

Spring 2019

The Basics of Horticulture

Maria Uhase
mcu3@zip.uakron.edu

Please take a moment to share how this work helps you [through this survey](#). Your feedback will be important as we plan further development of our repository.

Follow this and additional works at: https://ideaexchange.uakron.edu/honors_research_projects



Part of the [Illustration Commons](#)

Recommended Citation

Uhase, Maria, "The Basics of Horticulture" (2019). *Honors Research Projects*. 806.
https://ideaexchange.uakron.edu/honors_research_projects/806

This Honors Research Project is brought to you for free and open access by The Dr. Gary B. and Pamela S. Williams Honors College at IdeaExchange@UAkron, the institutional repository of The University of Akron in Akron, Ohio, USA. It has been accepted for inclusion in Honors Research Projects by an authorized administrator of IdeaExchange@UAkron. For more information, please contact mjon@uakron.edu, uapress@uakron.edu.

The Basics of Horticulture

Maria Uhase

7100:499 Honors Project in Art

December 12, 2018

The Basics of Horticulture

Maria Uhase

Department of Fine Art

Honors Research Project

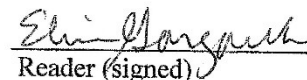
Submitted to

The Honors College


Approved:

 Date 11/29/18
Honors Project Sponsor (signed)

David Szalay
Honors Project Sponsor (printed)

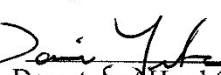
 Date 12/3/18
Reader (signed)

Elin Hargreth
Reader (printed)

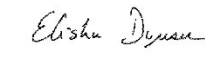
 Date Dec 2 2018
Reader (signed)

Matthew Kolodziej
Reader (printed)

Accepted:

 Date 12-12-18
Department Head (signed)

Danie Trostman
Department Head (printed)

 Date 11 Dec 2018
Honors Faculty Advisor (signed)

Elisha Dumser
Honors Faculty Advisor (printed)

Date _____
Dean, Honors College

Artist Statement

The purpose of this series of fine art infographic posters was to combine visual art with information to create an instructional and compelling body of work about horticulture. As part of my Honors Senior Research Project, I designed five large-scale posters with the individual pieces focusing on one topic of gardening. Together they form a foundation for anyone to begin their own successful garden.

The series includes information from how to begin growing plants to how to maintain a healthy garden. Since there are many ways to approach each of these processes, I described methods based on the variety of sources from which I gathered information, and from my own limited experiences.

In the work, I emphasized the illustrations, diagrams, and overall composition in order for them to be visually attractive, and to help explain various concepts. I also aimed to form images that reflect note taking and the aesthetic of the pages in a sketchbook. Text is loosely organized along with its corresponding images while plants, flowers, leaves, and earth enter into the negative spaces to tie the entire composition together.

The Basics of Horticulture

Introduction

A common misconception of art is that the artists create their work with little planning involved. However, the research process that comes long before a final piece can be begun is lengthy and complex, but still enjoyable. As I have evolved as an artist, the steps of my preliminary process have developed as well into an intricate system of steps. For myself, as an artist living in a world where there is a large amount of constantly incoming information, it is necessary for me to have a system to filter and organize it. This paper discusses how I did that by undergoing an intensive research and creation process to make a body of work for my Honors Senior Research project. The goal of this project was for the work to be equally categorized as fine art, and be a resource tool to help others with a specific need.

The very beginning of my process begins with deciding the purpose of the project I am creating, and what type of project can be used to fulfill this purpose. I think about the content, intended audience, and the impact that the work can have on the viewers. I then begin to plan the execution of the work, including which materials to use, what aesthetic I aspire for, and what the final product will look like. Next comes designing the presentation of the artwork so that it is most successful in highlighting them, and helps create a memorable viewer experience. Research continues as I explore the media I have chosen to make sure it will be a useful tool to achieve my goal. I gather both visual and factual information that will be included in the pieces, construct a set of thumbnail sketches for composition design, and then I finally begin to create the work. While creating, I encounter various unexpected challenges that I solve or find other ways of finishing the work. After they are complete, I install the artwork for the exhibition. Even now the research does not end; I listen to the responses from viewers and mentors, and then use that feedback. This helps me to revise my current work and prepare for future projects.

