Japanese Garden Design

For The 21st Century

eric yamasaki

Japanese Garden Design for the 21st Century

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Accepted and Approved by:

_____

Committee Member, James Jones

_____

Faculty Committee Member, Lorence Oki

_____

Committee Member, Linda Yamasaki

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Committee Member, Wesley Yamasaki

_____

Faculty Senior Project Advisor, Mark Francis

Eric Yamasaki
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Abstract

This project focuses on making Japanese garden design sustainable. To this end, a brief history of the Japanese garden is explored. The Japanese garden has been evolving for over a thousand years and has continued to be as relevant and interesting as ever to this day.

Sustainability in general has seen an influx of interest in recent years. Garden design is just one way that adds to this principle of thought. Creating low- and no-water gardens can reduce a household's use of water by up to 50 percent. In California, times of drought can be common so the reduction of water consumption becomes quite important. Choosing native and climate-adapted plants is a simple way to combat excess water use.

Making the Japanese garden sustainable for the Mediterranean climate is very possible. Many traditional Japanese plants are drought-tolerant and adapted to survive in California. The use of greywater can accommodate more water-reliant plants although there can be some drawbacks to its use.

The final portion of this project covers a site-specific design for a residential backyard in Saratoga, California. The design utilizes information gained from the history of Japanese gardens and sustainable practices to create the next step in this garden's evolutionary process. Photo simulations accompany the design and provide realistic images of what the garden will look and feel like once it is completed.

Biographical Sketch

Eric Yamasaki was born on August 14th, 1986. He grew up in San Jose, California and attended Leland High School. In 2005, he began studying Landscape Architecture at the University of California, Davis. During the four years he spent at Davis, Eric came to find his true passion in terms of a career.

As a soon-to-be landscape architect, Eric hopes to pursue his interest in sustainable design and Japanese gardens.

Acknowledgements

I would like to offer special thanks to all of the people who have made this project possible:

To my committee members, James Jones and Lorence Oki, I would like to offer my sincerest thanks for all the help you have provided me during this process.

To my aunt and uncle for graciously providing me with their backyard as a place to design to my heart's content.

To Mark Francis for providing true words of wisdom and guidance during the past six months.

To all my fellow LDAers who kept me sane during our time spent in the program.

And finally, to my family whose love and support has gotten me to where I am today.

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Preface

This senior project came about somewhat haphazardly. Eric had known he would have to do a senior project for years, but had not come up with anything until the first day of class when the senior project process began in January 2009. Mark Francis had asked each student to write down the topic he or she wanted to do as a senior project. Eric poured over his thoughts of what he could possibly choose as a topic. He knew his aunt and uncle wanted him to come up a with a design for their backyard. From this, he added the idea of using sustainable principles in the garden's design. Well, he had come up with his topic in about 10 minutes and has stuck with it over the past 6 months to create the following project.

This project encompasses Eric's desire of creating sustainable Japanese gardens in the future. He has used this opportunity as a starting point for his future endeavors. This project is intended for those who enjoy Japanese gardens or just want to further their knowledge when it comes to sustainable design.

Chapter 1:
The Japanese Garden

"Visualize the famous landscapes of our country and come to understand their most interesting points. Re-create the essence of those scenes in the garden, but do so interpretively, not strictly."

■ *SAKUTEIKI*, Japanese garden manual

The rich history and evolution of the Japanese garden can be traced back to the sixth century (Rogers, 2001). Although continuously influenced by Chinese garden concepts, the Japanese garden took on its own distinct characteristics and stylings. Over the centuries, garden design has been influenced by religion, art, and politics.

~ Early History to the Heian Period

Important devleopments of this period:

1. Religion
2. Chinese influence
3. Symbolism

Religious underpinnings were the beginning place for Japanese gardens. Places defined as sacred to the worship of Shinto gods, Japan's native religion and deities, were found in natural objects such as trees and rocks (Rogers, 2001).

Figure 1.1 – These rocks symbolize the union of marriage in Shinto beliefs.

When Buddhism was introduced from China in 552, temples and their accompanying gardens began to develop. During the Heian period (781 -1185) gardens were further influenced by **Chinese style**. Ponds in these gardens were large, complete with islands and **symbolic** rock arrangements in the forms of cranes and tortoises which recall Chinese mythology (Rogers, 2001).

~ Kamakura Period

Important developments of this period:

1. **Zen Buddhism**
2. **Rock arrangements**
3. ***Kare sansui***

The next reign of power came during the Kamakura period (1185-1333) and gave rise to **Zen Buddhism**. The Zen ideals of austerity and simplicity grew in popularity and began to influence garden design. Chinese Song garden art influenced design choices such as vertically positioned **rock arrangements** (Rogers, 2001). The temple of Saiho-ji was the first example of ***kare sansui*** with its use of horizontally placed rocks that form a dry cascade. This garden also shows how the Japanese garden incorporated Chinese style, vertically positioned rocks, and made this element its own with the use of the horizontal plane which reflects the natural landscape found in Japan (Rogers, 2001).


