Professor Amy Leidtke
Design Principles I

WEEDING FORK

Garden Tool Redesign for Severe Arthritis

Melissa Chen

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DESIGN BRIEF

Challenge: Redesign a gardening tool for users with severe arthritis.

Gardening is a widely practiced activity, but many gardening tools, including weeder forks for tackling stubborn weeds, are primarily designed as hand tools with unfriendly grips. These designs often result in pain and discomfort, particularly for users with limited hand strength or conditions like arthritis.

The OXO Swivel vegetable peeler is an example of the importance of “inclusive design”, as the rubbery handles developed for people with arthritis became better tools for everyone to use. Building on this, the design process will emphasize comfort and ergonomics, iterative prototyping, working with the user group, and incorporating feedback. Applying principles of inclusive design, this goal of this project is to **redesign the weeder fork for senior gardeners living with rheumatoid arthritis, to create an accessible and comfortable tool that can ultimately benefit all users.**

01

PRODUCT ANALYSIS

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I. PRODUCT OVERVIEW

HISTORY AND VARIATIONS

- The first steel garden fork was introduced by Alexander Parkes at the Great Expedition in London in 1851. The same qualities of this fork are still evident in use in the English garden fork of today.
- The Industrial Age brought about mass production of steel. In the 1860s, the steel digging fork enabled a man to perform one-third more work in a day than with a spade because it breaks the soil well.
- Shorter, closer-spaced, thinner tines are known as ladies' forks, and are used for lighter weeding.
- Forks with broader, flatter tines are made for lifting root crops from the ground.
- A pair of forks back-to-back is used to lever apart dense clumps of roots.
- Other variations: dandelion weeder, weed puller.

NAME: Weeding Fork

COUNTRY: Europe

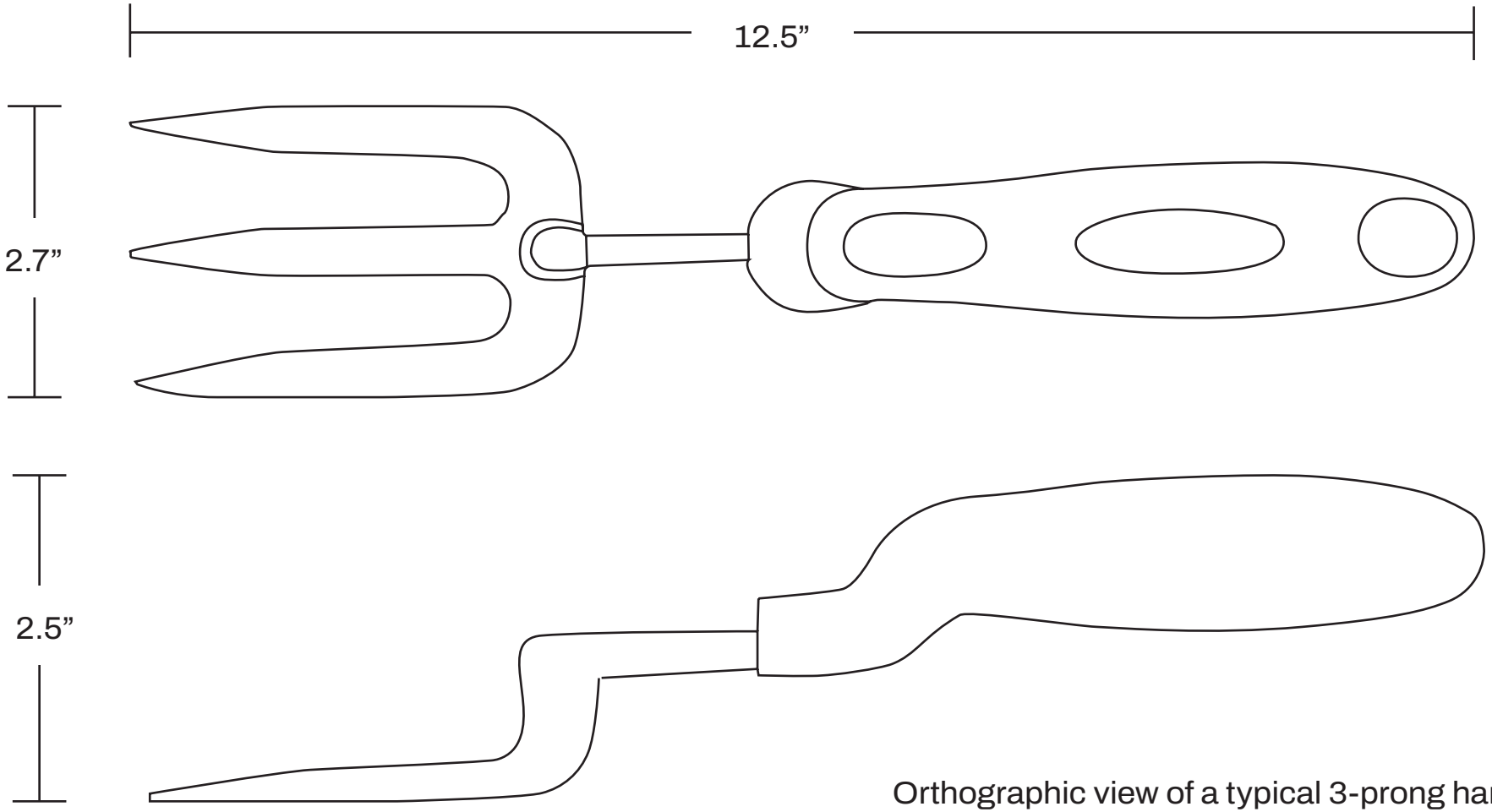
USE: A forked tool for removing weeds from the soil