Beginning the Research Process

When I create a body of artwork it is initially in response to a challenge that I have been given to solve, or which I set up for myself. It is often a problem, such as how to make visual a concept that is difficult to explain through other forms of communication, like words. In the case of my Honors Senior Research Project, the problem I created was how to incorporate my interests in biology with my creative practice to develop a body of artwork. I wanted to explore creating art that has a purpose, specifically with achieving a specific goal or understanding a subject more thoroughly. I have an interest in horticulture and personal gardening myself, and I realized that it is a topic with a large amount of information to be sifted through to find the essential points. I decided that I would filter the research and display it for others in a series of fine art infographic posters on the basics of gardening. Not only would I be help to inspire others to begin a garden, but I would be educating myself on the subjects while having the opportunity to further develop illustration techniques.

I considered the relevance of this type of project, and how it could possibly become a reality. I wanted the pieces to be an inspiration for people to begin a personal garden of their own, which is one way to become more environmentally conscious, to produce one's food for personal economic purposes, and to simply benefit their overall wellness. Gardening can help as a creative outlet, involves physical exercise, and provides healthy, organic food that is more fulfilling to consume with the knowledge that it was self-grown.

I intended for the project to be a quick access guide to information that was helpful in fulfilling their goals in horticulture. However, I was concerned that it could become a single-use image that would be more practical in a digital format rather than as a piece of physical work. To help give it a longer lifespan, I wanted to emphasize the fine art aspect of the work, making the illustrations as important as the informational text, not only a support of it. Presentation is vital in this era where an overload of data easily drowns individual pieces.

In hypothesis, I imagined these pieces could be usefully placed on display in garden centers, home improvement stores, and local plant stores. People here may already be inspired to start gardening, but are unsure where to begin so they could see a summary of what they should consider. To go beyond this audience, I also considered that it would be useful hung in personal spaces or areas of education to reach those of more diverse in their interests. To make them more accessible, they would be duplicated as relatively inexpensive prints.

Planning the Execution

The next part of my process includes planning how I want the work to look and how to execute it. This includes decisions on materials, overall aesthetic, and compositions of the final pieces. I begin this process by researching a wide range of artists who have created similar projects to mine for reference. I look at many examples so that I do not become centered on one artist's work, and can create a more unique piece. When drawing inspiration from the artists' works I look at their use of line, color, composition, shape, and values. Other elements include texture, unity, and balance.

In researching for this series of posters, I specifically looked at other artists of infographic posters, or work that included text along with illustrations. I studied work that would give me ideas to help me achieve a natural, organic style that reflected a growing garden. Many of the contemporary posters I viewed used digital techniques and had a clean, graphic style. Few had any elements created by hand, and were not very natural in appearance. They also did not emphasize the illustrations along with the text, and they became supports for it instead. What I did see was the way the artists organized the information and illustrations in creative ways, such as using organizational charts and pictograms, which further helped me with planning my posters. As far as style and the creation of the work in more of a fine art style, I looked to vintage botanical illustrations which contained a large emphasis on the images. I was inspired by the hand-drawn and painted look, the neutral color palette, and decreased saturation which appeared more

based on the natural world. The artists often included linear hatching techniques with ink that was delicate and descriptive. My challenge now was to find a way to combine these two styles. I wanted the organization of the digital pieces, but the organic feel and emphasis on the art that was in the botanical illustrations. After later gathering my information that I wanted to include in the pieces, I returned to the final compositions.

With this in mind, I continued with the next steps of my research process which is deciding on what materials I have access to, and which will help me get to my goal. I think about the media I have used in the past, or what I would like to newly explore with. Many of the botanical prints that I studied included watercolor paintings for the base, and ink or graphite for linear details. That combination of media was something that I had used previously and found myself somewhat successful in creating an organic and natural look. It also was a process in which the layers placed down are literally growing the painting, similar to a plant. In order to include the text successfully, I planned to take high-quality photographs of my work and upload them to the Adobe InDesign program where I would add the text.