Figure 1.2 – Rocks found at Saiho-ji.

~ Muromachi Period


Figure 1.3 – The Golden Pavilion and its accompanying lake.

Important developments of the period:

1. **Opposing design styles**

The Muromachi period (1333-1573) continued the transition of the Heian nobility lake gardens to the minimalism found in Zen garden design. Kinkaku-ji, the Temple of the Golden Pavilion, is one of the former and was originally built as a pleasure garden complete with a

large lake used for boating parties and rock arrangements in the forms of cranes and tortoises (Rogers, 2001). Ryoan-ji is a temple garden created in the *kare sansui* style. It is composed of 15 stones surrounded by white gravel that is raked to evoke a sense of water. This garden **typifies the contrast** between gardens created for purely aesthetic purposes versus those created for meditation and enlightenment.

Figure 1.4 – The rock garden of Ryoan-ji creates a place for deep meditation.

~ Momoyama Period

Important developments of the period:

1. **Tea gardens**
2. **Strolling gardens**
3. **Lanterns**

The Momoyama period (1573-1603) saw a return to the more extravagant side of garden design. One ruler of this time, Toyotomi Hideyoshi, used his wealth to amass a huge collection of specimen rocks and had the Sambo-in temple refurbished for viewings of cherry blossoms (Rogers, 2001). In contrast, this period also produced the development of the tea ceremony as well as the tea garden which valued understatement. The **tea garden** introduced new design elements such as the *cha niwa*, or "dewy path", which brought attention to the ground plane of the garden (Rogers, 2001). This type of rock and moss pathway also led to the development of larger **strolling gardens**.

Figure 1.5 – Cherry blossoms at the Sambo-in temple.

Figure 1.6 – Lantern which would be lit at night for using the *tsukubai*

Lanterns previously used only for Buddhist temples ceremonies were now implemented as lighting for the paths at night and gave rise to a new design element in and of itself (Rogers, 2001).

~ Edo Period

Important developments of the period:

1. **Shut off from the outside**
2. **Hide-and-reveal tactics**
3. ***Kirei sabi***
4. ***Shakkei***

The Edo period (1603-1867) was a time when Japan **shut off** its connections to the outside world. Although contact with places like China was highly restricted, the Japanese garden continued to evolve. One prominent garden designer of the time was Koburi Enshu. He began to integrate the use of zigzag pathways into stroll gardens which used **hide-and-reveal** tactics and promoted movement rather than the static nature of viewing as was the norm for earlier gardens (Rogers, 2001). ***Kirei sabi***, another term of garden aesthetic, came about during this time and valued the com-

Figure 1.7 – Winding pathways in Katsura Villa invite viewers into the garden.

bined notions of elegance seen during the Heian period with characteristics of rustic simplicity seen in the tea ceremony and gardens of the Momoyama period (Rogers, 2001). The use of ***shakkei*** also came into play during this time which incorporates views of the surrounding landscape outside of a garden into a larger holistic entity.

Figure 1.8 – At Shugakuin, the mountainous backdrop becomes a part of the garden itself.

~ Meiji Restoration to Modern Times

Important developments of the period:

1. **Modernization and Westernization**
2. **Integration of new and old**

Japanese gardens have continued to change in today's modern world. After 1868, Japan saw a large shift in its political and social structures. The country began to rapidly modernize and westernize after being closed off from the outside world for so long. Western style design was incorporated into some new gardens. However, early gardens of this period made no effort to combine the new and old as an integrated whole (Itoh, 1984). As time progressed, designs began to incorporate modern and traditional styles more coherently. Modern designers focused more on self-expression rather than creating an idealized place of nature (Itoh, 1984). Split, crushed, and cut stones were now being used in designs.

Figure 1.9 – This garden by Shigemori represents a *kimono*.

Landscape architect and historian Morei Shigemori incorporated concrete into his designs (Tschumi, 2005). The Japanese garden has had the amazing ability to "adapt and adopt" to the new while still remaining true to its roots and will continue to thrive and evolve through this spirit (Itoh, 1984).

Chapter 2:
The Sustainable Garden

"Nowadays, modern temples and shrine buildings need to be accompanied by modern gardens; we can no longer just keep using the same old rules."