PRONGS: Number can range from 2-10, and can be straight or curved

MATERIAL: Wood, steel

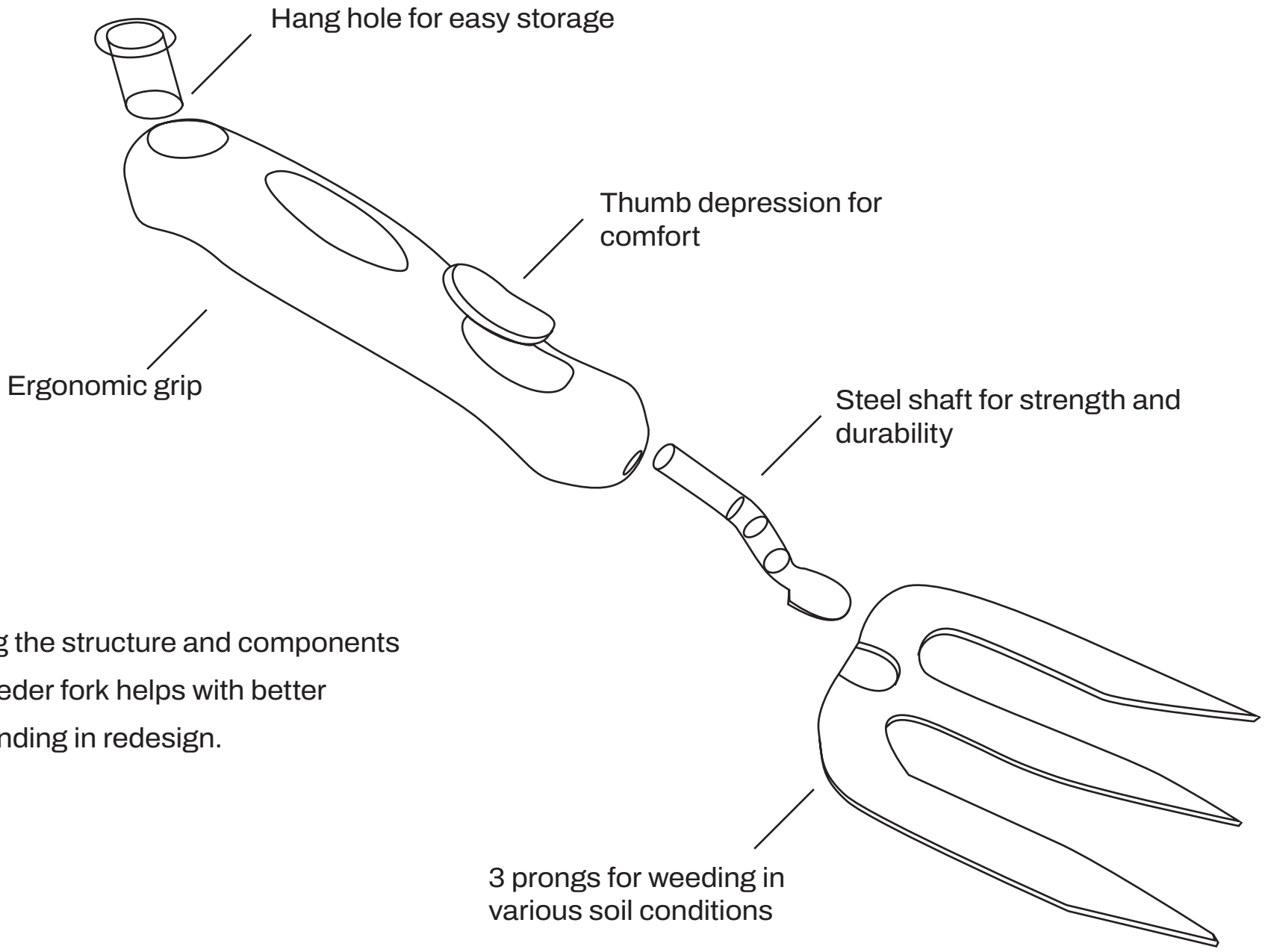
Garden Guru's 100% Stainless Steel Gardening Fork