I was simultaneously considering the scale at which I wished to work. There needed to be enough room to feature the illustrations while also leaving space for enough text that was useful and not overwhelming. The pieces were intended to be reproducible on a standard printer, and so I decided that a size large enough would be a vertical image of 24 inches by 36 inches. I chose to use Arches 300 lb. watercolor paper, and adjusted to Arches 140 lb. paper since it had similar effects with the material but was lighter and less expensive. The final dimensions that I did choose ended up being just 22 inches by 30 inches however, as I decided to present them as original paintings.

Display and Exhibition

The plans for how I would display the works were just as important as the creation of them. My first decision after deciding the support, medium, and dimensions was to figure out how I would prepare the pieces for hanging. I chose to use poster frames that were light and easily transportable, yet would be more professional than hanging them directly on the wall. They were a few inches larger than the artwork, both vertically and horizontally, and that allowed me to use the brown background, but keep the decal edges of the paper visible. This helped with the handcrafted and natural aesthetic.

My plans for the exhibit in the gallery space involved hanging the pieces in chronological order of the steps of creating a garden. The first was how to decide which plants to grow, how to grow them, preparing soil for planting, garden maintenance, and finally pest and disease defense. After having responses from my sponsor and readers, I realized that I should have switched the order of the second and third poster, since it is more important to know how to prepare soils for the plants before growing them. In addition to the main pieces of work, I found my process of research and design equally important, therefore I included my process book in the display as well.

During exhibition set up, I opted for a simple design so that the viewer would not be overwhelmed by a large amount of information, and the focus could remain on the artwork. However, after I finished installing, I felt that the space appeared bare, and the pieces were lost on the wall. In order to indicate the space the pieces were occupying, I created decorative, organic 'bracket' silhouettes with a dark indigo latex paint. They mimicked the patterns and motifs of leaves and plants that were within the poster images, helping to tie the exhibit together. On top of this I thought it would be a good idea to 'grow' those silhouettes every day that my work was on display by adding additional leaves and vines. However, I realized that my timing would not work unless I could paint during the daytime when people were present in the school, and I did not want to make that an emphasis of the work nor draw attention to myself as the artist.

Gathering Information and Process Book

This part of the research was the most time-consuming of the entire process, yet the most vital. Before I began deciding on the amount of pieces I wanted to make, I had to figure out what the topics were that I could discuss. I looked to a 1951 *Better Homes and Gardens* book in which the information was outdated, but the basic elements of gardening (which have stood the test of time as well as my attempt in the garden) were the same. After deciding on which topics, I broke those topics down into subsections to help clarify the information, decide how much I needed, and organize it better in the artwork. For example, in the first poster, I had the topic of planning gardens, and subtopics of the importance of the amount of sunlight it receives, the hardiness zones, and the meaning of annuals, perennials, and biennials. When I was looking for information, I was inundated with it in each subject, and had to carve it down into what was the most important for a beginner gardener to know without making it confusing. Originally I planned on doing 6 posters, each covering a different topic. The last one would include tending to indoor plants, especially succulents and cacti. After doing the research and planning, I realized that this concept did not quite belong with the others which were focused on the outdoor garden. It seemed like an unnecessary addition, and so I omitted it for now.

I began taking notes in my process book so that simultaneously I could be gathering information while planning out my illustrations and compositions. I would spend time making quick drawings of the notes I took so that when I began making my compositions I already had the choices for the material for ideas ready. As I worked in my process book and deliberately laid out each sketchbook page, I realized that I wanted to make the posters directly reflect my sketchbook, and have a similarity to a researcher's field notes. I began making small thumbnail sketches to create an overall sense of the composition I would want without being immersed in the details. Then from those I chose one to develop several more times until I had a composition for the final that I wanted.