■ MIREI SHIGEMORI, landscape architect and historian

Landscape architecture is continually changing and evolving. In recent years, making design sustainable has been at the forefront. Although the term "sustainable" is thrown around all too often, I believe that it truly is something which should be taken seriously. News of global climate change has affected the way that everyone looks at oneself and how each of us impacts the planet we call home. There are many varied ways that landscape architects have begun to deal with these issues and it can range from large-scale regional planning all the way down to site-specific, individual elements.

I find great interest in sustainable garden design. It is my wish to use this type of design ethic for the work I will do as a professional. The popularity of sustainable products and ideas has grown considerably over the past few years and it seems appropriate that it would come to encompass the field of landscape architecture as well. The following will highlight some of the principles and tenets that make a garden sustainable.

~ Things to Consider in Sustainable Garden Design:

1. Water
2. Plant selection
3. Climate
4. Materials and goods
5. Energy
6. Chemical usage

~ Water

Water is a major issue when thinking about sustainability. It is estimated that maintaining landscapes account for nearly half of our residential water consumption (Ellefson, 1992). Learning to plan and design using plants that are adapted to the local climate can help reduce the amount of water needed to keep them alive and thriving. Plant choices may become limited but do not be discouraged. Through smart planning, plants that require more water can be implemented into the design.

Ground water recharge is another component to take into consideration. Large areas of paving and other impermeable surfaces prevent rain and other runoff water to be absorbed by the ground. Instead, this water is usually directed to storm drains and other collection devices and does not have the chance to permeate into the ground. This causes problems when areas use ground water for irrigation. The groundwater is not recharged at a sufficient rate and may lead to a depression in the water table. Using permeable and semi-permeable materials or simply reducing the amount of impermeable surfaces when designing are easy ways to prevent excess runoff and allow improved groundwater recharge.

Rain gardens are one particular style of design which utilizes precipitation as a means of irrigating plants. These gardens rely on drainage systems which direct rainfall into the garden instead of to curbs and storm drains.

Finding ways to integrate greywater into your irrigation system is another way to make the garden more sustainable. The typical household produces 80 -90 gallons of greywater each day (Windust, 2003). The use of greywater is a great way to recycle everyday domestic water use and redirect it into the garden.

Hydrozoning is another landscape practice that makes a garden more sustainable. Grouping plants with similar water needs is more efficient. It is also practical

in the sense that dissimilar water needs can kill plants in the same area due to either too much or too little water.

~ Plant selection

Using native and climate-adapted plants is necessary in creating a more sustainable garden design. Picking the right kinds of plants can save you time and money when it comes to their care. With xeriscaping, plants will need to be either native or adapted to the area in which you live.

If you are considering creating a rain garden, it is best to use native plants that are adapted to your area's rainfall. These plants also create natural habitats for animals and insects in the region as well.

Greywater use can affect the types of plants one uses in terms of irrigating. Plants that get watered by this will need to tolerate alkaline conditions (Windust, 2003).

~ Climate

Getting to know the local climate and site conditions is another key element of creating a sustainable garden. The annual rainfall, temperature, soil type are all major factors in deciding the types of plants you can consider using in your design. Plants that have evolved in your particular climate may survive merely from the conditions on your site.

~ Materials and goods

The types of materials being used also play a role in sustainable design. Finding local goods and stores reduces the need to rely on faraway services that require lengthy and expensive transport. Using renewable and sustainable products is another great way to reduce the environmental impact of design.

If one is replacing or augmenting an existing garden, recycling and repurposing materials from the previous garden are easy and often free ways to create design elements in the new garden.

~ Energy

Energy is another important aspect of making your garden sustainable. Planting deciduous trees on the south side of buildings is one smart choice. During the winter, the trees are bare and allow sunlight to heat the home, thus reducing the need for heating. When it is summer, the full canopy of the tree shades the home and reduces the need for air conditioning, saving energy and money.

If lighting is added to the garden, try using LED lights. These require very low amounts of energy when compared to conventional incandescent fixtures.

~ Chemical usage

Fertilizers, pesticides, and herbicides are chemicals which may be used in a garden. Fertilizers may help to perk-up plants, but the excess that is not absorbed gets washed off site. When these growth chemicals enter bodies of water, eutrophication may occur. As this happens, water quality becomes poor and can kill fish and other aquatic organisms. Limiting or not using fertilizers help prevent this from happening.

Pesticides are helpful in the sense that they kill harmful insects but they can kill the beneficial ones as well. Also, with time, insects develop immunities to these chemicals and more poisonous concoctions must be made to keep up. Instead of relying on chemicals, biological controls such as ladybirds can help defend your garden without the need for pesticides.

Just like pesticides, herbicides can create weeds that become chemical resistant. Drip irrigation can help reduce the amount of weeds by limiting areas that receive water. Pulling them out by hand is labor intensive, but it is something anyone can do without relying on harsh chemicals or drip irrigation systems.

