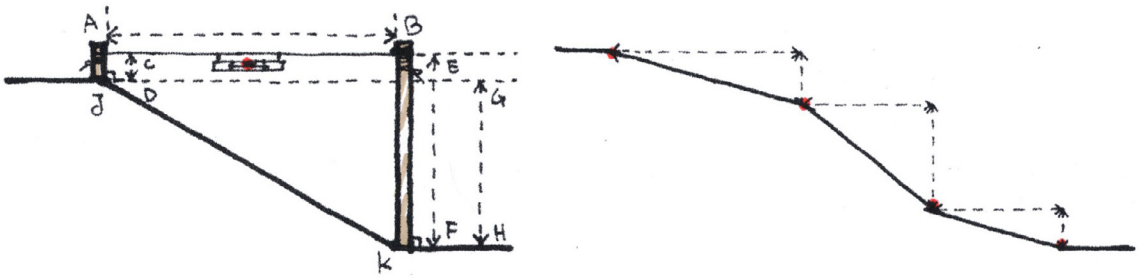
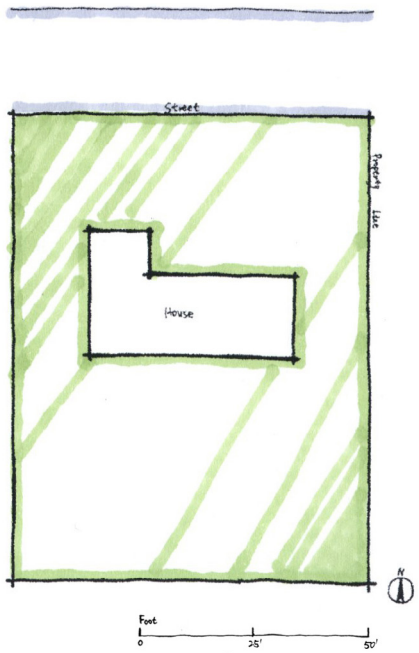


Figure 2.1.5: A string level and how to measure a long slope



A base map is used for site analysis with a certain scale, such as 1 inch equal to 10 feet (1”=10’). The base map itself should have the dimensions (the directions of North, South, East and West), street, and property lines of your site and your house (Figure 2.1.6). You can check the deed, property survey, visit county recorder’s office or assessor’s office, and call utility companies to find the information for your property line and underground utilities (electricity lines, gas lines, water lines, etc.) of your site.

Figure 2.1.6: Base map

Prepare several copies of the base map for different inventories because if all information is only one base map, it will look messy and confusing.

These items are usually needed to know and present on a base map:

Topography
Drainage
Soil
Depth of bedrock
Sunlight and shadows
Wind
Noise
Wildlife
Existing good views
Places that need screening
Existing plants
Detailed information about your house/structures
Neighbors’ house
Underground and aboveground utilities and easements

We can use those measuring methods to measure the landform and draw an overall topographic information on the base map. Once we have the topographic information, we can mark and draw how water flows to show the drainage (Figure 2.1.7).

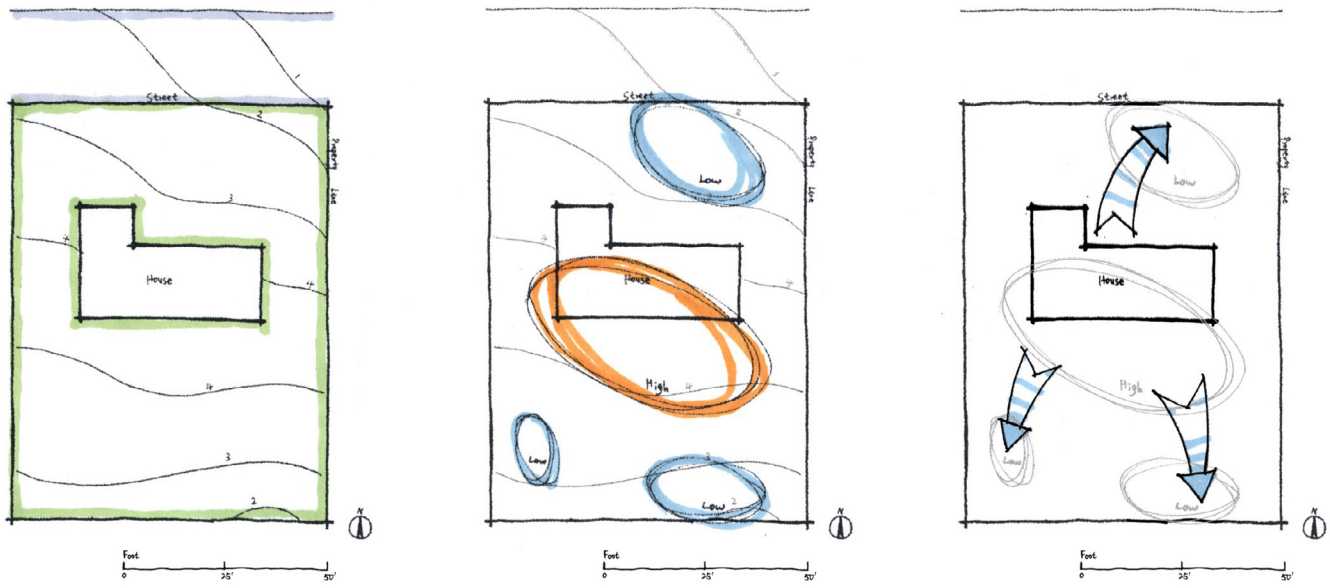


Figure 2.1.7: Topography and drainage

The information of soil and depth of bedrock helps you to decide where, how much and how deep you need to dig the soil when building the landscape. Soil depth also affects how to grow plants. Four to six inches of soil can grow a good lawn, 2 feet depth is good for shrubs, and 4 feet soil is best for trees. When soil is moved around on your lot, set topsoil aside, grade the subsoil for proper drainage and then replace the topsoil. Soil maps are available in Extension offices in counties where soils have been mapped. Soil information can also be found in Natural Resources Conservation Service of United States Department of Agriculture. (Website: https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm)

Sunlight, winds, good views, and noise change a lot throughout the year. As a result, inventories are not required to be 100% accurate (Figure 2.1.8). When analyzing your house, show rooms, windows, and entrances of the house (Figure 2.1.9). To make a site look better, the style, size and color of the house need to be considered.

People can also acquire more information from online sources, such as satellite maps or online maps to help you define and locate your context, neighborhood, existing plants, and so on (Figure 2.1.10).

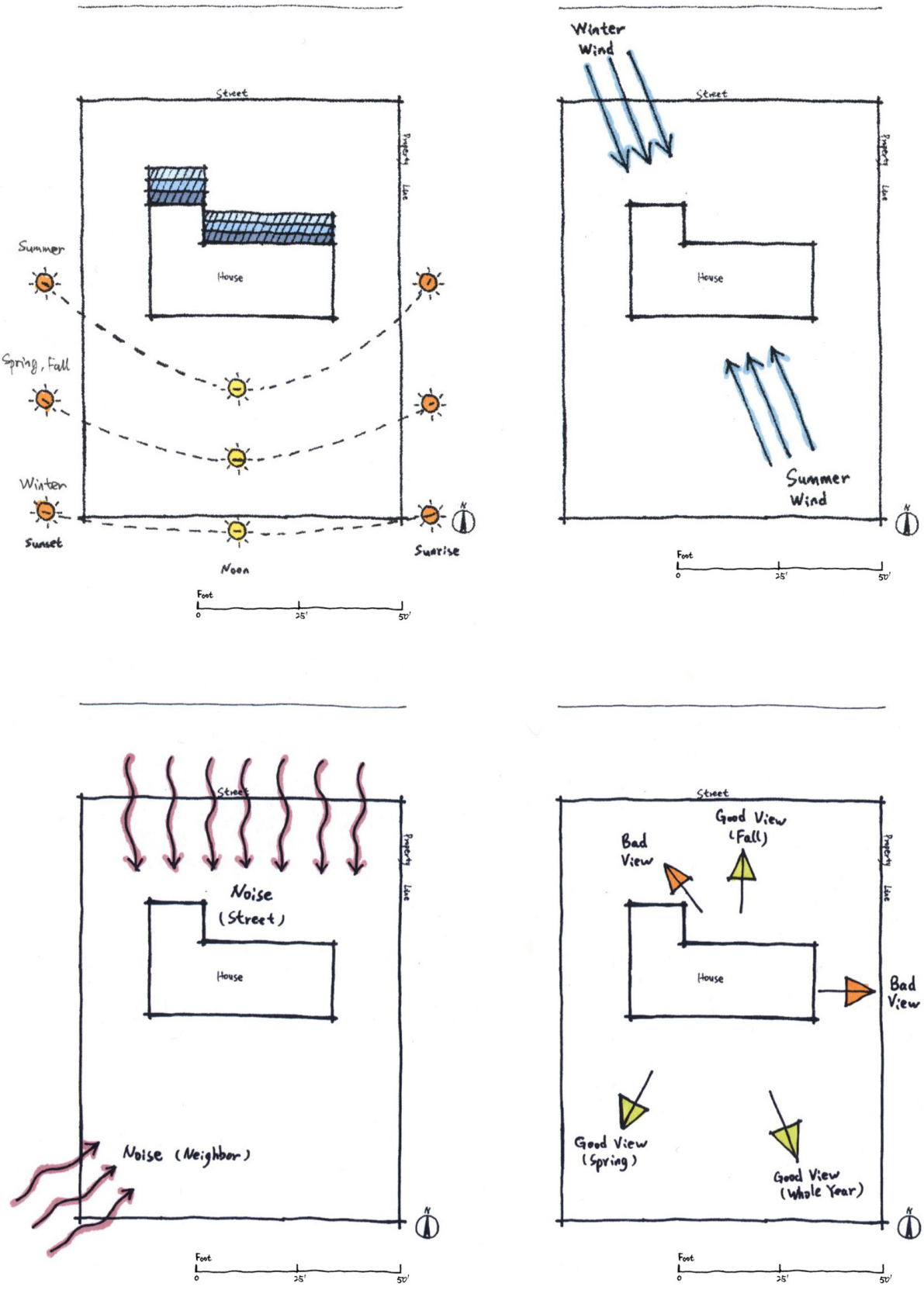


Figure 2.1.8: Inventory examples of sunlight, wind, noise, and view

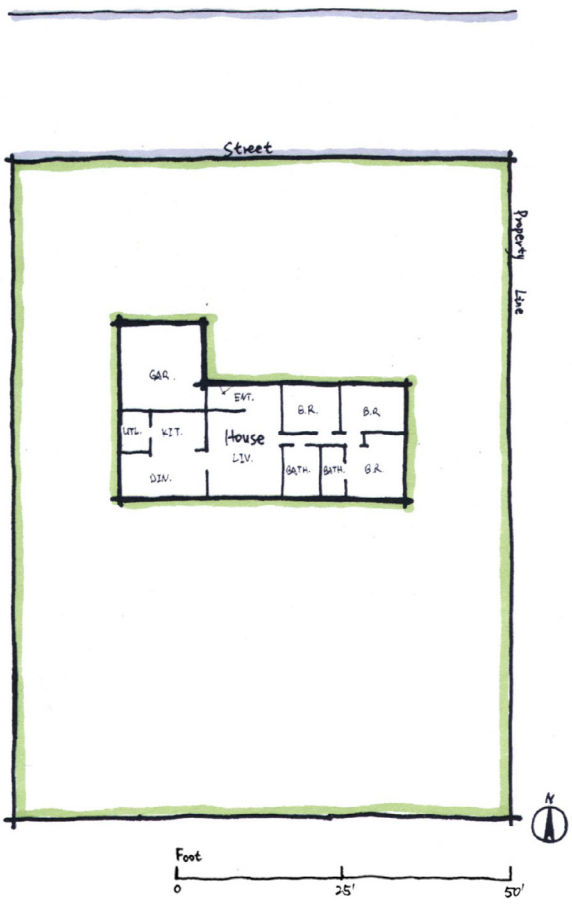


Figure 2.1.9: Interior space of the house

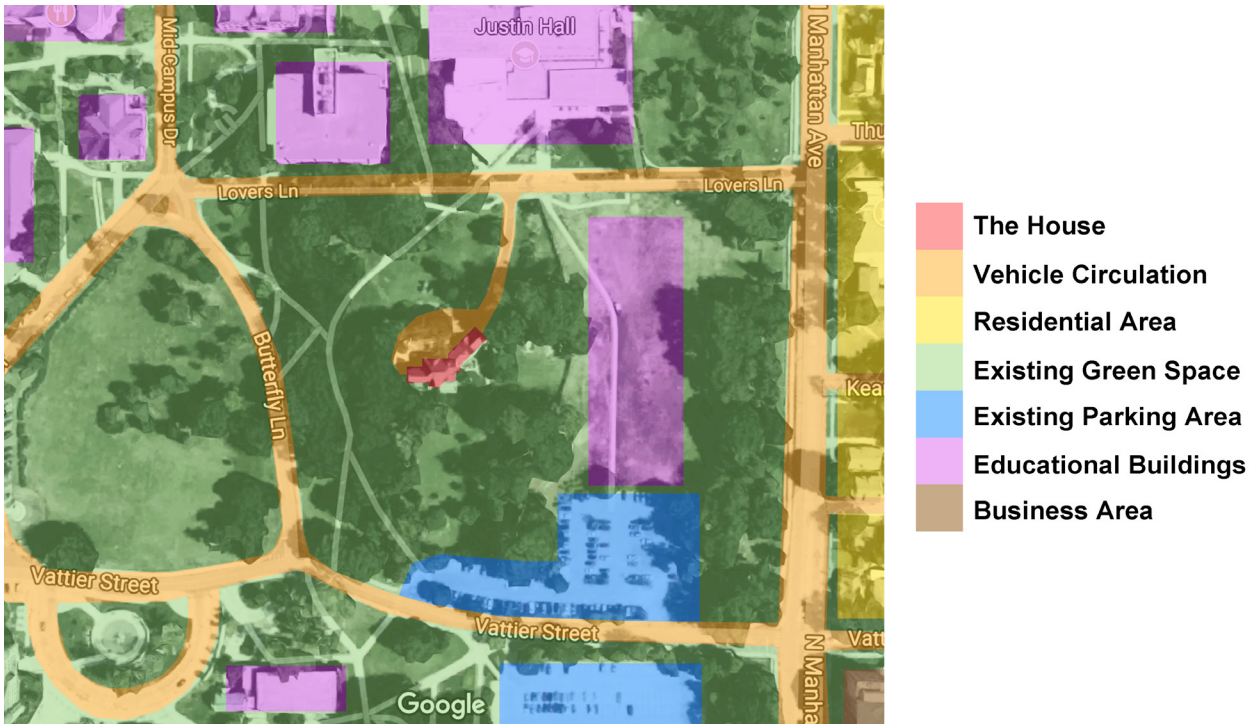


Figure 2.1.10: Use online source (Google Map) and computer software (Adobe Photoshop) to analyze the site (Example: Kansas State University)

Step 2. Space and functional areas

This step introduces dividing the site into different spaces for arranging different functional areas based on site analysis.