Some of the limitations I felt while coming up with the information included how there were many techniques and tools that can be used to solve one problem or do one task. I limited it down by looking at many sources, books on horticulture, talking with more experienced gardeners, and drawing from my own limited experiences. Even with this, everyone will find their own techniques as they gain more experience in the garden; this is only to get you inspired to begin. Another limitation is how I wanted these posters to be able to work for around the nation, but with different climates and zones, it's difficult to always have information that is universally accurate. I left out some details, like planting times and frost dates, because that is something that is only determined locally.

Execution

Finally I began creating the actual painting of the posters. This is the part where I was testing all the research I had done, and seeing if my experiment would work. There were many unforeseen problems to solve that I would have to figure out quickly in order to recover. Originally, I planned to make each illustration a spot illustration that I would do separate of the entire composition, photograph these illustrations, then place them into the Adobe software format to be consistent. However, I was concerned that the typeface would appear too artificial and stand apart from the rest of the image. As I created the preliminary sketches of the compositions, I realized that I was having difficulty deciding what the minimum size of each illustration would be, and I struggled to visualize how it would all come together in the end. Instead, I decided to work in my usual way and lay it all out by hand together, then digitalize it to add the text. I left room in the compositions using place holders to mark where that would be so that I would have enough room for the text.

When I began, I first used light graphite to sketch out the base drawing on the posters, looking at my detailed compositions I created in my process book. I was able to alter things as I went to make it more cohesive and tie the different illustrations and details together. The next step was creating the

watercolor paintings. I did 2 to 5 layers of watercolor per illustration, varying it depending on the values needed. Then I added layers of hatching and details with the ink pens, helping to create dimension and stylized realism. The process was very structured, and never rarely varied unless out of necessity.

Tools and Materials

In order to make the work, I had to be able to create it with the tools and materials that I had. I was aware that I was comfortable using watercolor, and that I could use my past experiences with it to add the color and values to the illustrations. Overall I used a similar color palette to what I have used in past projects, which include cooler greens, a small variety of colors, and little saturation. In my process book I practiced with a few variations to help expand that color palette, especially in the range of green tones I had, since I'd be using those the most and I want to create interest. The lack of saturation helped me to make a more vintage aesthetic.

I planned to add linear elements to the illustrations through light outlining to help distinguish elements from each other, and through the technique of hatching. This was an important factor for me to add in dimension also, since I have difficulty adding in many darks with watercolor. That also creates more unwanted saturation. I intended for it to be similar to vintage botanical illustrations, and I specifically was looking to Leonardo da Vinci's botanical sketches where he created descriptive but stylized work. Originally I was going to use black ink and a dip pen, but after discussing with my sponsor, I decided that a brown ink would help create less of a harsh contrast throughout the piece, and seem more aged. Working with the dip pen on the 300lb paper worked fine, but when I switched to the 140lb it began to bleed and I could not obtain the fine line work I aimed for. I bought a set of sepia archival pens that solved this problem by reducing the amount of bleed since it helped monitor the distribution of the ink.

After completing the illustrations I prepared them to photograph in order to digitalize them and add the text. I am not comfortable using a DSLR camera, but I attempted to capture the best images I

could. As I downloaded them into Photoshop and began the editing process, I realized that the quality of my photographs were not as high as I wished; it would only decrease as I continued to manipulate and then print them. I also was considering in what way I would print since a size of 22" x 30" is not normal print size, and I would need to decrease the size to maintain the resolution. I finally decided that I would try to do the text by hand. My first attempts were successful so I decided to continue. For the headings of the posters, I wanted a more specific type face, so I used a light table to trace out the letters from prints I made. I then carefully used my own handwriting as the font for the rest of the text, attempting to make it as consistent as possible. I made sure that it was easily readable, and I ended up enjoying the lack of perfection that existed; it helped finish the effect of the handwritten field notes. These imperfections also tied into the rest of the piece more successfully than a computerized font type would. Now, after reviewing my pieces and making small revision, my work was complete. All that was left was to frame and install.