II. ORTHOGRAPHIC VIEW



Orthographic view of a typical 3-prong hand weeder. Example from Garden Guru. All measurements shown in inches.

III. EXPLODED VIEW



Analyzing the structure and components of the weeder fork helps with better understanding in redesign.

02

DESIGN RESEARCH

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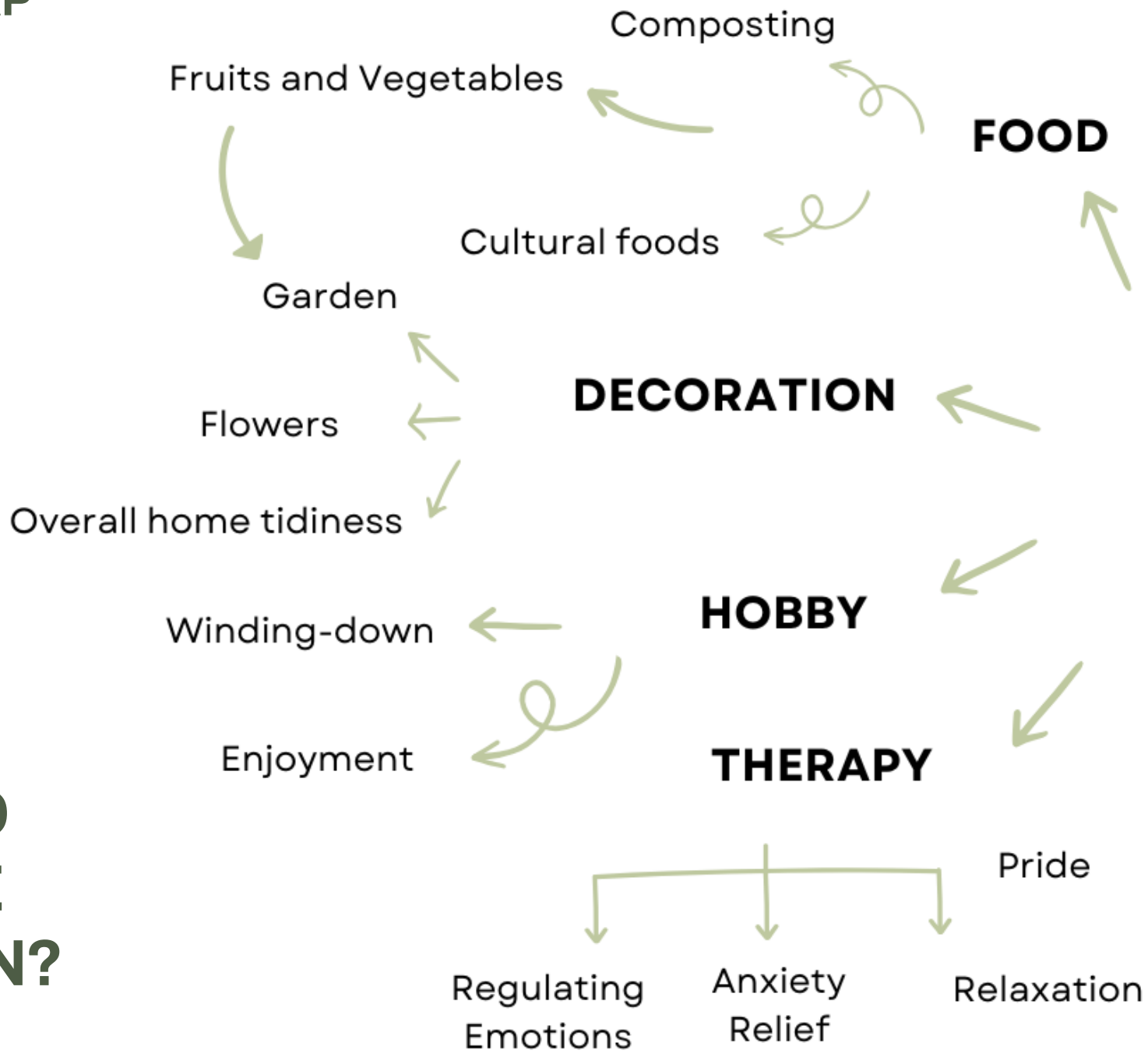
16 Empathy Map
17 Ergonomic and Biomechanic Analysis
18 Market Analysis
20 Patent Research
22 Brand Analysis
24 Handles, Weight, and Retail Analysis