The concept of space might be unfamiliar and abstract to most people, but it plays important roles in landscape, and adds “character” to a garden. Different types of spaces offer different environments and create different psychological reactions. At the same time, people with different moods tend to stay in different spaces. For instance, an open space creates psychological reaction, which is active, outgoing, and sometimes being exposed (Figure 2.2.1), and people in an enclosed space may feel territorial, safe, and private (Figure 2.2.2). Different types of space also influence the arrangement of different functional areas in the landscape. For example, open space can be a lawn, a flower garden, and a patio, and enclosed space can be a meditative area, path with dense plants, and a small pavilion.

Figure 2.2.1: Psychological reaction of an open space (from left to right: active, outgoing, and exposed)

Figure 2.2.2: Psychological reaction of an enclosed space (from left to right: territorial, safe, and private)

Before arranging functional areas, each family needs to know what they want in their yard. Family can add function to their yard and also can reduce functions in their yard. For example, a family may not need a playground for kids after they grow up. There would be many thoughts of functions. To prevent missing and forgetting some ideas, it is recommended to do a checklist of everything you want and some specific thoughts (Table 2.2.1). When arranging functional areas, people should consult the site analysis, such as the places that need to dig soil deeply should keep away from underground utilities, there should be some screening between your site and your neighbor, and the area with tall trees should not block the good view from window (Figure 2.2.3).

Analysis of Needs and Desires

List Current Needs

Outdoor Sports

Badminton _____

Croquet _____

Football _____

Horseshoes _____

Shuffleboard _____

Softball _____

Tennis _____

Volleyball _____

Other _____

Required Features

Boat Parking _____

Camper Parking _____

Clothesline _____

Compost Heap _____

Decorative Plants _____

Dog Run _____

Firewood Storage _____

Outdoor Water Feature _____

Parking for__Cars _____

Permanent Walks _____

Pool _____

Screened Outdoor Space _____

Tool Storage Shed _____

Other _____

Children's Play Equipment

Jungle Gym _____

Play Cabin _____

Sand Box _____

Slide _____

Swings _____

Other _____

Patio Space Requirements

Average Number of People Entertained Ourdoors _____

Frequency of Ourdoor Cooking _____

Desired Size* _____

Garden Space

Fruit Trees _____

Kinds of Fruit Trees:_____, _____, _____, _____, _____.

Vegetable (Size:___sq.ft.) _____

Long-Range Objectives

Fountain or Pool _____

Greenhouse _____

Screened Patio _____

Screened Patio _____

Swimming Pool, Wading Pool _____

Other _____

*: Approx. 75-100 sq. ft./family member. Average patio size is 300 sq. ft.

Table 2.2.1: A checklist of ideas and thoughts

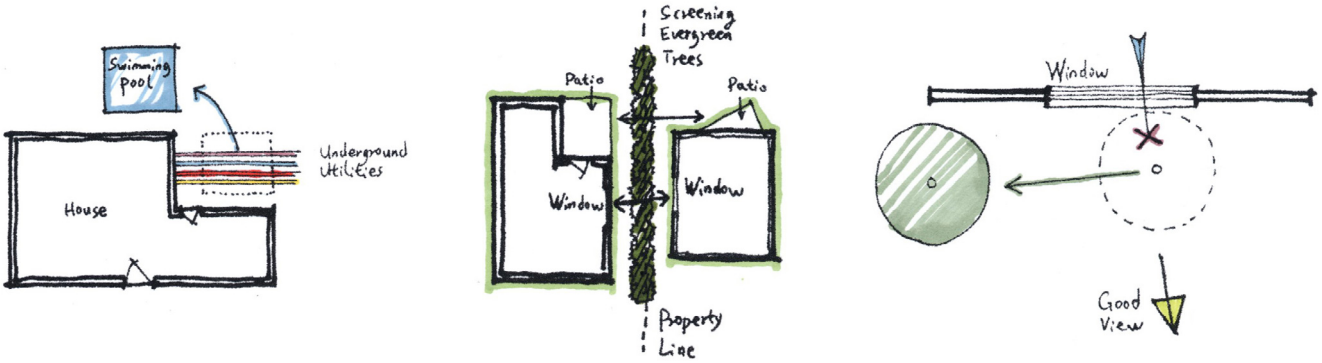


Figure 2.2.3: Landscape feature should be away from underground utilities. Screening between your site and your neighbor. Tall trees should not block the good view from window.

The spatial area map and functional area map can be drawn on the base map that used in site analysis. They will look like maps with bubbles because these maps are only rough ideas of how and where to locate different functional areas, and also the possible size of each area (Figure 2.2.4). According to different using areas, create different types of space (Figure 2.2.5).

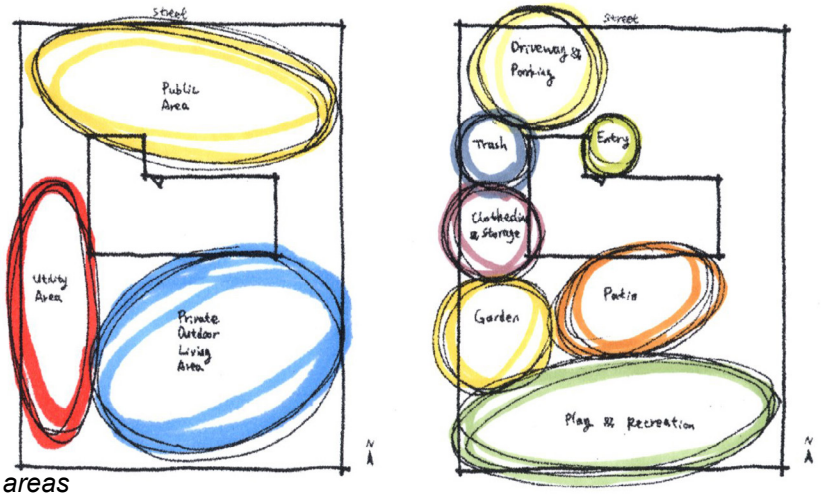


Figure 2.2.4: Functional areas

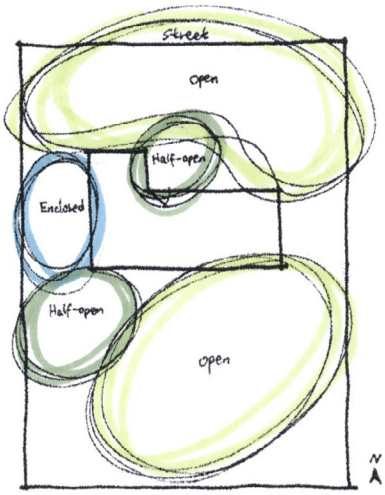


Figure 2.2.5: Different spaces

Step 3. Planting design

As the essential element, landscape plants provide interest, color, shading area, scent, and food, and decrease summer temperature. Plants also work with different types of spaces to create a variety of sights and feelings.

Bubble maps are good approach to arrange different types of plants based on the spatial map and functional area map (Figure 2.3.1). Here are some tips for proper types of plants in some certain spaces and functional areas (specific plant materials will be introduced in step 5):

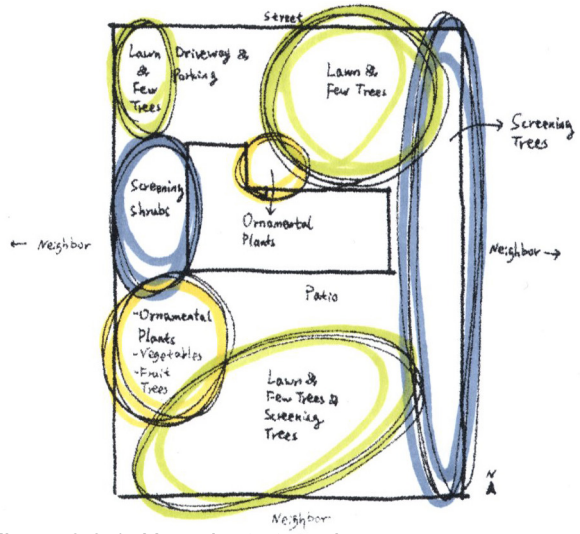


Figure 2.3.1: Use plants to enhance spaces

1. Plants can be classified in different ways. According to size: tall, medium, small, and groundcover (Figure 2.3.2). From their biological habits: evergreen, semi evergreen (in winter, leaves will stay on the plant in warm area, but will fall off in cold area), and deciduous (leaves will fall off in cold seasons). In the aspect of density of branches and leaves: loose, medium, and dense (Figure 2.3.3, 4, 5, 6). Plants have characters of color: spring leaf color, fall leaf color, flowering before growing leaves, flowering in spring, flowering in summer, and flowering in fall. Plants have different stem and shoot forms: herbaceous, woody, and vines (Figure 2.3.7). Plants also have texture presented by leaves, flowers, and barks: fine, medium and coarse (Figure 2.3.8).

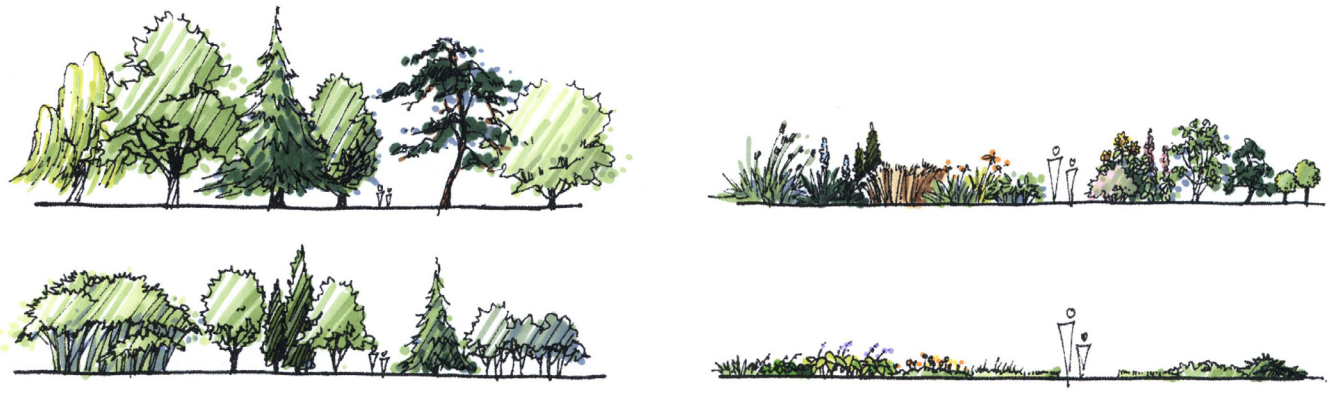


Figure 2.3.2: Different sizes of plants

Tall: white willow (*Salix alba*), Northern red oak (*Quercus rubra*), sugar maple (*Acer saccharum*), Austrian pine (*Pinus nigra*), etc. Medium: black bamboo (*Phyllostachys nigra*), Chinese juniper (*Juniperus chinensis*), winter honeysuckle (*Lonicera fragrantissima*), etc. Short: maiden (*Miscanthus sinensis*), yucca (*Yucca filamentosa*), rose of Sharon (*Hibiscus syriacus*), hollyhock (*Alcea rosea*), oakleaf hydrangea (*Hydrangea quercifolia*) etc. Groundcover: creeping juniper (*Juniperus horizontalis*), hosta (*Hosta* species), English ivy (*Hedera helix*), etc.