Conclusion:

Overall I feel that my pieces were successful in fulfilling their challenge to be a quick resource for information as well as being pieces of fine art. The illustrations are what might attract someone to take a closer look of the pieces, and adds interest. The information is clear and organized in various ways to make it unique. Some things that I would change, however, that I came to see after discussions with my sponsor and readers were elements such as creating more of a border between the edge of the paper and the illustrations for framing devices. Also taking the time to be a little more precise in some of the illustrations that depict man-made objects so that they are more easily recognizable. Another thing is to work on differentiating some areas of the illustrations from each other, with varying values and linear elements. The main things I will be changing are the frames which are not of the highest quality. This is an important influence on the viewer's perception of the quality of the pieces, and since I settled for not using better quality ones it detracted from the value of the pieces.

I feel that I have learned a lot on this journey, including how to adapt to challenges that appear during the process, and still achieve an end goal. I learned how different materials react with each other, sometimes unexpectedly and not always in desirable ways. I did learn what works and what doesn't when photographing artwork, and my time spent editing my photos on Photoshop helped me to learn some techniques with that. Besides what I learned with my artistic process, I feel that I have gained a greater amount of knowledge from the information I gathered on gardening. I will be applying these techniques in my garden, and will hopefully it will become healthier and more vibrant than ever. Most importantly however, I feel that I have finally understood the importance of my process as an artist. I never realized the amount of research I do for each of my pieces in all of my work. I gradually found what path works best for me, and I am building my practice around that. Having structure and planning out the final results helps me to create more successful works, though that still does not mean that it will be perfectly as planned, which is why I continue to create my work.

Bibliography

Beckett, Kenneth A. *The RHS Encyclopedia of House Plants, Including Greenhouse Plants*. Massachusetts: Salem House Publishers, 1987.

Cathey, Marc and Christopher Brickell. *The American Horticulture Society A-Z Encyclopedia of Garden Plants*. New York: DK Publishing, Inc., 2004.

Daidone, Jose, and Bernard Walgensinger. *The Personal Garden; Its Architecture and Design*. New York: Van Nostrand Reinhold Company, 1975.

“Direct Sowing: Starting Seeds Outdoors.” SBM Life Science Corp. Last modified 2018.
<https://www.bioadvanced.com/articles/direct-sowing-starting-seeds-outdoors>

Fichter, George S. *Insect Pests*. Wisconsin: Western Publishing Co., 1966.

Gough, Tom and David Longman. *The Instant Guide to Healthy Flowering Houseplants*. New York: Random House Inc., 1983.

Grounds, Roger. *The Complete Handbook of Pruning*. New York: Macmillan Publishing Co., 1973.

Lizotte, Mike. “How to Plant Fall Flower Bulbs.” American Meadows. Last modified 2018.
<https://www.americanmeadows.com/how-to-plant-flower-bulbs>

Olds, Jerome and Robert Rodale. *Complete Book of Composting*. Pennsylvania: Rodale Books Inc., 1971.

“Plant Hardiness Zone Map.” Potted Trees.com. Last modified 2018.
<https://www.pottedtrees.com/plant-hardiness-zone-map.html>

“Preparing Garden Soil.” Planet Natural Research Center. Last modified September 5, 2017.
<https://www.planetnatural.com/garden-soil/> “Preparing Soil for Planting.” Yankee Publishing Inc. Last modified May 25, 2018. <https://www.almanac.com/content/preparing-soil-planting>

“Soil pH Levels for Plants.” Yankee Publishing Inc. Last modified August 15, 2017.
<https://www.almanac.com/content/soil-ph-levels>

“Starting Seeds Indoors.” Yankee Publishing Inc. Last modified 2018.
<https://www.almanac.com/content/starting-seeds-indoors#>

“USDA Plant Hardiness Zone Map.” United States Department of Agriculture. Last modified 2012.
<https://planthardiness.ars.usda.gov/PHZMWeb/>

Vinje, Eric. “Garden Planning and Design.” Planet Natural Research Center. Last modified August 8, 2017. <https://www.planetnatural.com/garden-planning/>

TO PLAN A GARDEN

Starting a thriving garden begins by knowing which plants fit the best in your environment. Gathering information about the lifecycle, length of a plant, hardiness zones, and how much sunlight it needs can help you decide which plants to pick.