Chapter 3:
The Sustainable Japanese Garden

"One should never imitate that which has been inherited from one's forebears; one should, instead, strive after that for which one's forebears strove."

■ MATSUO BASHO, poet

~ Recommended Readings and Resources

The following is meant to guide readers who already have an interest in and understanding of Japanese garden design. With that in mind, I will not be going into the basics of creating such a garden. If you would like to learn more about general Japanese garden design, I suggest the following material to gain a solid foundation. You can then apply the tips below to your own sustainable garden.

Sakuteiki – A modern translation by Jiro Takei and Marc P. Keane. This book is the oldest known Japanese garden manual and was written during the 11th century. It contains a wealth of information on the dos and don'ts of the time period.

Creating Japanese Gardens – This manual offers technical information on design. It covers the major styles of gardens, practical design guidance, plant lists, and great illustrations of American-built residential gardens.

A Japanese Touch for Your Garden – This book goes into more detail of elements that make up the garden. Different styles of walkways, lanterns, and fences are just some of the aspects of Japanese garden design that are covered.

The Japanese garden has the means to be a model for sustainable design. As history has shown, the Japanese garden is highly adaptive to novel and contemporary ideas. Overlap of sustainable practices already exists within the traditional styles. Now it is only a matter of taking this concept a step further. The following discusses how sustainability and Japanese gardens can work in harmony.

Creating a sustainable Japanese garden seems the next logical step in the evolution of this particular design style. The Japanese garden began as a place to revere nature and in today's terms, working with our environment can take on old and new meanings. Using plants that are adapted to survive in a Mediterranean climate is one way in which to pay respect to the place we live.

~ Drought-tolerant Plant List for the Mediterranean Climate

The following are plants to consider when creating a sustainable Japanese garden. These plants are adapted to the Mediterranean climate found in the Northern California region. Most have been traditionally used in Japanese gardens or are natives found in Japan. A few are additions that can serve as nice complements.

*This list is based upon Heidi Gildemeister's *Mediterranean Gardening A Waterwise Approach*, 2002.

	Scientific name	Common name
1.	*Aloe vera*	Aloe vera
2.	*Artemisia schmidtiana*	Angel's hair
3.	*Aucuba japonica*	Japanese aucuba
4.	*Bignonia sp.*	Trumpet vine
5.	*Bletilla striata*	Chinese groung orchid
6.	*Buxus microphylla* var. *japonica*	Japanese Boxwood
7.	*Camellia japonica*	Japanese camellia
8.	*Cedrus deodara*	Deodar cedar
9.	*Deutzia gracilis*	Deutzia
10.	*Dietes iriodioides*	Fortnight lily
11.	*Diospyros kaki*	Persimmon
12.	*Elaeagnus pungens*	Silverberry
13.	*Eriobotrya japonica*	Loquat
14.	*Euonymus japonicus*	Boxleaf euonymus
15.	*Fatsia japonica*	Fatsia

16.	*Freesia alba*	Antique white freesia
17.	*Ginkgo biloba*	Maidenhair tree
18.	*Iris japonica*	Japanese iris
19.	*Koelreuteria paniculata*	Golden rain tree
20.	*Ligustrum japonicum*	Japanese privet
21.	*Lonicera japonica*	Japanese honeysuckle
22.	*Ophiopogon japonicus*	Mondo grass
23.	*Pinus radiata*	Monterey pine
24.	*Pinus thunbergiana*	Japanese black pine
25.	*Pittosporum tobira*	Tobira
26.	*Prunus serrulata*	Japanese cherry
27.	*Rhaphiolepis umbellata (japonica)*	Hawthorn
28.	*Trachelospermum jasminoides*	Star jasmine
29.	*Viburnum suspensum*	Ryukyu viburnum
30.	*Wisteria floribunda*	Japanese wisteria

~ The importance of water

The use of greywater recycles water that would normally become waste. This allows the introduction of plants into the garden that are not as well adapted to survive in the dry Mediterranean climate.

Although greywater is a possible way to increase a garden's sustainability, there are some issues that should be taken into consideration. Many traditional plants such as Japanese maples prefer more acidic soils (Kawaguchi, 2000). To combat this discrepancy, try using old coffee grinds as mulch to keep the soil from becoming overly alkaline. Greywater may contain soaps, detergents and other contaminants that can damage plants and soils (Windust, 2003). A cloth bag can be used to catch particulates like lint and fat (Windust, 2003). Using filtering plants such as irises can help cleanse the greywater before it is used on other parts of the garden. Because of possible health risks, greywater should never be used to irrigate vegetables, and it is recommended that greywater only be used on a subsurface level. Although greywater may not completely replace conventional irrigation, its use can help reduce the average household's water needs by 30 -50% (Windust, 2003).