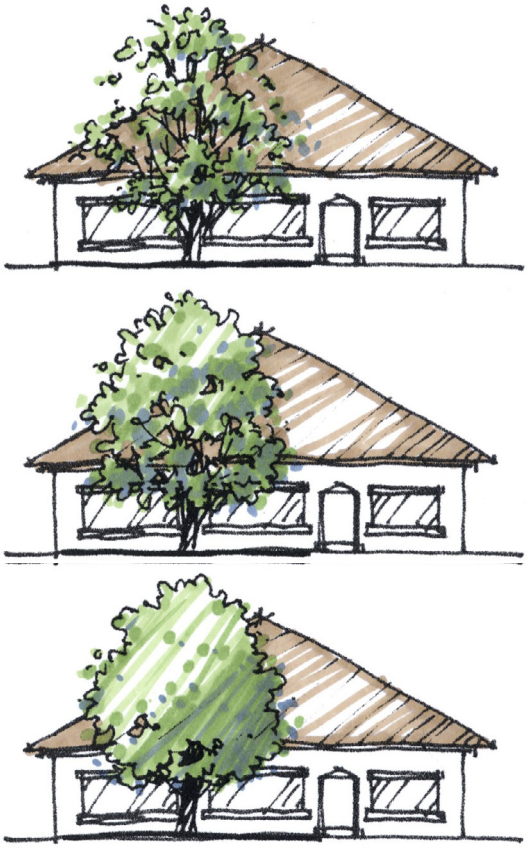


Figure 2.3.3: Different types of density of leaves and branches of a tree.

Figure 2.3.4: An example of leaves and branches with low density

Figure 2.3.5: An example of leaves and branches with middle density

Figure 2.3.6: An example of leaves and branches with high density

Figure 2.3.7: Herbaceous plants, woody plants, and vines (from left to right)

Figure 2.3.8: Different plant textures (from left to right: fine, medium and coarse)

2. Growing plants loosely creates open and half-open space, and growing plants densely creates enclosed and half-enclosed space (Figure 2.3.9).

3. Dark colored plants create quiet and private feelings, while light colored plants create active and outgoing feelings.

4. Use less problem producing plants, such as flowering quince (*Chaenomeles speciosa*), boxwood (*Buxus microphylla*), sugar maple (*Acer saccharum*), etc. near paths, patios, other activity areas, and people who have allergies.

5. Lawn is a good place that offers open space, activity areas, rainwater gathering, etc. (Figure 2.3.10)

6. Plants with different sizes have different functions. Taller trees are usually used for shade or background (Figure 2.3.11). Medium, small, and groundcover plants are used for foreground (Figure 2.3.12), providing fruits and pleasant view, and covering soil (Figure 2.3.13, 14). Some medium sized plants can also offer shaded areas but the height of lower branches should be higher than people.

Figure 2.3.9: A graduate change from open space to enclosed space created by plants

Figure 2.3.10: Functions of a lawn

Figure 2.3.11: Uses of taller trees

Figure 2.3.12: A scene of taller trees, shorter shrubs, and turf (groundcover)

Figure 2.3.13: Uses of medium and small plants

Figure 2.3.14: Groundcover plants can hold the surface soil

7. Shrubs are counted into medium and small sized plants. They are used for increasing the density of plants (Figure 2.3.15), softening hardscapes (Figure 2.3.16), softening the relation between the land and house (Figure 2.3.17), decorating the house (Figure 2.3.18, 19), fence, and plant background, separating different areas and spaces (Figure 2.3.20), screening, and being trimmed to form borders.

8. If people want complete privacy, evergreen plants with dense foliage is a good option.

9. Except for tall and medium trees, shading area can also be a pergola or winding corridor with vines. Vines growing on a fence can also be a beautiful border (Figure 2.3.21).

10. Each type of plant can be planted without other types of plants, but the combination of different types of plants adds interest in your yard, increases the density of planting group, and enhances the feeling of enclosure.

Figure 2.3.15: Shrubs and small plants increase the density of planting design

Figure 2.3.16: Plants soften pavement and rocks

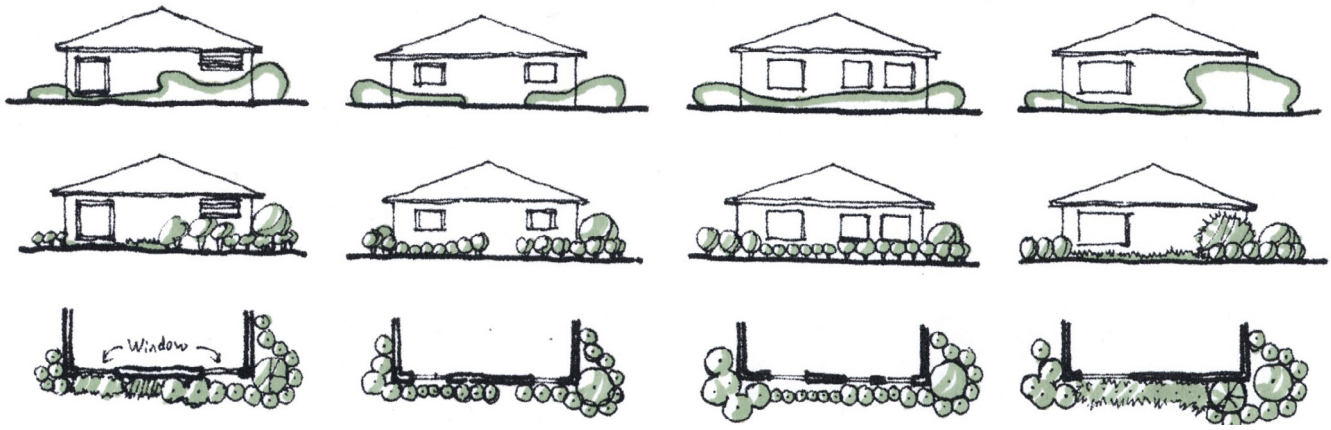


Figure 2.3.17: Four examples of planting design around the house

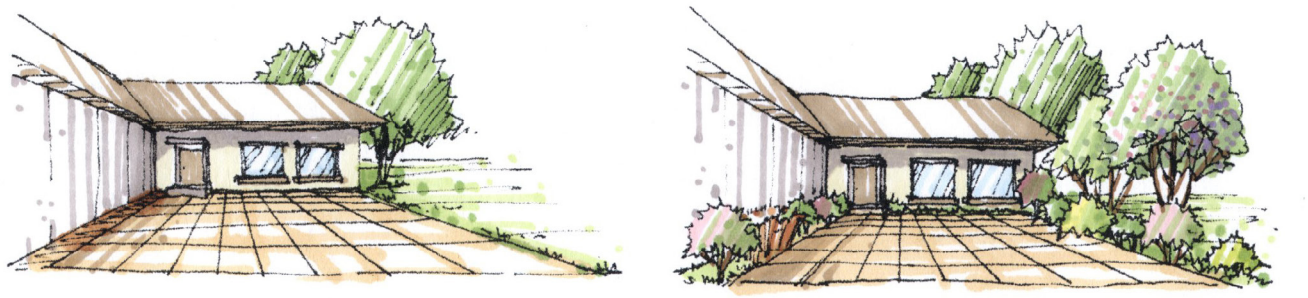


Figure 2.3.18: Plants decorate the house

Figure 2.3.19: Plants decorate a building in reality

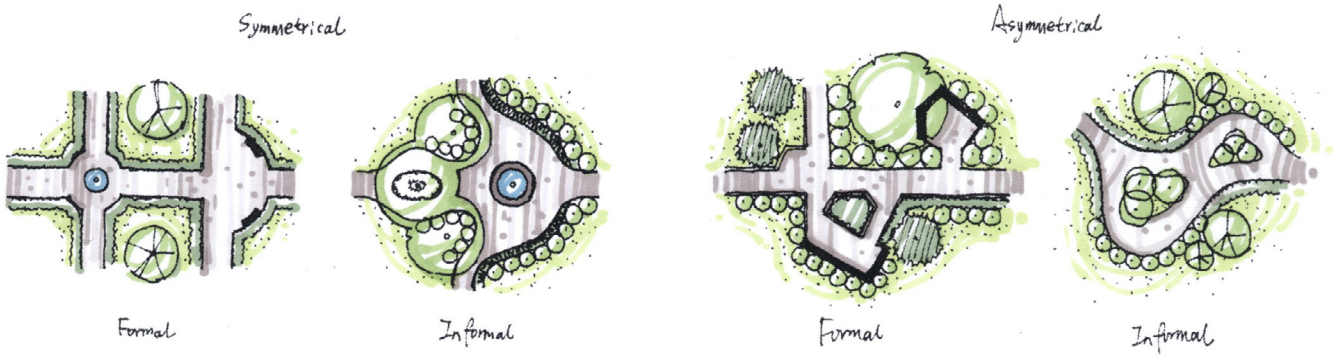


Figure 2.3.20: Plants separate areas and spaces

Figure 2.3.21: A rose fence

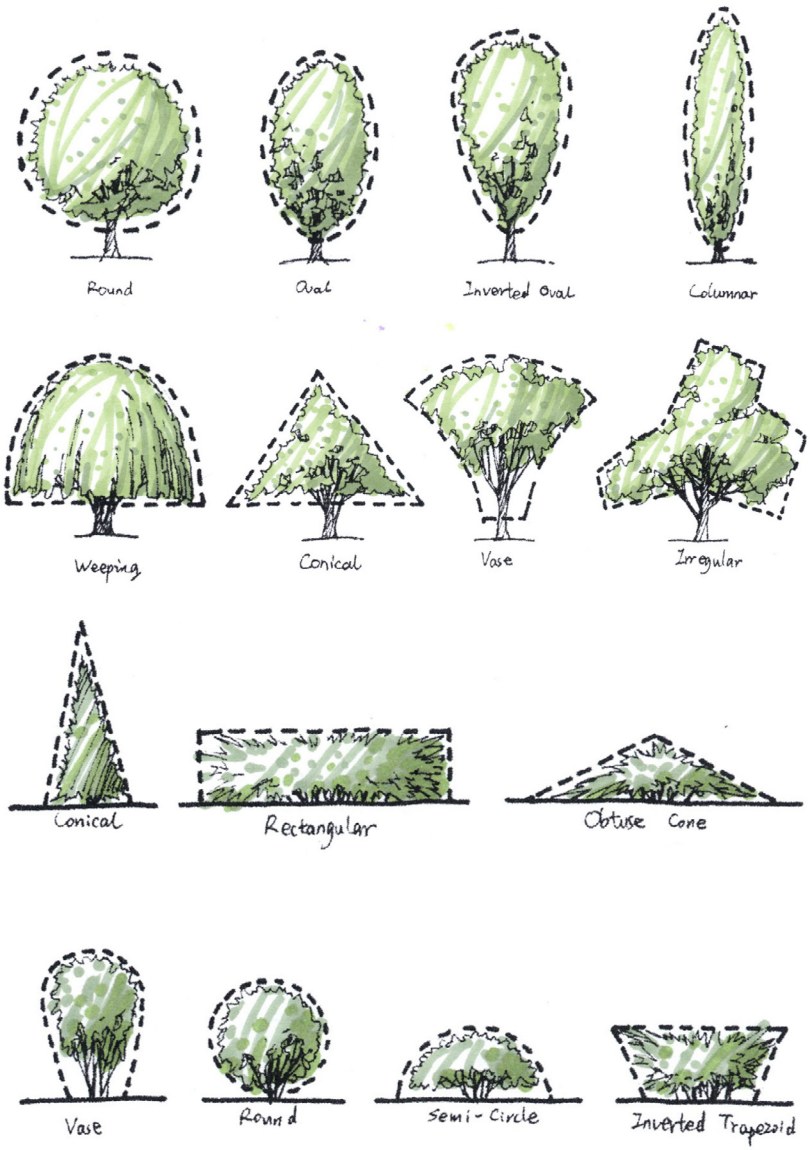


Figure 2.3.22: Different shapes and figures of trees and shrubs

Plants present different colors and shapes. This characteristic will help us to select specific plant materials and create a more interesting garden. Plants show color with their flowers, leaves, fruits, and sometimes bark. Plant color has a wide range, and some species, and cultivars of plants have more than one color on leaves and flowers. Trees and shrubs present their natural beauty with their shapes. There are a great variety of shapes that people can use (Figure 2.3.22). People can also trim the plants into shapes, but thees plants should have small and dense leaves and dense branches, such as boxwood (*Buxus*).

Step 4. Combine functional areas with planting design

Combining functional areas with planting design should work harmoniously to create space, and realize and improve functions. During the process of landscape design, plants should enframe and assist the hardscaping, unless there are unmovable existing plants.

To make plants work well within a functional area, knowing how plants grow is helpful. A naturalistic pattern creates wild and natural view, and buffers the nature and the residential site. Planting in order creates regularization and formalization. There are several patterns of planting: accent planting, grouped or clustered planting, row planting, forest-like planting, scattered planting (if the lawn is big enough), “face-to-face” planting, etc. (Figure 2.4.1). As one element of focal point, accent plant plays important roles. An accent plant means a plant, usually a tall tree or a shrub, that make people look at it. To be an accent plant, it must have unique characters (color, shape, form) or it takes a dominant visual weight (larger size) (Figure 2.4.2, 3, 4). Good use of accent plant will add much more seasonal interest in outdoor spaces.

Figure 2.4.1.1: Accent planting

Figure 2.4.1.2: Grouped or clustered planting

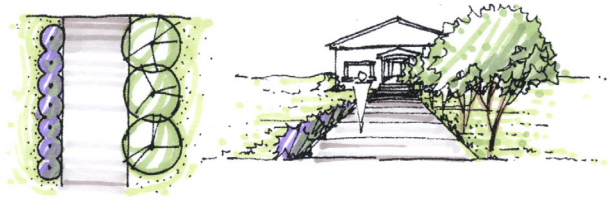


Figure 2.4.1.3: Row planting

Figure 2.4.1.4: Forest-like planting

Figure 2.4.1.5: Scattered planting

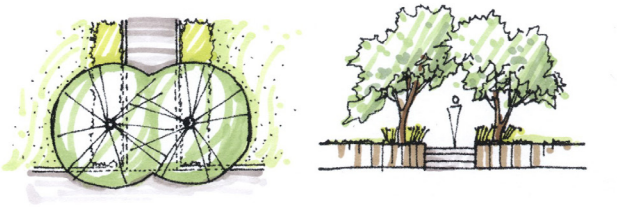


Figure 2.4.1.6: "Face to face" planting

Figure 2.4.2: Accent plant of a unique form: Juniper (*Juniperus* species).