Life Cycle:

There are three main categories of plants based on their life cycles: annuals, biennials, and perennials. This is the life of a plant as it goes from germination to bloom, produces seeds, and then dies. Choose plants depending on how quickly they grow and produce flowers or fruits. Also consider how often you will need to replace the plants.

Annuals	Biennials	Perennials
---------	-----------	------------

- Completes life cycle in single growing seasons (1 year or less)
- Faster growing
- Good for redefining garden
- Ex: Zinnias, cosmos, Sweet asylum

- Life cycle over 2 years
- Flowers usually during second year
- Good for designing gardens over time
- Ex: Foxgloves, Canterbury bells

- Life cycle longer than 2 years
- Hardy Perennials can stand severe winter cold. Ex: Iris, peonies
- Tender perennials can be killed by freezing temps. Ex: marigolds, geraniums
- Good for perennials and recurring gardens

Full Sun (high)
6+ hours

Full Shade (low)
3-4 hours

Part Sun (med)
4-6 hours

Sun and Shade:

One of the most important things is to decide on the amount of sunlight your plants will get. They need a certain amount to thrive, neither too little nor too much. Know about how many hours of sunlight different areas of your garden get daily, then choose plants accordingly.



Plant Hardiness:

Every plant is hardiest in its natural, native habitat. Hardiness is the resilience of a plant in climate conditions in a specific area year-round. This map shows you the zones of the United States based on average annual minimum winter temperatures for the 2019 season.

To Plan a Garden, 2018, Maria Uhase, Watercolor and Ink, 22" x 30"

THE SOWING OF SEEDS

Sowing indoors:

One way to sow seeds is in an indoor situation. This gives plants a head start on the growing season, and in controlled conditions they have a better chance of germination. You can start about 6-8 weeks before the last hard frost in the area. Rather than waiting until after this point. This is best for heat-loving plants (ex: tomatoes, peppers, eggplants), and most flowers that can withstand being transplanted (ex: petunia, amaranth).

1. Prepare:

Fill clean containers that have individual cells with potting mix formulated for seedlings. An example is equal parts vermiculite mixed with soilless peat-moss. Pour mix into bucket, blend, and moisten with warm water.



2. Sow

Place 1 to 2 plant seeds in individual cells according to instructions on seed packets. This way there is an alternate if one seed fails to germinate. Most seeds can be gently pressed into soil with the end of a pencil. Cover containers with perforated plastic for ventilation, then place in an area with strong sunlight or under an indoor grow light. Seeds sprout best at 65°-75°F (13°-24°C).



3. First Transplant:

When seedlings get their second pair of leaves, fill larger individual pots with a blend of potting mix and compost. Gently remove plants with soil and place into new pots. Moisten the soil and keep out of sunlight for about 2-4 days.



4. Hardening Off

Seven to ten days before the final transplant into the outdoor garden, set plants outside in dappled shade for only a few hours each day. Gradually increase exposure to full sun and keep soil moist.

5. Transplanting

After about 4-6 weeks after sowing, set plants into loose, well-aerated soil in the garden. Soak soil around new seedlings immediately, and spread mulch to reduce moisture loss.



5. Water:

Add water to soil gently, avoiding splashing and disturbing the seeds. This may need to be done a few times a day until germination.

Maria Uhase 2018

Growing flowers, vegetables, or fruits from seed takes some work, but in the end it is more fulfilling and cost efficient than buying them pre-grown from a nursery. Here are a few ways you can start your plants, including when in the season to begin and the growing process.

Sowing outdoors:

This method of sowing seeds is directly in the garden soil after the last hard frost occurs. It is best for tap-root vegetables that don't transplant well as seedlings (ex: carrots, radishes), and for flowers that thrive in cool soil (ex: poppies, moonflower).



1. Prepare Soil:

In early spring use a rake to loosen soil by breaking up large soil clumps. Remove debris like rocks and sticks. Add fertilizer or organic matter to soil as needed and then level the surface.