Chapter 4:
The Design

"When creating a garden, let the exceptional work of past master gardeners be your guide. Heed the desires of the master of the house, yet heed as well one's own taste."

■ *SAKUTEIKI*, Japanese garden manual

The final chapter is broken up into the analysis of the existing site, program elements, detailed plant information, a masterplan, and photo simulations of the finished design. The following will discuss the elements that have gone into making the final design for my clients' backyard through graphics and written descriptions.

~ Existing Site Conditions

The design portion of this project focuses on a residential backyard. The site belongs to my aunt and uncle and is located in Saratoga, California. The backyard itself is roughly 105' x 80'. Currently, the backyard is filled mostly with trees. Some trees of interest include a mature coast live oak, three declining walnut trees, two lemon trees, five planted Japanese maples, two potted Japanese maples, and two Japanese apricots.

Figure 4.0.1 & 4.0.2 – The existing plants seen when viewing from the patio.

The rear of the house encircles a space that is currently filled with a concrete patio area. This space is utilized as the main entertainment area during outdoor gatherings and as a more casual sitting/dining area. The concrete will be repoured because of cracking and discoloration that has occurred.

Figures 4.0.3 & 4.0.4 – The area covered by the concrete patio.

~ Program Elements

Program elements shape a landscape through design. The following are programmatic elements that are to be integrated into the site-specific design:

1. low water usage

   The requirement of minimal water use for the garden is one essential way to make the garden more sustainable. This will be accomplished through the use of native and climate-adapted plants. For plants that require extra water, greywater will be used as a recycled resource.

2. low maintenance

   At the request of my clients, keeping garden maintenance as low as possible will be a goal of the design. It is understood that a garden by definition cannot be completely maintenance free. Careful plant selection will be key.

3. a place of enjoyment

   My clients would like the garden as a place to enjoy scenery. Since they entertain during the summer with barbeques and outdoor events, their guests will use the garden as well. The garden will also be used on a more casual level in terms of everyday use.

4. compact growers

   My aunt and uncle would also appreciate plants that will not become overgrown or too large. Keeping the plant selection to compact and dwarf varieties will be essential for this aspect of the design.

~ The Design

There are multiple plants that will be retained and incorporated into the final design. The largest of these is a mature coast live oak tree which is about 25' tall and is located in the southwest corner of the yard. Other trees that will be utilized include several Japanese maples. The last of the trees that will be preserved include the three trees located in the north part of the garden which screen out the neighboring yard. Everything else will be cleared out for the new garden layout.

The overall garden design is based on the strolling garden style. Winding pathways and hide-and-reveal tactics are implemented to elicit the users' attention and to draw them into meandering through the space and discover different views. The low bamboo wall partially hides the camellias behind it and offers one element that viewers will want to investigate.

The design incorporates many drought-tolerant plants to reduce the need of excess amounts of water. Although not immediately apparent to a viewer, the garden itself pays respect to the natural environment. Nearly all the plants used in the design have been careful selected to be compact growers, such as the boxwoods and dwarf mondo grass. Although Japanese maples do not tolerate low water conditions, it is the only plant used that will require any significant amount of irrigation.

As the seasons change, so will the garden. During the fall, the maples will turn brilliant shades of reds and oranges. Winter will provide a more subdued look for the garden except for the Japanese apricot which blooms during this season and offers interest with its leafless braches covered in flowers. Spring brings about new growth and flowers from the wisteria, magnolia, camellias, and irises. Fortnight lilies offer their flowers as an attraction during the summer.

This written account of the garden will describe in detail the different elements of the garden. The walkthrough will start at the patio, move towards the south, work its way around towards the east, and then finish back at the patio.

~ The walkthrough

The patio area receives slight modifications to what already exists. As mentioned before, the concrete paving will be repoured. To help with water infiltration, I have proposed to widen the joints to leave a 3-inch gap between each slab. Those spaces will be filled in with dwarf mondo grass to create a green border. A bamboo trellis will hang over the patio. Japanese wisteria will climb to cover the trellis and offer shade as well as lovely purple blooms during the spring. Copper rain chains finish off the space.