Figure 2-4-3: Accent plant of an outstanding size: pin oak (*Quercus palustris*).

Figure 2.4.4: Accent plant of a unique form and outstanding size: weeping cherry tree (*Prunus subhirtella*)

Here are some tips for creating good relationships between plants and hardscaping:

1. Plants should be a certain distance away from the edge of house, patio, path, etc. to guarantee people's activity;

2. Avoid growing tall and over sized plants, which could possibly block the window, door, and path;

3. Use groundcover plants (or other materials, like bark chips, pebbles, and gravels) in areas that are difficult to mow;

4. Use mulch in borders and edging materials between lawn and borders, such as wood, brick, and materials that prevent lawn grass from invading the border area;

5. Select fruitless trees outside of fruit tree garden.

The planted area is a good place for rainwater drainage. Plants cover the soil, and their roots hold soil to stop soil erosion. Dense plants can also hide the facilities of drainage to offer a more beautiful view. An area with function of aesthetic and rainwater drainage, collection, and conservation is called a rain garden (Figure 2.4.5). Rain gardens capture and filter rainwater to recharge the water table. Plants in a rain garden should be able to tolerate a high level of moisture for a relatively long time. Rain garden can also have hardscaping features, such as path, rocks, and small bridges for walking and recreation. The rain garden not only can be a complete garden, but also can be a part of a big garden. A rain garden is shallow but with slope (1-10%) for rainwater flow.

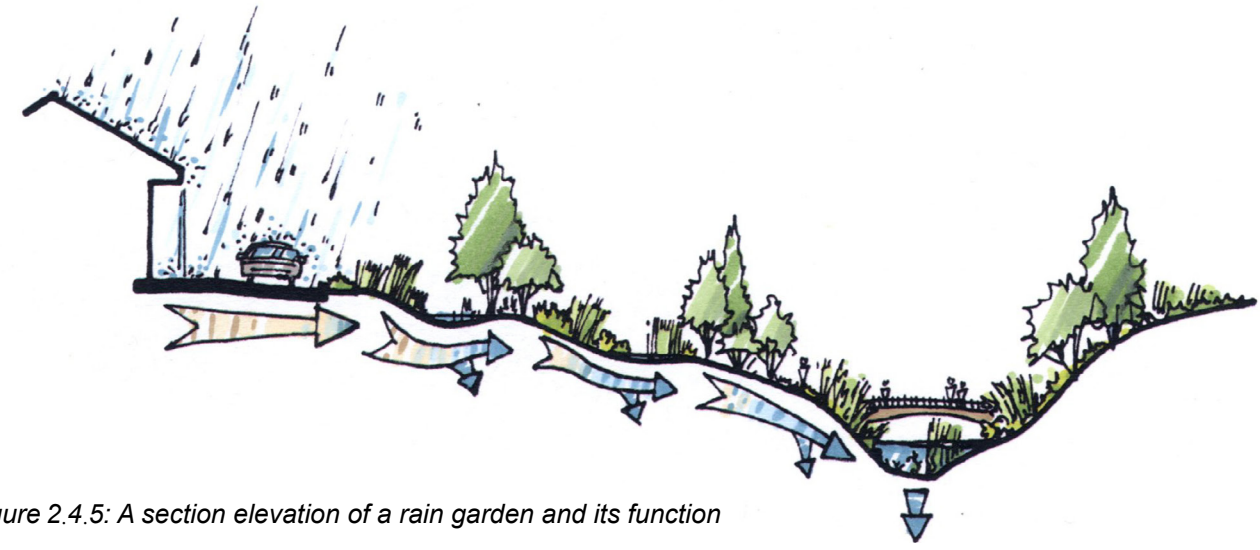


Figure 2.4.5: A section elevation of a rain garden and its function

On farmsteads, a single drive is usually desirable for traffic control so that vehicles can be readily observed from the house. Exceptions include a second drive to a major remote unit such as a large livestock center. When selecting the location for entryway, make sure that there is ample visibility. Maintain the drive about 16 feet wide with at least 7 feet wide additional clearance on each side. The additional width allows for large overhanging equipment and provides for snow storage and drainage for drive way. Use only gentle curves. The house is usually the first building approached along the drive. It is necessary to provide an attractive parking lot for at least 3 cars with a direct and pleasant way to the main entrance. Using signs and plant screens are good approaches to lead circulation well (Figure 2.4.6).

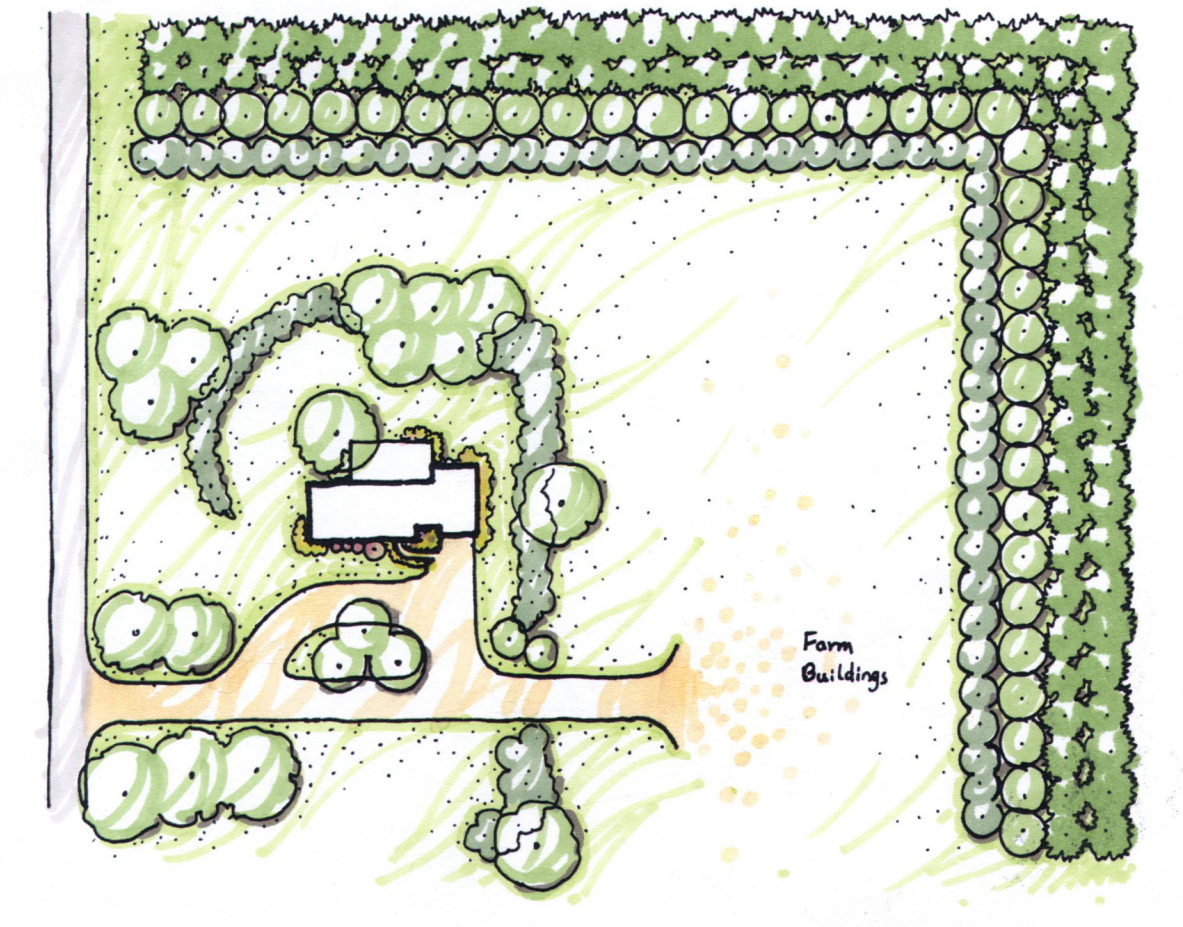


Figure 2.4.6: Farmstead

The hammerhead (Figure 2.4.7) is a convenient for a regular car backing out of a garage. Designing the driveway with an 18-foot radius allows adequate space for turning.

The farmstead court is usually an extension of the main drive. Plan for ample parking and maneuvering machines and trucks. Extra space allows for temporary storage of machines and vehicles.

A loop is common approach to connect functional areas. Leave an open space in the center for over flow parking. A long truck needs 55-foot radius for turning. A parking space for trucks, no matter big or small, is important.

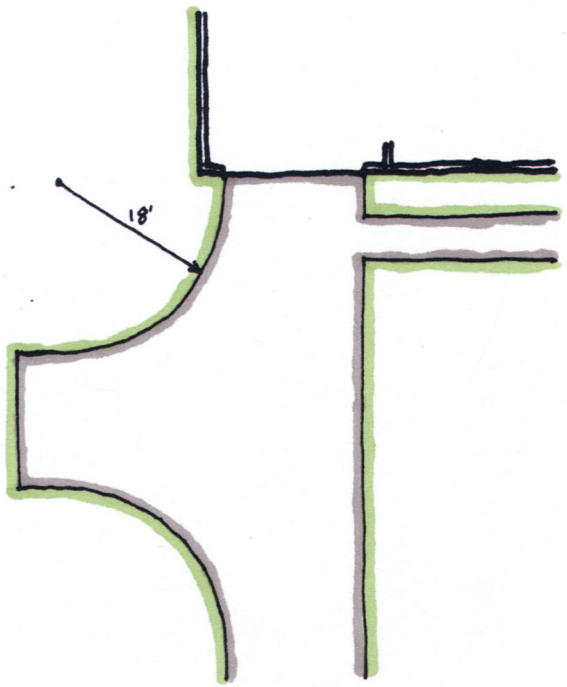


Figure 2.4.7: Hammerhead

Step 5. Plant and paving materials selection

This step introduces specific plants and paving materials.

People may feel confused, that is why we do not suggest selecting plant and paving materials during the process of planting design and functional area arrangement (especially circulation design). Let us see landscape design as a drawing. The reason is that arranging different areas is like a draft, while material selecting is rendering. Only after draft has made sense, the rendering has potential to be harmonious and reasonable.

Here are some tips for plant selection. For more information about landscape plants, see other publications and resources listed in Part Four.

1. Use local plants and plants that are recommended for your local area;

2. Grow plants according to their biological habit. Do not grow plants that love sunlight in shaded area, do not expose plants that prefer more shade to direct sunlight, do not grow plants that cannot tolerate too much water in a rain garden, and so on;

3. Fruits are good but sometimes they pollute your garden and cause allergy. For example, female mulberry trees (*Morus nigra*) produce large amounts of fruits in early June, and berries can make the pavement very dirty and sticky. Ginkgo trees (*Ginkgo biloba*) are an excellent fall color tree, but if the fruits from female trees are broken, you landscape will have an unplesant odor. Dry fruits of plane tree (*Platanus x acerifolia*) have fibers that may cause allergy. Hard fruits such as oak nuts can be a safety issue during fall and winter;

4. If a homeowner wants color in the yard, plant selection and color periods should be scheduled to emphasize one season and also decorate during the other three seasons. For example, a family wants most plants in a flower garden to bloom in summer, however, there have to be flowers and colored leaves in spring and fall as well, and we can use evergreen plants and natural bark colors to decorate winter (Figure 2.5.1);

5. Dark colored plants should not exceed 10% of total number of plants. The entire garden should not be planted over densely because dense plants will hide harmful animals and criminals;

6.A lawn area provides “empty” space and water-loving plants increase the moisture to protect your house from wildfire (Figure 2.5.2);

7.To reduce maintenance, use more resistant plants.