WHO are you designing for?

WHAT already exists?

I. MIND MAP



WHY DO PEOPLE GARDEN?

Making money

Family business

WORK

Staying fit

Garden clubs

EXERCISE

Low-impact exercise

COMMUNITY

Socializing

Collaboration

Activism

MAINTENANCE

Native plants

Removing invasive species

Sustainability

Prevention of fire

Prevention of floods

II. USER PERSONA

Ahmed Khan

Expectations

- Wants to get rid of weeds comfortably to plant vegetables and flowers.
- Wants to be able to spend more time in a comfortable state when he is tending to his backyard.
- Does not want to think about how his back pain will affect him when he bends down or stands up.

Frustrations

- **Hands**: Impacted by swelling, which makes it challenging to handle gardening tools or plant seeds. Cannot exert too much force with his hands.
- **Mobility**: Pain in lower back makes bending and lifting objects challenging. Cannot work for too long, has a hard time getting up after sitting or squatting for an extended period of time.

Needs

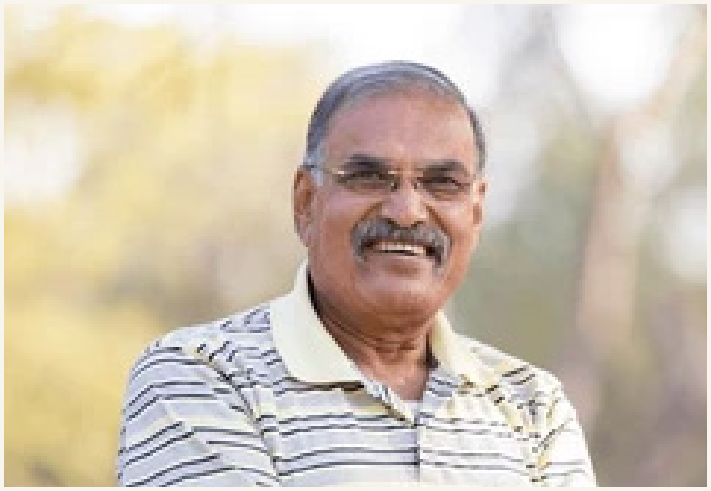
- **Sustained comfort**: To allow him to move around for longer outdoors.
- **Ergonomy**: Tools that are easy on his hands, but still strong enough to dig through dirt and tough weeds. Handles should be sized to fit his hands and take into consideration swelling caused by prolonged usage. A longer reach may be useful so he is not required to constantly bend down.
- **Accessibility**: A cane can aid him in getting up when he is squatting down to work in the garden.