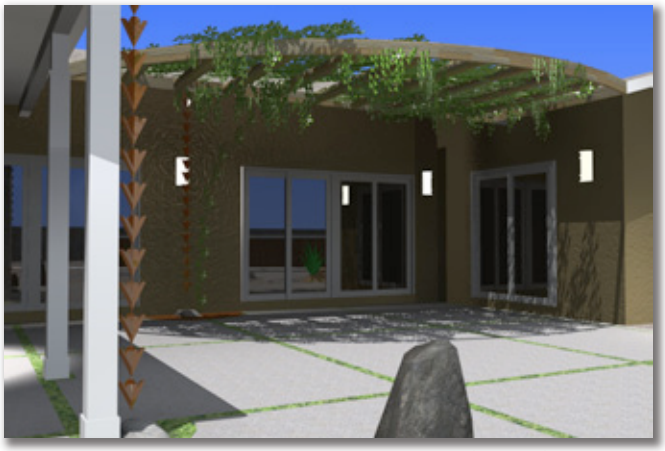


Figure 4.1.1 – Hanging Japanese wisteria and rain chains.

From the edge of the patio one can see numerous elements of the garden. Starting from the left, the rock garden is visible and is slightly modified from the norm. First, the gravel contained in the bed will be recycled from the previous concrete patio. The concrete will be split and crushed until it is the appropriate size. To help keep maintenance down, the raked pattern will be set in concrete to make it permanently fixed in place. The use of a low wall found in the center of the garden screens off part of the garden when standing on the patio. Moving towards the center will bring the grouping of Japanese boxwoods into view. Their low growing character brings focus to the ground plane and leads the eye upwards to the rest of the garden. Sitting near the boxwoods is a Buddhist trinity rock arrangement. The large stone represents Buddha and the two smaller stones on either side act as his attendants (Takei, 2001). It is also slightly off center because it is very unlucky to have the stones facing directly towards the house (Takei, 2001). A grove of um-

brella bamboo creates a living wall when looking off to the right. These plants serve the purpose of inviting people into the garden to see what mysteries exist within the space.

Moving off to the right leads to the stone pathway. At the start, a red Japanese maple shades the southwest part of the house and is so placed based on ideas set out in *Sakuteiki*. Dwarf mondo grass will be used as a groundcover underneath the existing coast live oak. This will fulfill the need of having a lawn area without the high water needs. When one reaches the oak tree, a small maple sitting atop a mound is revealed behind the stand of bamboo. When viewing the yard from behind the oak tree, the house will be screened from view by the stand of bamboo and only the garden will be visible. It is in this place that the most tranquil of environments can be found.

Figure 4.1.1 – Underneath the oak admiring the view.

Going passed the oak will move you towards the north. This is the first time one will cross the greywater path. The use of greywater in the garden has multiple purposes, both practical and symbolic. First, and most obviously it acts as a greywater irrigation system. The path itself starts from the east, heads south, and terminates in the west. This is based on precepts set out in *Sakuteiki*. Following this arrangement will bring a long and healthy life to the household (Takei, 2001). The zigzag pattern was inspired by *yatsuhashi* bridges as it is a walkway over the water as well. The water itself would be running underground to prevent any contact with people. The above-ground lit portion would sit atop it. At night, it can be turned on to light the garden when desired. Moving further along the stone path brings us to two more maples that shade both sides. Just beyond them lies a

ginkgo tree. Its light bark and oddly shaped leaves brings a sense of wonderment to this part of the garden.

Another view that was blocked from the patio becomes visible. A grouping of camellias lies behind the low fence. It will be a spectacular sight to behold when they are in bloom. To the right of the camellias is another hidden object. This small tool shed and *tsukubai* serves both a functional and aesthetic purpose. It will house tools and instruments for the yard but will look similar to a teahouse. The viewer will only discover it if one travels completely through the garden.

Figure 4.1.3 – Teahouse tool shed with *tsukubai*.

A triad of existing Japanese maples can be seen to the left once you move beyond the tool shed. To the right of these trees is a low planting bed connected to the greywater system. It is filled with irises which act as a biological filter for cleansing the greywater for further irrigation purposes. From there, two existing Japanese apricots come into view as well as the bamboo gate that separates the front and backyards. The viewer now moves to the left against the house. An existing magnolia tree shades a small mound which is home to fortnight lilies, aloe vera, and a lantern for added night light. The tour has now ended with the return to the patio.

~ Plant List Details

The drought-tolerant plants

⁘ - denotes existing vegetation

Figure 4.1.1

1. Aloe vera (*Aloe vera*)

Known as *shaboten* in Japanese, this succulent is highly drought-tolerant. It can be use to treat inflammation.

Figure 4.1.2

2. Japanese Boxwood (*Buxus microphylla* var. *japonica*)

The Japanese boxwood is a slow growing shrub reaching between 2 -5 feet tall. It will tolerate hot summers. Needs protection from wind.

Figure 4.1.3

3. Japanese camellia (*Camellia japonica*)

The Japanese camellia is an evergreen shrub. It produces flowers during the spring. Color ranges from white to pink. Needs to be protected from sun and wind. Grows between 3-10 feet tall.