Figure 2.5.1: An example of the color arrangement of a flower garden

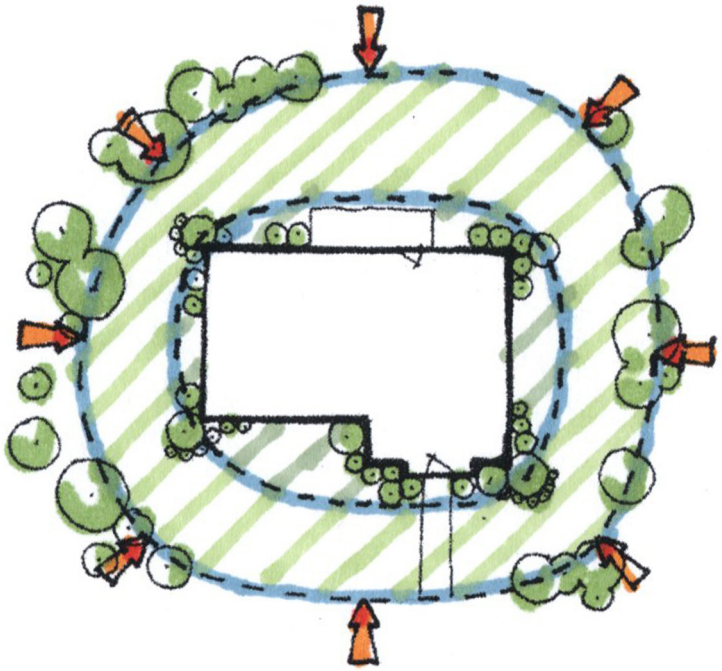


Figure 2.5.2: An "empty" space prevents your house from wildfire risk

Planting design and plant selection is not easy for people with less experience. Some common mistakes are:

1. Overplanting: young and small plants grow up and design size is smaller than real size. Solution: Plan and plant for mature plant size;

2. Too many different types of plants;

3. Scattered shrubs and trees in a small garden;

4. Trees, shrubs, flowering plant, or ornamental grass in the middle of lawn;

5. Plants grow too big and block the window, entrance, path, etc.;

6. People will be distracted by special and light-color plants placed in wrong places (the corner of house, and places other than focal point and activity area), and the focal point lack interest (Figure 2.5.3);

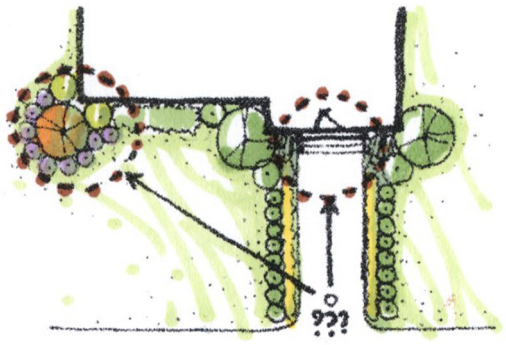


Figure 2.5.3: An over colorful group of plants distracts the interest of main entrance

7. Plants are too close to the house and the edges of paved area: roots are possible to break the construction, and branches and leaves effect people's walking and block view.

Some functional areas need to be paved, such as patio, paths, and trash area. Pavement is important in the landscape. Pavement organizes circulation (Figure 2.5.4), and adds interest and variety. Paving materials also keep the ground easier to be cleaned and managed. Common landscape paving materials include concrete, bricks, pebble, sand, etc. Concrete is relatively less expensive, easier to use, and can be colored and patterned. Bricks and pebbles need time and patience to pave. Small pebbles or large grains of sand paved on a path can be moved away by wind and water. Interest of paving materials come from their texture, pattern (Figure 2.5.5), and color. Inflammable paving materials also keep wildfire away.

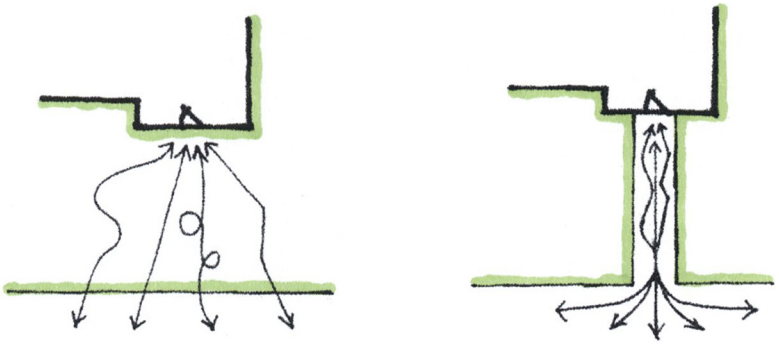


Figure 2.5.4: A path organizes the circulation

Figure 2.5.5: Several patterns and colors of paving

Plants and paving materials offer color in the landscape. A color arrangement will beautify your yard, but a landscape with a bad color arrangement is tiring and unattractive. A color wheel (Figure 2.5.6) helps people to select harmony color combination. Usually there are 4 types of combinations:

1. Monochromatic: Only a single pure color with its tints and shades. Strong but can be boring. (Figure 2.5.7)

2. Analogous: Colors that sit side by side on the color wheel. (Figure 2.5.8)

3. Complementary: Two colors that opposite on the color wheel. Very contrasting and grab attention. (Figure 2.5.9)

4. Color Triads: Three colors spaced equally apart on the color wheel. (Figure 2.5.10)

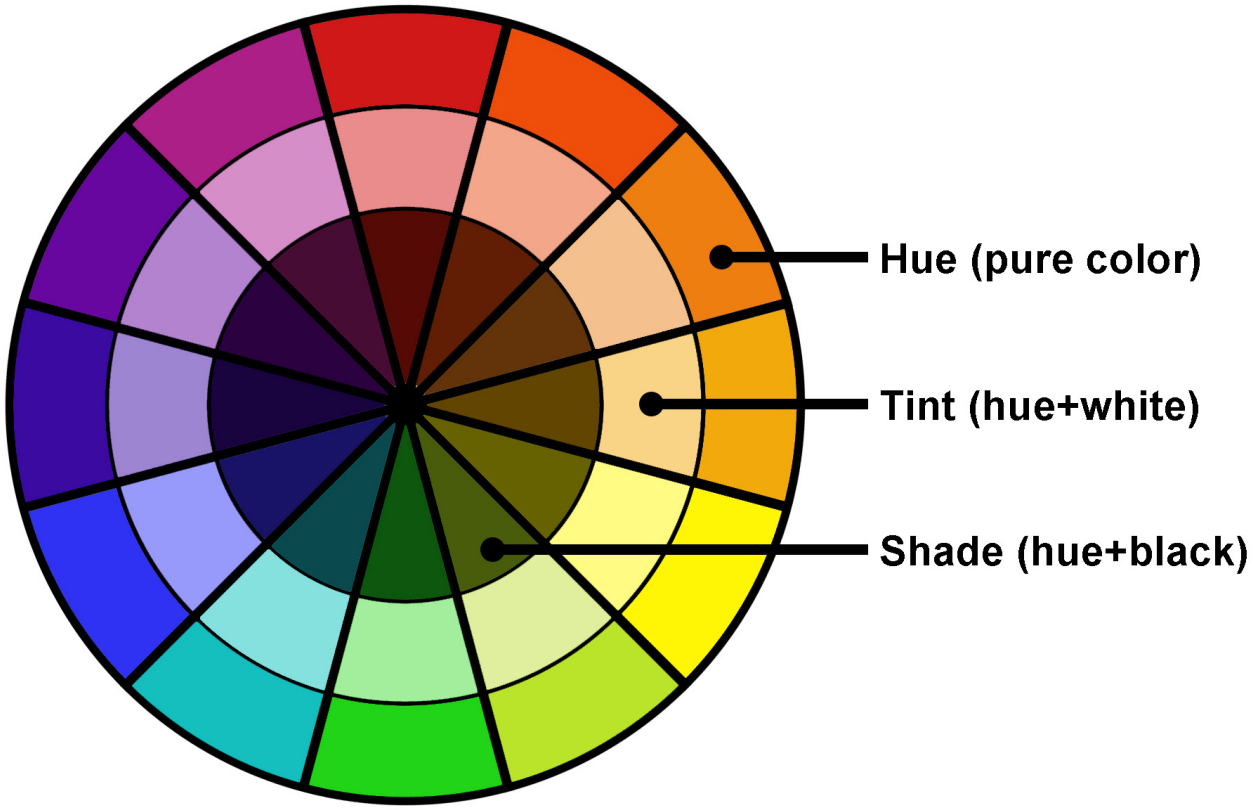


Figure 2.5.6: A color wheel

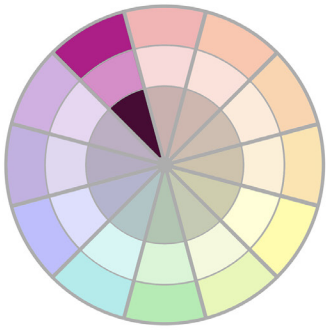


Figure 2.5.7: Monochromatic (purple)

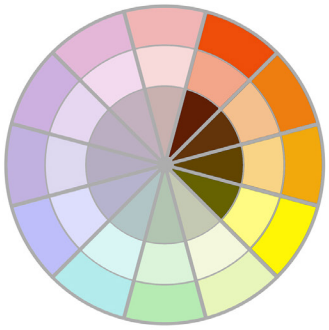


Figure 2.5.8: Analogous (yellow to red)

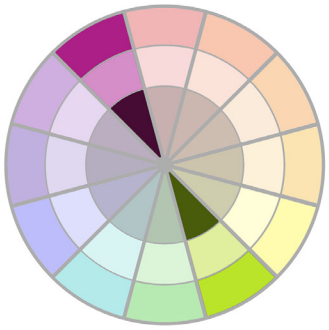


Figure 2.5.9: Complementary (purple and green)

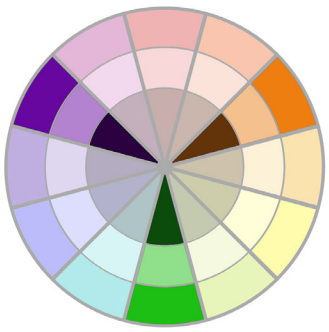


Figure 2.5.10: Color triads (purple, green and orange)

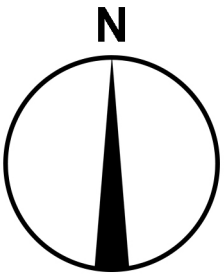
Step 6. Draw a master plan

The master plan for a landscape is a map, showing the future landscape from a top-down view. It is indispensable because it illustrates the overall picture of the landscape design and contains important information such as function, circulation, aesthetic, etc. As a result, how to draw the master plan influences the efficiency of information transmission.

A map should include dimension (north arrow), scale, legend (graphic symbol), and additional illustrative text, table and figures.

The north arrow (Figure 2.6.1) shows where north is, so that people can identify the other three directions, the direction of sunlight, and so on. Scale is determined by the real size of the site and the size of the paper. For example, a 60x60 feet site can be drawn on an 8.5x11 inches paper in 1:10 scale (1inch=10 feet), and in a scale of 1:8 on an 11x17 inches paper. If the site is huge, such as 3000x3000 feet site, an 11x17 inches is far too small to show enough information. Usually, more information (Figure 2.6.2) is presented in a bigger scale (1:10 is a bigger scale than 1:40) or a narrower vision. Different people draw in different ways. To prevent confusion and misunderstanding, it is a good way to offer a legend to explain the graphic symbols (Figure 2.6.3). Additional texts, tables and figures explain the design and map more comprehensively.

To draw a more beautiful plan, start with a draft. Use pencils and eraser to adjust and improve your design. When you think the pencil draft is good enough, use ink pens to trace everything and wipe off the pencil draft with eraser. Vellum paper (a type of translucent paper) is also good to trace the design with ink pens (Figure 2.6.4).