Age: 60

Occupation: Software engineer

Family: Married, father of two recent college graduates (23 and 26)

Location: San Jose, California



“With my two kids gone, I have so much more time for hobbies. Now I can finally spend more time in the garden, even if my back and joints remind me to take it slow.”

Motivations

Learning curve

Comfort

Product longevity

Affordability

Ahmed has been a software engineer his whole life to support his family. His two kids are recent college graduates in the workforce, and now financially independent, so Ahmed finally has some time to himself. He has always wanted to transform his backyard, which became so neglected that weeds completely took over. After overcoming the weeds, he dreams of a flourishing vegetable and flower garden for he and his wife to tend to in their retirement.

III. RHEUMATOID ARTHRITIS RESEARCH

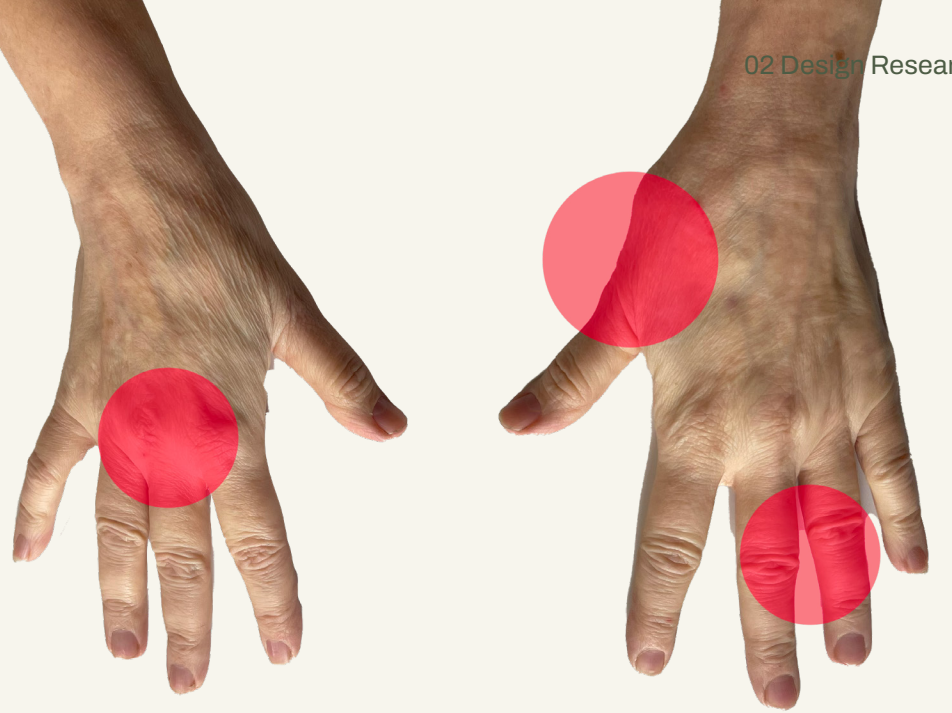
Rheumatoid Arthritis (RA) is a chronic autoimmune disease that occurs when the immune system, which normally helps protect the body from infection and disease, attacks its own tissues, typically in the hands and feet. It usually starts to develop between the ages of 30 and 60.