4. Fortnight lily (*Dietes iridioidies*)

The fortnight lily adds a nice burst of color with its white, purple, and yellow flowers. The leaves are spear like. Blooming occurs during the summer.

Figure 4.1.4

5. Umbrella bamboo (*Fargesia murielae*)

Umbrella bamboo are evergreen perennials. They grow to about 10-15 feet tall. Since they are clumpers, there is no need for containment. Only some of the leaves will fall off during autumn.

Figure 4.1.5

6. Maidenhair tree (*Ginkgo biloba*)

Ginkgos tolerate drought and are slow growing. Leaves are fan shaped and turn yellow during the fall. Male trees are preferred as females produce unpleasant smelling fruits. It has interesting light bark.

Figure 4.1.6

Figure 4.1.7

7. German iris (*Iris germanica*)

Native to the Mediterranean region, German irises are drought-tolerant and easy to grow. Enjoys alkaline conditions which is perfect for greywater use. Flowers are bright purple.

Figure 4.1.8

8. Southern magnolia (*Magnolia grandiflora*)*

Magnolias are adapted to tolerate dry regions. Southern magnolias produce large white flowers during the spring.

Figure 4.1.9

9. Dwarf mondo grass (*Ophiopogon japonicus* 'Dwarf Kyoto')

Dwarf Mondo Grass has the purpose of replacing moss covered areas. It is slow growing and tolerates sun and shade. The dwarf variety only gets about 1-2 inches tall.

10. Japanese apricot (*Prunus mume*)*

Known as *ume* in Japan, the Japanese apricot provides gardens with flowers during the winter. It grows to about 20 feet tall. Moderate-drought tolerance. Likes acidic soils.

Figure 4.1.10

11. Coast live oak (*Quercus agrifolia*)*

Coast live oaks are native to the California region. It is an evergreen that produces flowers in the spring and acorns during fall. Highly drought-tolerant, irrigation should be avoided.

Figure 4.1.11

12. Japanese wisteria (*Wisteria floribunda*)

Japanese wisteria adds a great burst of flowers during the spring. A climber that does well adorning an arbor or trellis. Tolerant of long summer droughts.