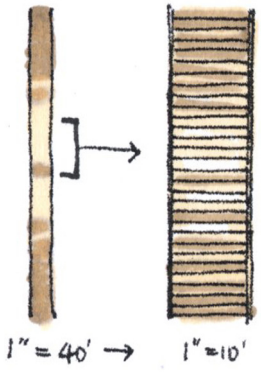


Figure 2.6.1: A North arrow

Figure 2.6.2: More information is presented in a bigger scale

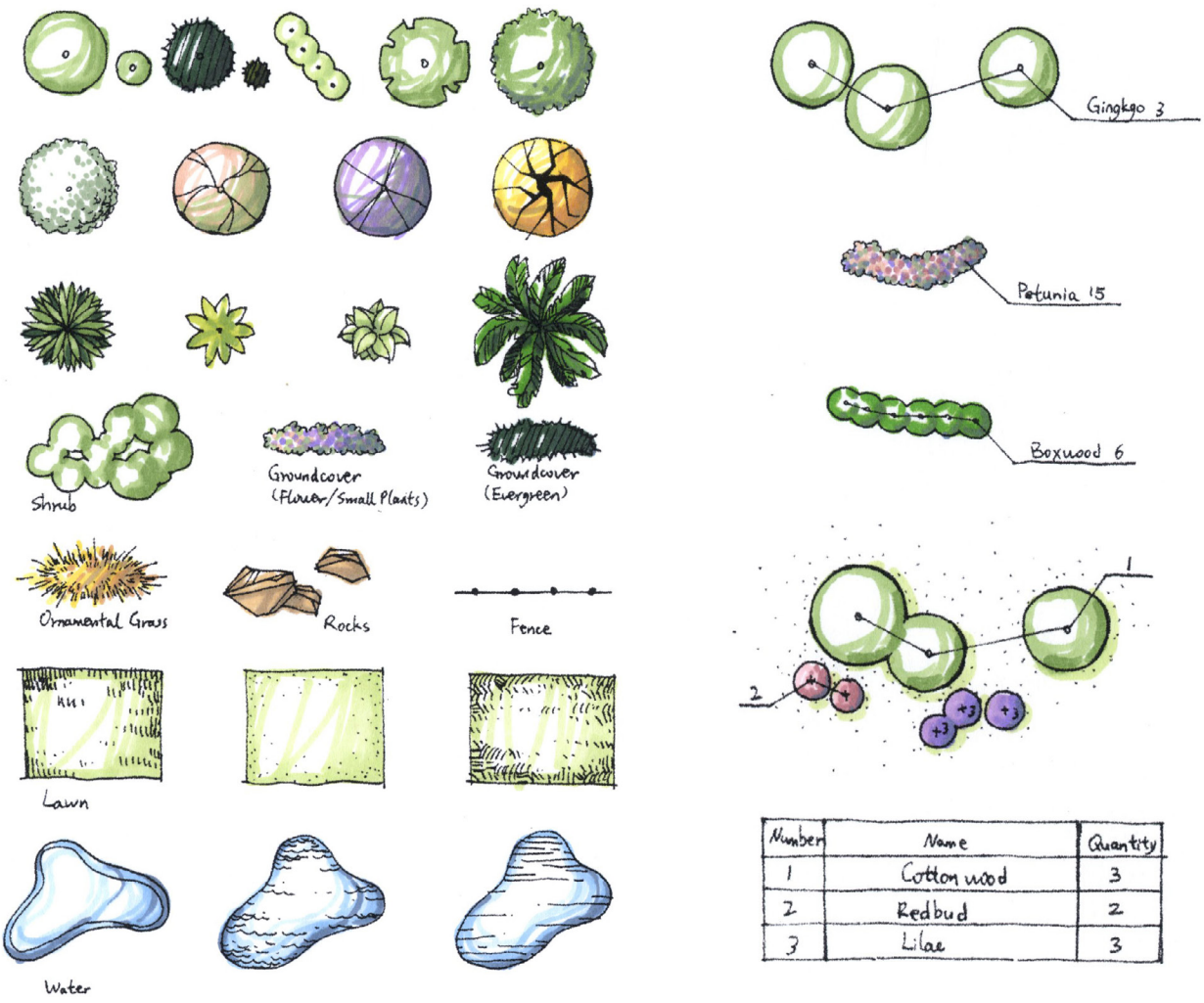


Figure 2.6.3: Graphic symbols of landscape features

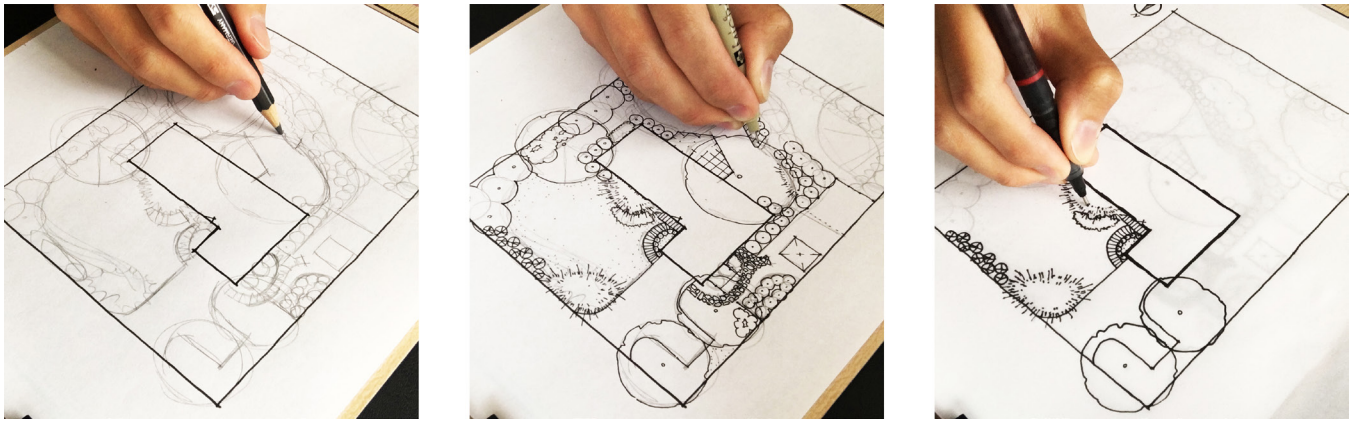


Figure 2.6.4: Designing and drawing process

Hierarchy means different levels of grades showing primary and secondary. A design map (especially in gray scale) without hierarchy looks dull, and confuses people because lines are all in a same size and style. Professional ink pens have different thickness in millimeter (mm): 0.05, 0.1, 0.2, 0.3, … 0.8 or 1.0. The walls of the house and other buildings are illustrated with thicker single or double lines (0.5-0.8) but windows are shown with single thinner lines (0.1-0.3) (Figure 2.6.5). Thick ink pens are also used in section figures and section elevation figures to show walls and ground. Other design elements are all shown with thinner lines. Generally, thick lines show the subjects close to you, while thin lines show subjects far from you (Figure 2.6.6).

Figure 2.6.5: How to draw and wall and window

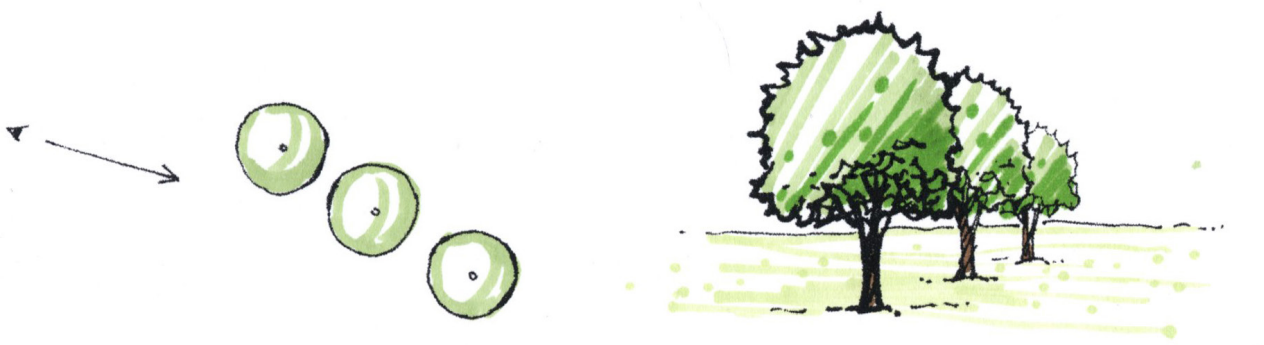


Figure 2.6.6: How to use thick and thin lines

Additional graphics include diagrams, elevation, section elevation, perspectives, table, etc. Diagrams are often used for site analysis. Elevation is the vertical view of the site, and section elevation is also a vertical view but it cuts the site (Figure 2.6.7). Perspective drawings show how the site looks in real vision (Figure 2.6.8). When drawing a perspective, all parallel lines in the plan end up to one point on the horizon line (Figure 2.6.9). Parallel lines in one direction only have one ending point (Figure 2.6.10). See examples: figure 2.6.11, and 2.6.12. All of these drawings and figures help people to visualize the design. A table can be used for listing information about plants, utilities, paving materials, etc.

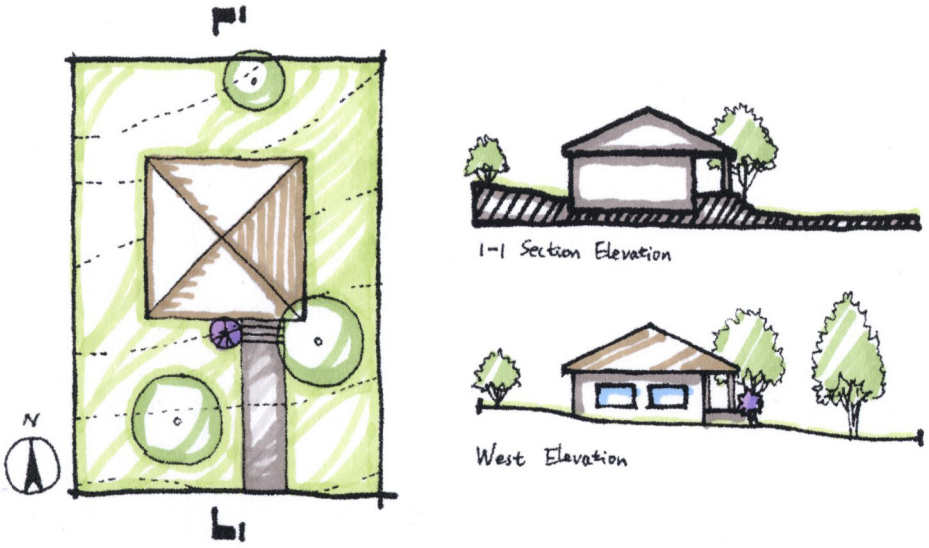


Figure 2.6.7: Section elevation and elevation

Figure 2.6.8: A perspective of a residential landscape

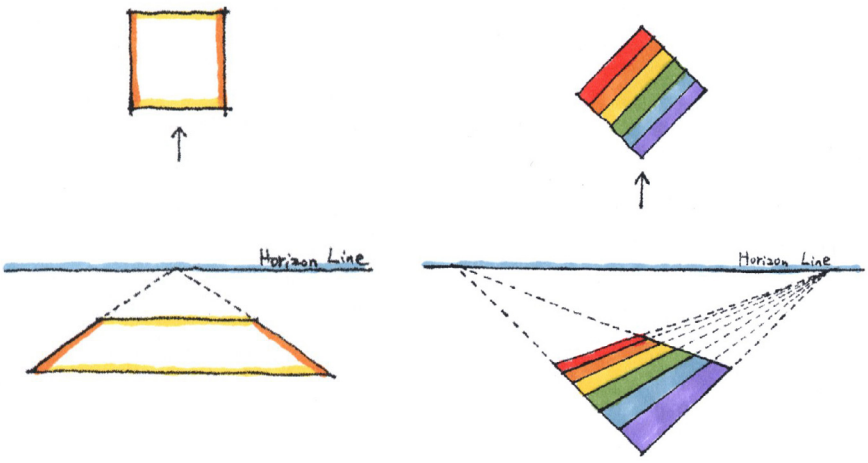


Figure 2.6.9: A square in perspective

Figure 2.6.10: Parallel lines of one direction have only one ending point

Figure 2.6.11: See parallel lines when facing the building

Figure 2.6.12: All parallel lines end up in one point on eye level when seeing them in an angle

Rendering is using multiple colors or single color to illustrate and beautify the drawing, but multiple colors are more expressive to present more information. During rendering, use different green colors to render plants, but we can also use other colors to show the special character of plants, such as flowers, spring leaf colors, fall leaf colors, and so on (Figure 2.6.13). Drawing pavement usually uses a lot of gray, brown, and brick color, unless there is special coloration of your paving materials. The house area can be no colored when the plan view is cutting through the house. However, people can draw and color furniture in the house to provide more information. If the plan shows the roof, which means the view is above the house, it is better to color the roof.

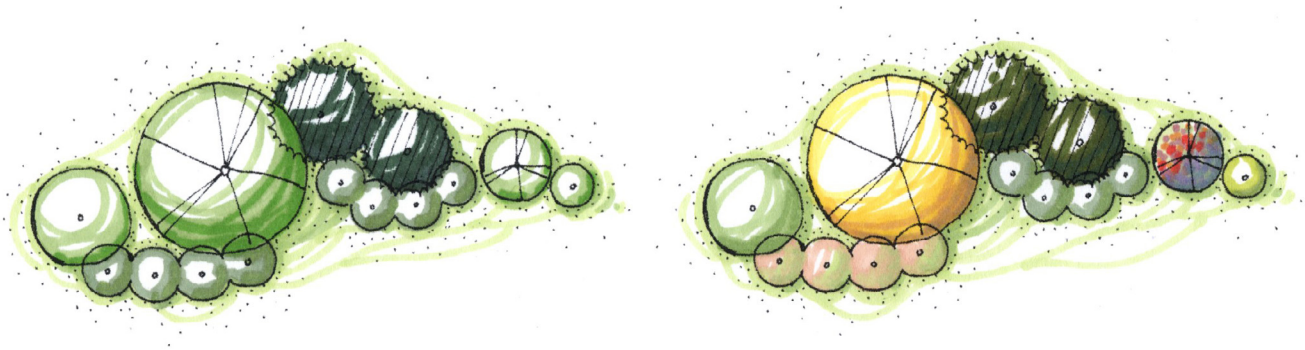


Figure 2.6.13: We can render trees in green, and also in other colors to show their special characters

People can render a blank drawing with:

1. Color pencils: relatively cheaper and can be used on a wide range of paper, but they are slow if we expect a good rendering. Some brands are water soluble, which can be used as watercolor (Figure 2.6.14).

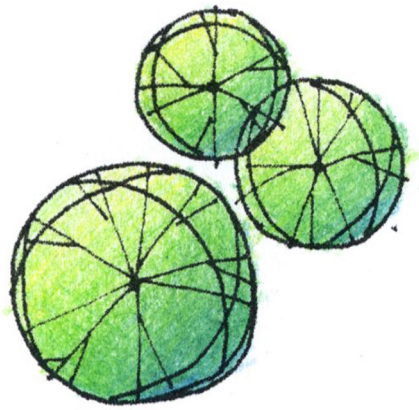


Figure 2.6.14: Color pencils rendering (3 minutes)

2. Mark pens: oil or water based. Some brands are expensive (a single pen costs 5 dollars), but they are faster than color pencils and can be used on a wide range of paper (Figure 2.6.15).

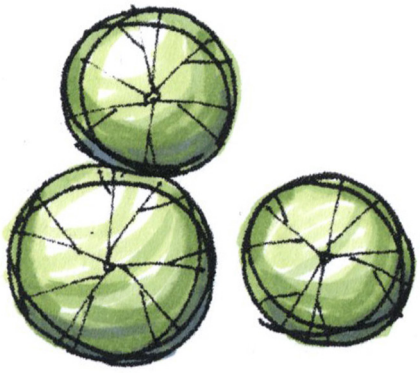


Figure 2.6.15: Mark pens rendering (2 minutes)

3. Watercolor: also can be expensive, but it is a fast rendering material. Only render on watercolor paper because other paper will be wet and out of shape (Figure 2.6.16).