High Clay Soil:

Cover seeds lightly with seed-starting mix (equal parts vermiculite and soilless peat-moss).

Small Seeds:

Add sand to help with even dispersal.

2. Sow:

Place seeds in soil following the instructions on the seed packet (above are some additional tips). Generally plant at a depth 3 times the seed diameter or allow them to rest on top of soil and press gently down.

Large Seeds:
Make long furrows in soil and drop seeds at proper spacing.

THE PREPARATION OF SOIL

A successful garden with healthy plants depends on having the proper soil. This means having a balance in nutrients, a supportive soil type, and a healthy pH level to help the plants grow the best. Figuring out what it needs is as simple as taking a soil sample during the fall season, and either using an at-home kit or sending it to be professionally tested. This will tell you the basic texture of your soil, the pH level, and will calculate and recommend which nutrients are needed.

Soil texture: Varies from sandy soil, loamy soil, or heavy clay soil depending by the amount of sand, silt, or clay that it holds.

Sandy Soil:

- Gritty to the touch, has biggest pieces of soil particles
- Is generally nutrient-poor, low in beneficial microbes, and organic matter
- Amendments: add humus, aged manure, peat moss, or saw dust

Heavy Clay Soil:

- Dense, does not drain well, hard, cracks when dry
- Has little organic matter and microbial life
- Plants have hard time growing roots through hard material
- Amendments: add coarse sand, compost, or peat moss

Loamy Soil:

- Ideal type of soil for successful plant growth
- Balanced combination of sand, silt, clay
- Rich in humus (decayed materials like leaves, grass, compost)
- Holds moisture, drains well, filled with air for plant roots, has essential minerals



pH: Good pH levels allow plants to absorb nutrients well, while a pH that is either too high or too low can lead to plant nutrient deficiency or toxicity. The ideal pH level for soil is from 6.5 to 6.8. These are some ways to help balance levels:

Acidic: 6.0 or lower

• Add powdered limestone in fall, or at least 2-3 months before planting

- 3-4 lbs of ground limestone per 100 ft² for sandy soil
- 7-8 lbs of ground limestone per 100 ft² for loamy soil
- 8-10 lbs of ground limestone per 100 ft² for heavy clay soil

Alkaline: 7.0 or higher

• Amendments: add sulfur, sawdust, conifer needles, or oak leaves

- 1 lb of ground sulfur per 100 ft² for sandy soil
- 1.5-2 lbs of ground sulfur per 100 ft² for sandy soil
- 2 lbs of ground sulfur per 100 ft² for heavy clay soil

Organic Matter: compost is an easy and environmentally friendly form of fertilizer. It can help fix the texture of sandy and clay soils, and slowly release nutrients when mixed in. Also it can help with improving aeration, beneficial microbial growth, and moisture retention. Create your own compost to add to garden annually.

Compostable Goods:

- Coffee grounds
 - Eggshells
 - Hair
 - Nutshells
 - Pasta
 - Leaves
 - Sawdust
 - Shredded paper
 - Grass clippings
 - Food waste
 - Straw
- (Avoid meat & dairy)

Nutrients: A soil test kit will provide you with the levels of the three primary nutrients for a garden: Nitrogen (N), Phosphorus (P), and Potassium (K). It is possible to add or replace these nutrients as needed using either nonorganic or organic (suggested) fertilizers.

Nitrogen (N)

- Strong leaf and stem growth, dark green color (wanted in broccoli, cabbage, greens, herbs)
- Add alfalfa meal, fish meal, or blood meal to increase

Potassium (K)

- Plant root vigor, disease, and stress resistance; enhances flavors (carrots, radishes, turnips, onions, garlic, etc.)
- Add green sand, wood ashes, gypsum, or kelp to increase

Phosphorus (P)

- Root growth and early plant growth, blossoms
- Add bone meal (fast-acting) or rock phosphate (slow release) to increase

Maria Uhase
2018

WATERING

One of the main reasons people struggle to grow plants, either indoors or outdoors, is regulating the water. Finding the right balance between too much or too little, and knowing when to water are the most crucial things to understand.