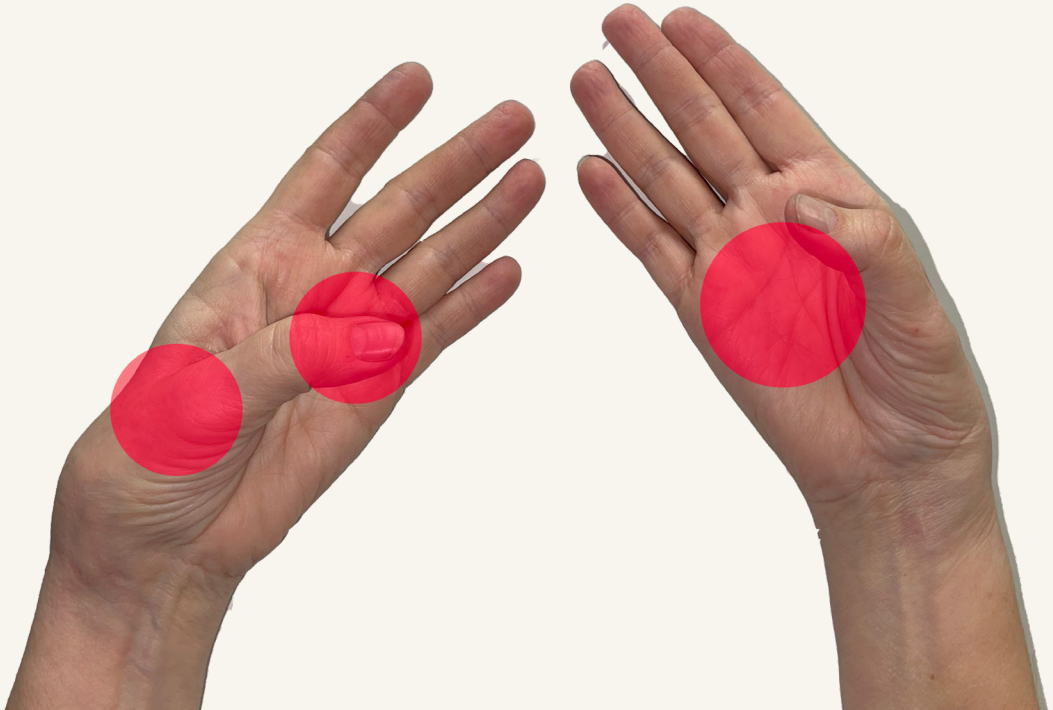
The disease causes pain, swelling, stiffness, and loss of function in joints. This may lead to bone erosion and joint deformity. Fatigue, fever and loss of appetite also can be symptoms.

There are over 200,000 US cases per year. Medicines, physical therapy, and surgery aim to control symptoms and prevent joint damage. *(Source: Mayo Clinic)*

Pain Points

- Joints: stiffness, swelling, tenderness, or weakness
- Whole body: fatigue, anemia, or malaise
- Skin: lumps or redness
- Hand: bump on the finger or swelling
- Also common: hysical deformity, or sensation of pins and needles





IV. EMPATHY MAP

SAYS

"I want to enjoy my garden."
"I need to find a way to accommodate for my aging body."
"I want something effective."
"I need to find a way to work with my body, not against it."

THINKS

"I don't want to hurt myself doing this at my age."
"Will this tool last and we worth the investment as my arthritis and back pain only grows worse?"
"I want to focus on enjoying the process, not struggling with it."

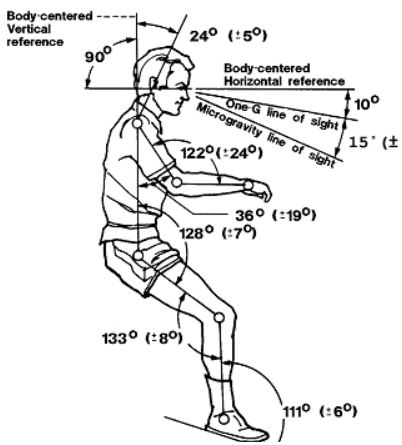
DOES

- Looks for tools with padded or ergonomic grips
- Looks for longer tools that are back-friendly
- Takes frequent breaks in between gardening