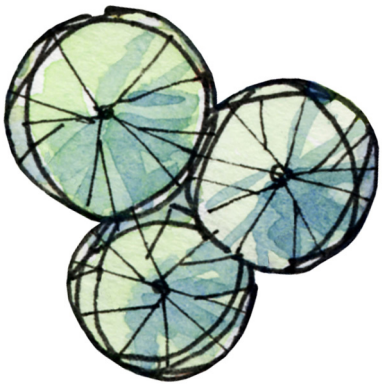


Figure 2.6.16: Watercolor rendering (2 minutes)

4. Acrylic: Fast but only used on acrylic paper.

5. Computer software: the drawing and rendering can be fast and more realistic than hand drawing, but it is challenging to learn and some computer programs are expensive (Figure 2.6.17).

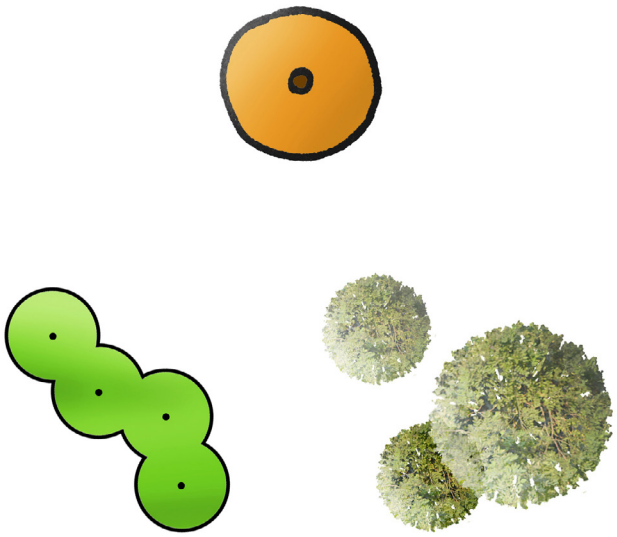


Figure 2.6.17: Computer rendering

Computer software is more and more commonly used in landscape design companies and studios. Homeowners can also use computer technology to design. Some computer programs are very expensive and difficult to learn, but some of them are relatively cheap and even free and simpler. University of Florida IFAS Extension recommends some computer programs to homeowners. Website: http://edis.ifas.ufl.edu/pdffiles/EP/EP52600.pdf.

Part Three: Examples Of Residential Landscape Design

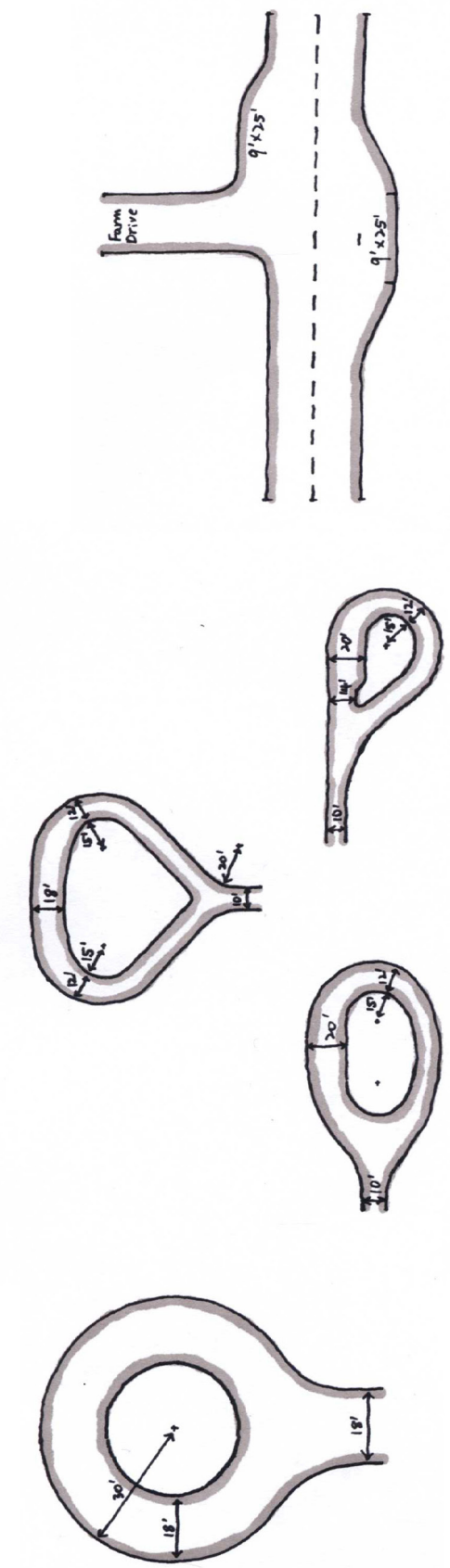


Figure 3.1: Suggested driveway arrangement and dimensions

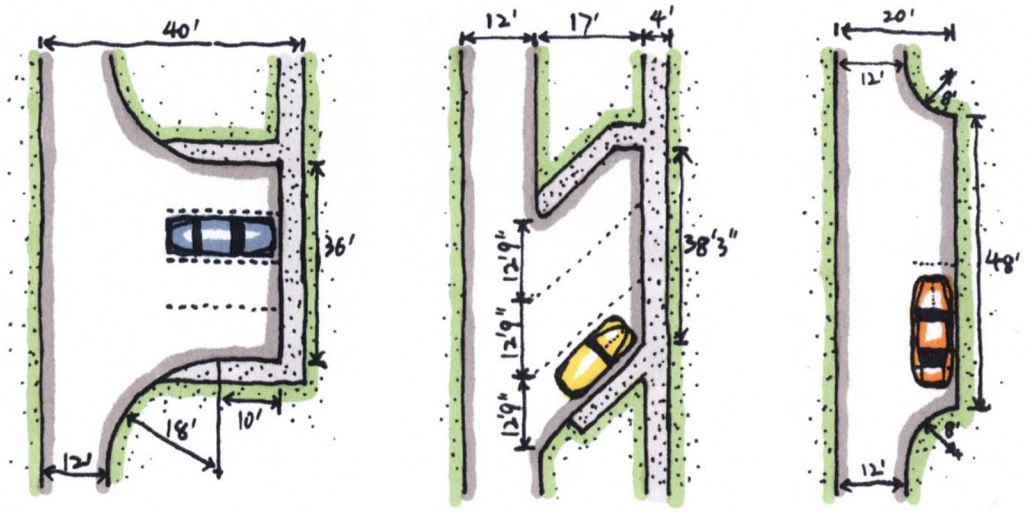


Figure 3.2: Suggested parking area arrangement and dimensions

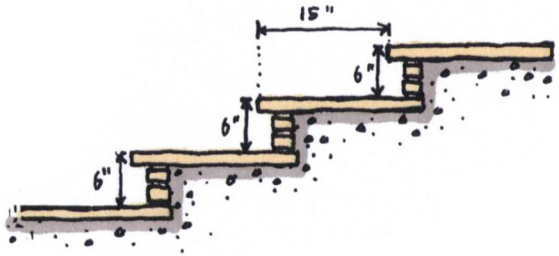


Figure 3.3: Functional steps – An incline of 18" calls for three steps of 6" each.

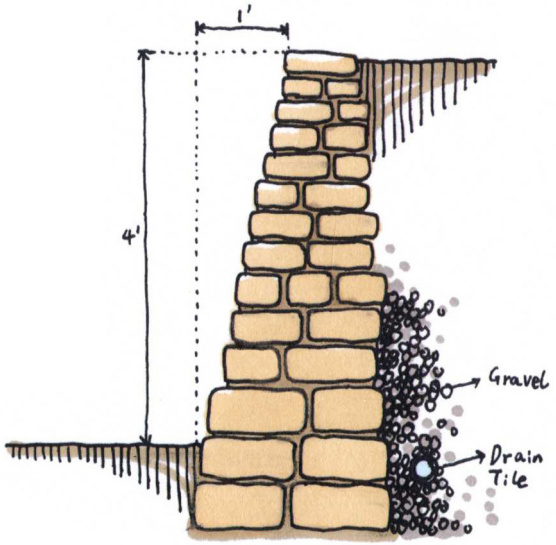


Figure 3.4: A well-constructed rockwall – heavy stones near base below frost line with good drainage. Build with a set back of 3" per foot and use of anchor rocks. Rocks could be slanted back slightly.

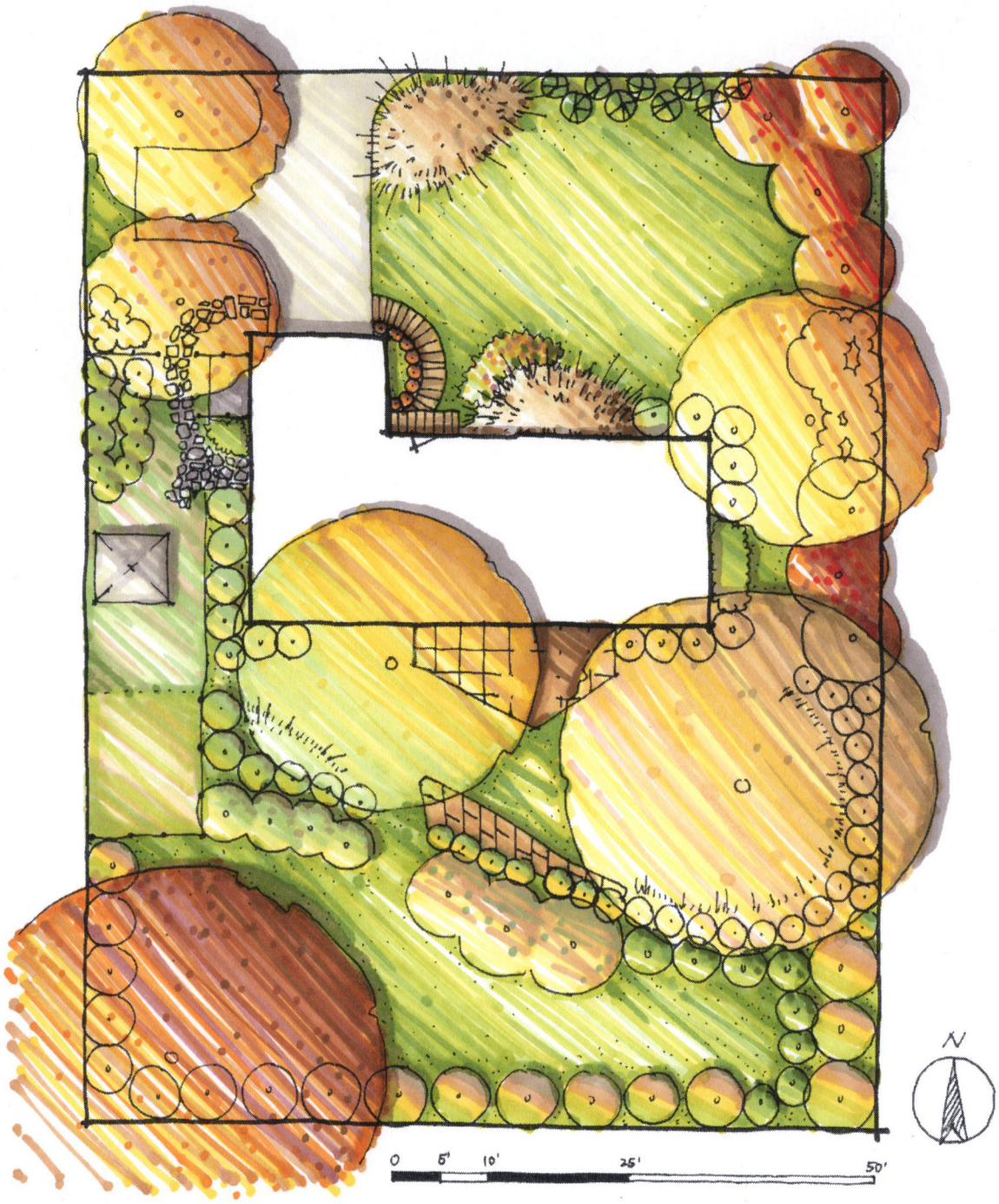


Figure 3.5: Residential landscape design 1 (fall colors)