Firstly, make sure you need to water: check soil moisture by digging a small hole with trowel or finger and feel the earth. If cool and damp below the surface, leave watering for later.

Water early in the morning before temperatures rise and evaporate the water immediately. If you water at night moisture lingers too long and invites slugs and fungal problems.

Water deeper and less often rather than frequently and lightly. Saturate each plant several inches down; this encourages the growth of roots.

Conserve Water:

- Group plants together when planting to cover ground. This keeps water from evaporating as fast and prevents weed growth.
- Trap water around plant by sinking large plastic pots into the ground up to the rim, then water the pot.
- Add organic material to help the soil hold onto moisture.
- Lay down mulch (about 2 inches) to slow evaporation; common types of mulch are wheat straw, shredded leaves, and wood chips.
- If allowed in your area, harvest water from an installed rain barrel.

Water Stress:

- overwatering and underwatering physically appear to have the same effects on a plant, but there is a difference.
- overwatering results in yellowing and dead leaves, and possible rotting.
- underwatering appears as wilting brown or dead leaves, and stunted growth.

WEEDING

Weeds are both unappealing and absorb nutrients and water from the soil that your plants need. Many gardeners resort to chemicals and herbicides to eliminate them, but they are harsh on the environment and many weeds are resistant to them anyway. Here are some natural tips:

Use mulch: besides maintaining moisture levels, it also blocks weed seeds from germinating and inhibits growth underneath.

- Keep mulch a few inches away from plant bases.
- For a more effective tactic, cover the earth with newspaper (black ink only), and then top it off with 2 inches of mulch.

Group plants together when planting to help reduce weed growth in between.

- Pull weeds: be careful to do this right the first time or it will regrow.
- It's best to do it when soil is wet, and when weeds are younger with less roots.
- Pull weeds from base (close to soil line); use a fork to remove missed roots.

Grow cover crops that spread easily as they grow to block weeds from growing, like wheat, clover, forage radishes, or barley.



Weeding and Watering, 2018, Maria Uhase, Watercolor and Ink, 22" x 30"

Aphids:

- Small (1/8-inch long), soft bodied, pear-shaped insects
- Green, yellow, brown, red or black
- Generally adults are wingless
- Secrete large amounts of a sticky fluid called honeydew when they feed

PROTECTING THE GARDEN

Fighting off garden pests and diseases does not always involve using toxic pesticides and herbicides. These tend to infiltrate rivers, oceans, and wetlands. Alternative solutions include organic pesticides and herbicides, or simple do-it-yourself techniques. Here are identifications for a few of the most common pests and diseases:

Cabbage Looper:

- Common destructive pest
- AKA: Inch Worms
- Eat three-times their body weight in plant material a day in larval stage

Slugs and Snails:

- Thrive in damp, shady areas
- Most active at night feeding on living or decaying plants
- Chew large holes in foliage
- Damage seedlings and low-growing vegetables and fruits

Leaf Miner:

- Larval stage of insect family
- Feed between upper and lower surfaces of leaves
- Create clear, winding tunnels

Strik bugs:

- Mostly familiar with brown marmorated species
- Have characteristic odor
- Cosmetic damage, or causes early decay

Leaf Spot:

- Caused by either bacteria or fungus
- As spots become more numerous, entire leaves may wither and drop
- Most active where there is plenty of moisture and warm temperatures

Fire Blight:

- Bacterial disease
- Enters plants at tips of branches and travels down stems causing dieback
- Kills blossoms, shoots, limbs, or entire plant

Rust:

- Common fungal disease
- Mostly on mature plants on surfaces of lower leaves
- Severe infestations deform and yellow leaves, causing them to drop

Cut Worms:

- Feed on plant stems at or below ground, eventually cutting them down
- Feed at night and burrow into soil during day
- Can take down entire row of plants in a single night



Honors Senior Research Project Exhibition
Emily Davis Gallery, Myers School of Art
11/9/18 – 11/14/18