Figure 4.1.12

~ Plant List Details

The water-reliant plants

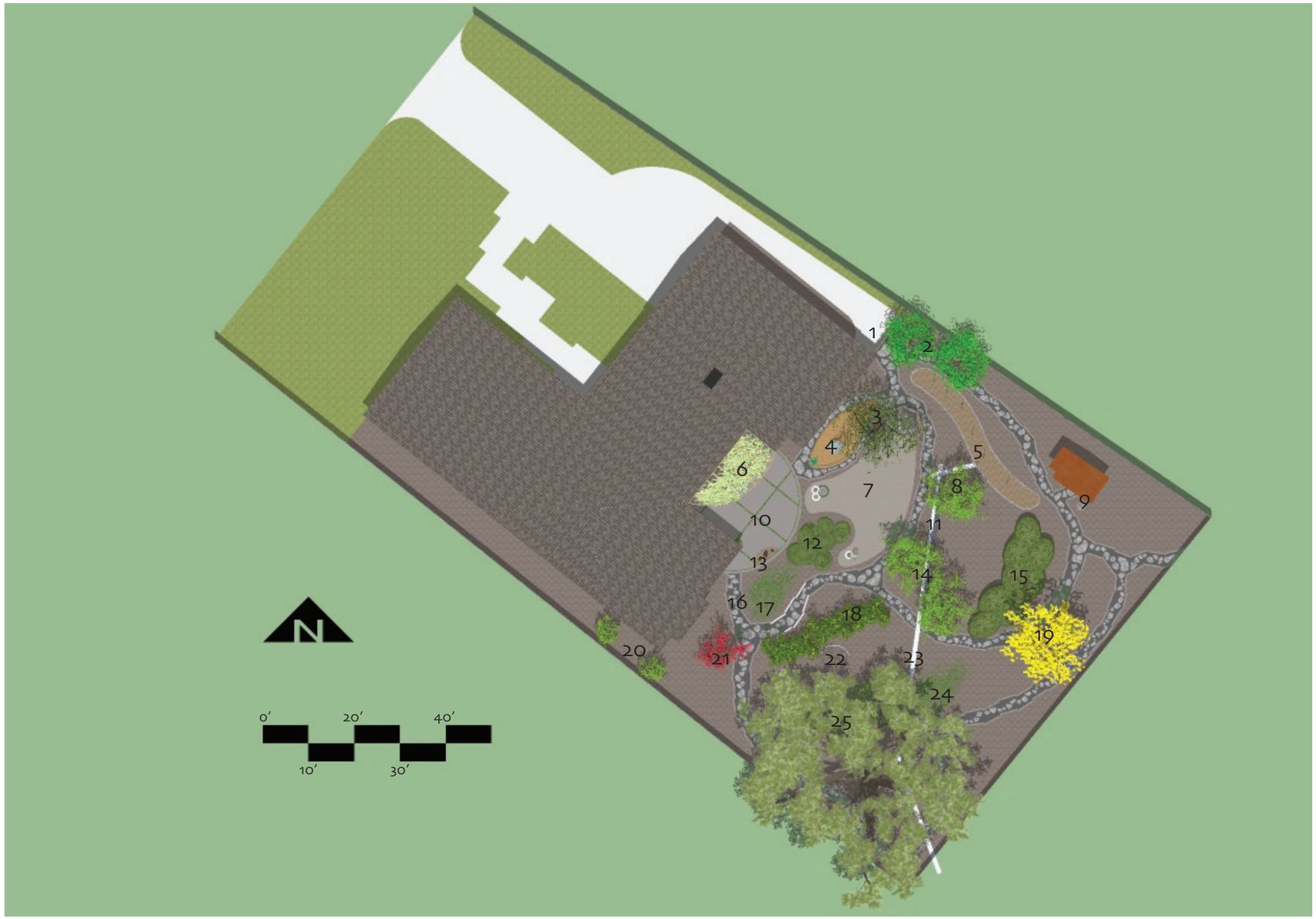
* - denotes existing vegetation

Figure 4.2.1

1. Japanese maple (*Acer palmatum*)*

The Japanese maple is a rather iconic symbol. Numerous varieties exist. Colors range from greens to deep reds. Leaves can be delicate and lacy. Too much boron in water can cause leaf burn. Likes acidic soils.

~ Masterplan



Key:

1. Bamboo fence
2. Existing Japanese apricots
3. Existing Southern magnolia
4. Small mound
    a. Lantern
    b. Fortnight lily
    c. Aloe vera
5. Iris flowerbed
6. Trellis with Japanese wisteria
7. Rock garden
8. Existing Japanese maple
9. Tea house tool shed and *tsukubai*
10. Concrete patio
    a. Dwarf mondo grass
11. Low bamboo fence
12. Existing Japanese maples
13. Buddhist trinity stone
14. Existing Japanese maples
15. Japanese camellias
16. Stone path
17. Dwarf mondo grass
18. Umbrella bamboo
19. Maidenhair tree
20. Existing Japanese maples
21. Japanese maple
22. Existing Japanese maple on small mound
23. Lit water pathway
24. Dwarf mondo grass
25. Existing coast live oak

~ Photo Simulations

Figure 4.4.1 – The before from inside the kitchen.

Figure 4.4.2 – The after from inside the kitchen.

Figure 4.4.3 – Bird's eye view of the garden (without existing trees).

Figure 4.4.4 – Garden viewed from the kitchen at night.

Figure 4.4.5 – Detail of stone path. Concrete siding with stone walkway and small rocks in between.

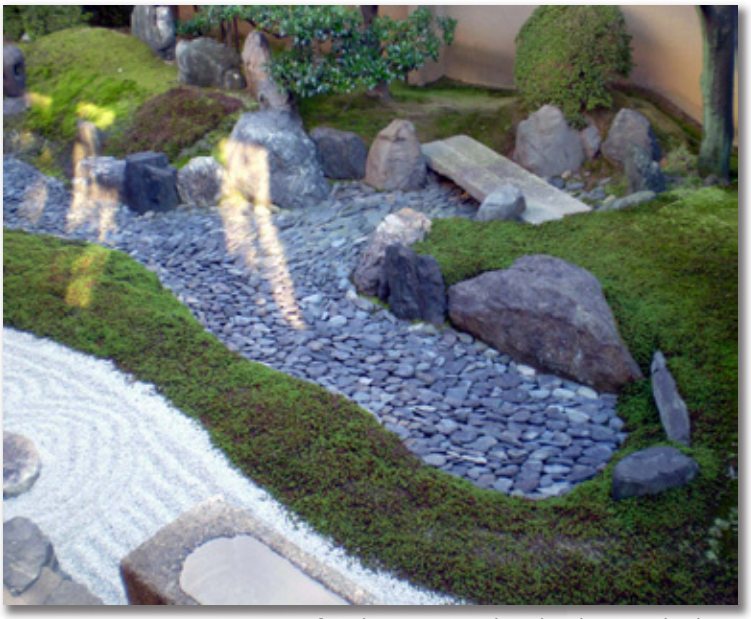


Figure 4.4.6 – Inspiration for the stone path. The dry riverbed would be utilized for the small rocks in the walkway.

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