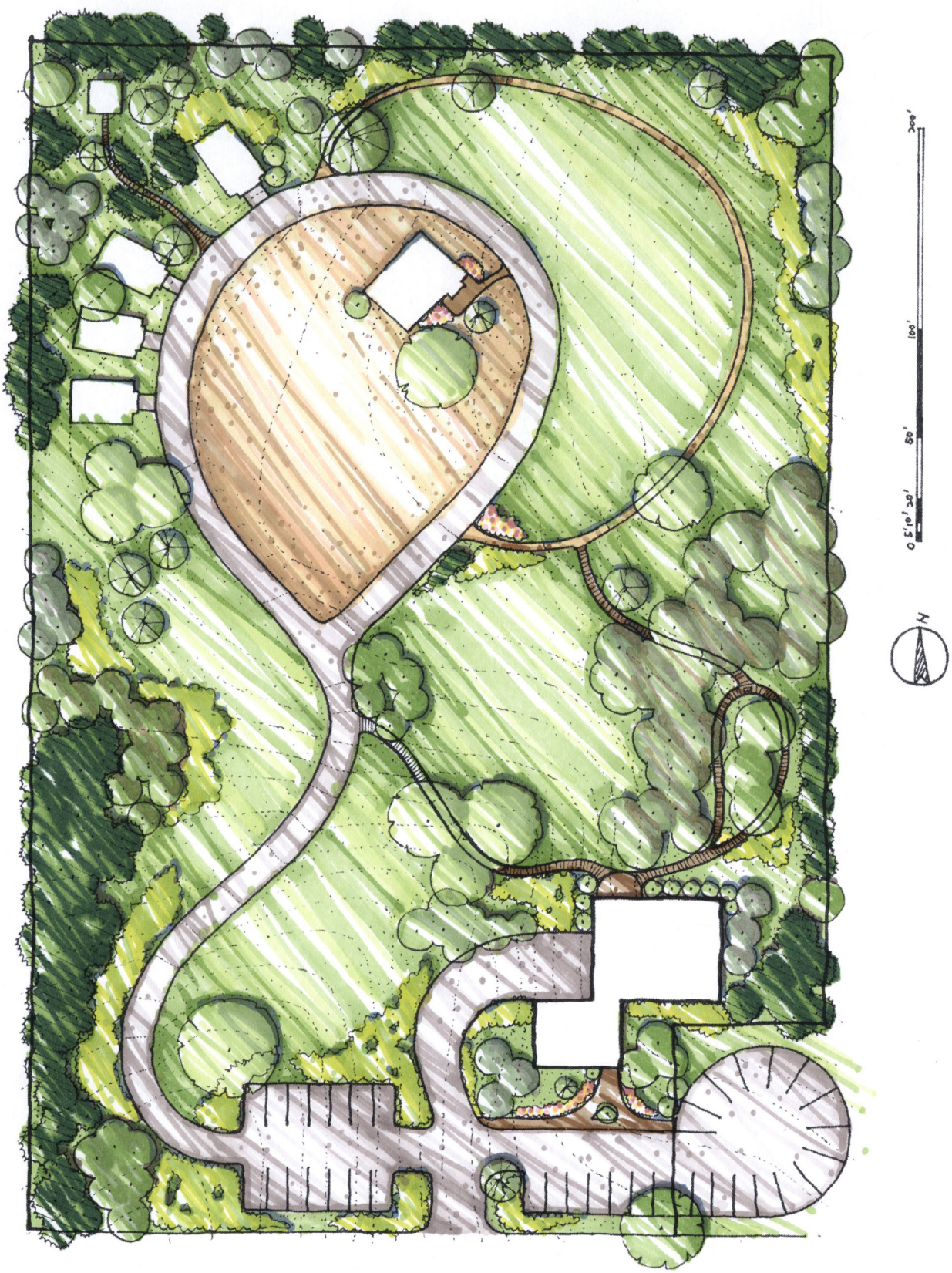


Figure 3.6: Residential landscape design 2 (summer colors)

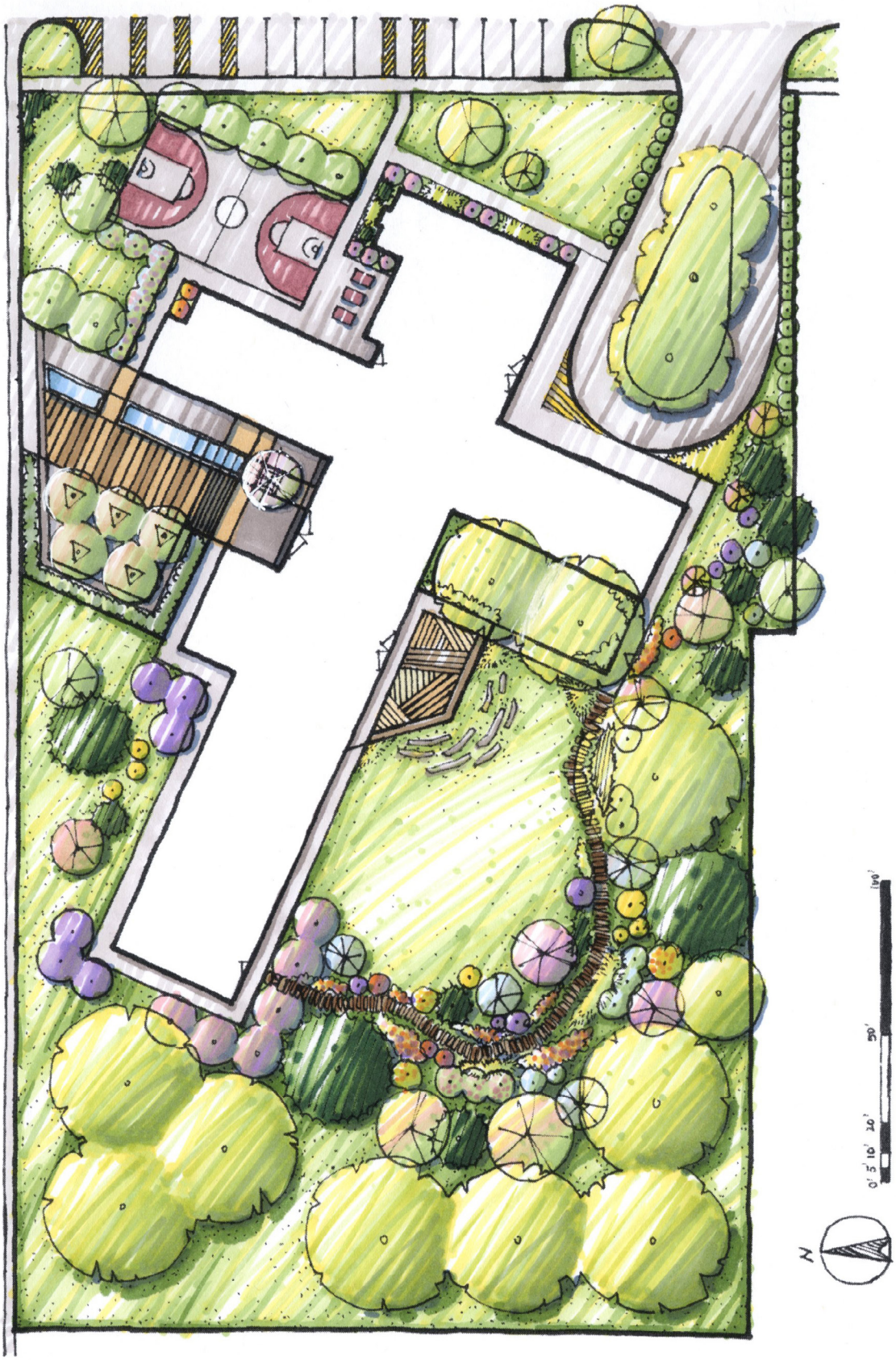


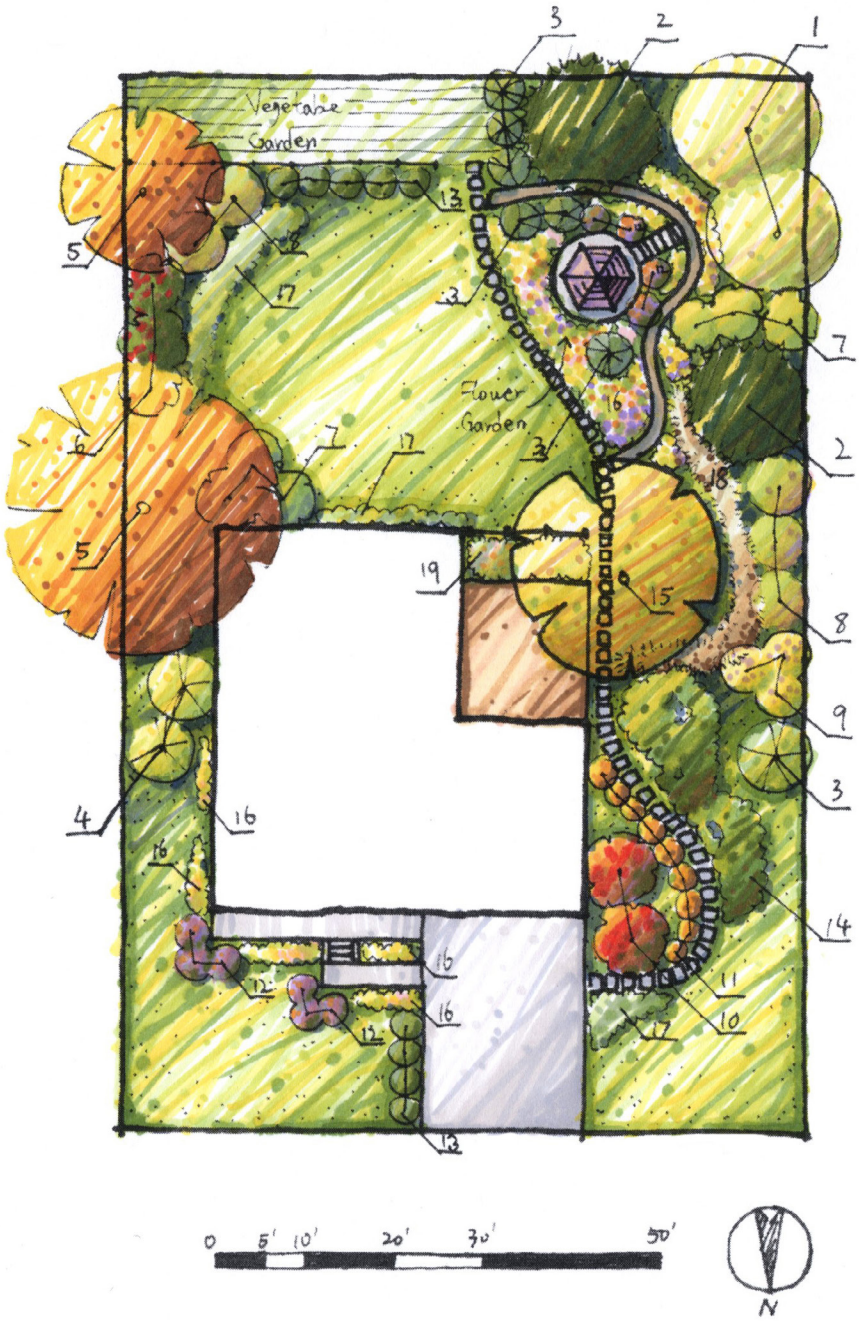
Figure 3.7: Residential landscape design 3 (spring colors)

Plant List

1. Apple *Malus*
2. Currants *Ribes*
3. Black Raspberry *Rubus*
4. Purple Raspberry *Rubus*
5. Cherry *Prunus*
6. Honeysuckle *Lonicera*
7. Boxwood *Buxus*
8. Peach *Prunus*
9. Pear *Pyrus*
10. Gooseberry *Ribes*
11. Butterfly Bush *Buddleja*
12. Apricot *Prunus*
13. Chinese Elm *Ulmus*
14. Yucca *Yucca*
15. Lilac *Syringa*
16. Crabapple *Malus*
17. Green ash tree *Fraxinus*
18. Sugar Maple *Acer*
19. Grape *Vitis*
20. Barberry *Berberis*
21. Ornamental Grass
22. Turf Grass
23. Ornamental Shrubs
24. Flowers (annuals & perennials)

Figure 3.8: Residential landscape design with a plant list 1 (spring colors)

Figure 3.9: Residential landscape design with a plant list 2 (summer colors)



Plant List

1. Chinese Elm
   Ulmus
2. Pine
   Pinus
3. Dogwood
   Cornus
4. Forsythia
   Forsythia
5. Bur Oak
   Quercus
6. Pyracantha
   Pyracantha
7. Flowering Quince
   Chaenomeles
8. Redtwig Dogwood
   Cornus
9. Vanhoutte Spirea
   Spiraea
10. Japanese Maple
    Acer
11. Anthony Waterer Spirea
    Spiraea
12. Barberry
    Berberis
13. Boxwood
    Buxus
14. Peony
    Paeony
15. Ginkgo
    Ginkgo
16. Perennial Flowers
17. Ornamental Shrubs
18. Ornamental Grass
19. Rose
    Rosa

Figure 3.10: Residential landscape design with a plant list 3 (fall colors)

Part Four: Resources

More information and publication of landscape plants:

1. *KansasRoots* website https://www.kansasroots.org

2. *Prairie Star Annual Flowers* https://www.bookstore.ksre.ksu.edu/pubs/MF2769.pdf

3. *Prairie Bloom Perennial Flowers* https://www.bookstore.ksre.ksu.edu/pubs/MF2772.pdf

4. *Kansas Garden Guide* https://www.bookstore.ksre.ksu.edu/pubs/S51.pdf

5. *Deciduous Shrubs for Kansas* https://www.bookstore.ksre.ksu.edu/pubs/MF3116.pdf

6. *Evergreen Shrubs for Kansas* https://www.bookstore.ksre.ksu.edu/pubs/MF3117.pdf

7. *Ornamental Grasses* https://www.bookstore.ksre.ksu.edu/pubs/MF3048.pdf

8. *Water Gardening: Plants for the Water Garden* https://www.bookstore.ksre.ksu.edu/pubs/MF2912.pdf

9. *Watering Vegetable and Flower Gardens* https://www.bookstore.ksre.ksu.edu/pubs/MF2804.pdf

10. *Watering Established Trees and Shrubs* https://www.bookstore.ksre.ksu.edu/pubs/MF2801.pdf

11. *Shade and Ornamental Trees for Kansas* https://www.bookstore.ksre.ksu.edu/pubs/MF2688.pdf

12. *Street Trees for Kansas* https://www.bookstore.ksre.ksu.edu/pubs/L803.pdf

13. *Ground Covers Rock, Garden Plants, and Ornamental Grasses* https://www.bookstore.ksre.ksu.edu/pubs/C468.pdf

14. If the links of these publications have expired, or more information is needed, welcome to visit Kansas State University Bookstore website: https://www.bookstore.ksre.ksu.edu.