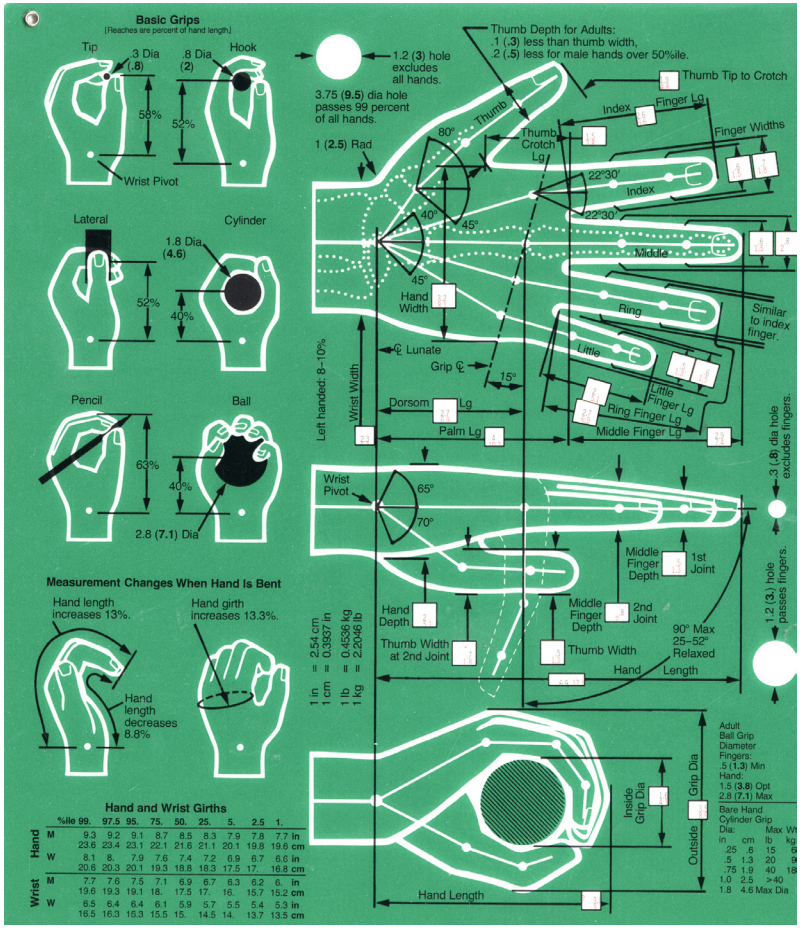
FEELS

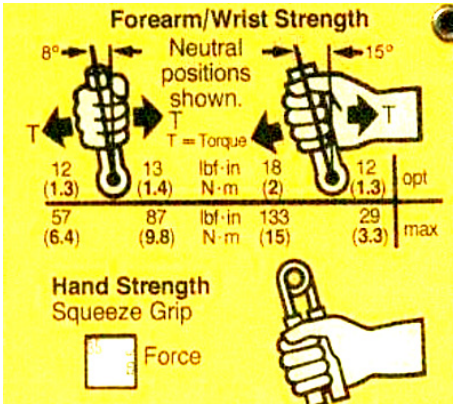
- Motivated to have a beautiful garden despite physical limitations
- Frustrated about current tools that pinch and cause discomfort to his joints and back
- Relieved to use tools that let him stand
- Fulfilled to see results

V. ERGONOMIC AND BIOMECHANIC ANALYSIS



Ergonomic analysis is essential in creating comfortable, safe, and efficient products. Biomechanics is the scientific study of the strucutre, function, and motion of the mechanical aspects of biological systems to help us gain a better understanding of movements that are natural and efficient.





Neutral wrist position is important to alleviate stress and strain on the wrist, and protect smaller joints affected by arthritis by using larger muscles to achieve movements.

The natural line of movement for the arms is in a straight line, and when exerting force with both hands, the natural position is slightly less than shoulder width apart.

The most comfortable grip for the general population ranges from 1.2” to 1.5” in diameter.

Source: Humanscale, The Measure of Man and Woman: Human Factors in Design

VI. MARKET ANALYSIS

Grampa's Weeder

Retail Price: $44.99

- **PROS:** 45" long handle helps remove weeds without bending, pulling, or kneeling. Features a 4-claw design that tackles weeds on softer soil types.
- **CONS:** Stepping mechanism is bad for balance, and handle is not ergonomic for users with arthritis. Not suitable for all soil types.

Peta Easi-Grip Long Reach Garden Fork

Retail Price:$58.95

- **PROS:** Extended shaft designed for gardeners who have to sit. Lightweight stainless steel tools are ideal for people who have difficulty reaching or bending. Soft grip handles are set at a right angle neutral position.
- **CONS:** Handle slips out of grasp for users with weaker hand grip strength, so the Arm Support Cuff (Retail Price: $14.95) is strongly recommended as an aid, which is not accessible to all users.

Grampa's Hand Weeder Tool

Retail Price: $19.99

- **PROS:** Wood handle is good for strength, flexibility and durability, and is a natural shock absorber. The lever design allows for the perfect angle to pull weeds easily.
- **CONS:** Hand grip is not in neutral position. Frequent usage of hand tools leads to back and knee pain.

Fiskars Ergo Weeder Tool

Retail Price: $12.99

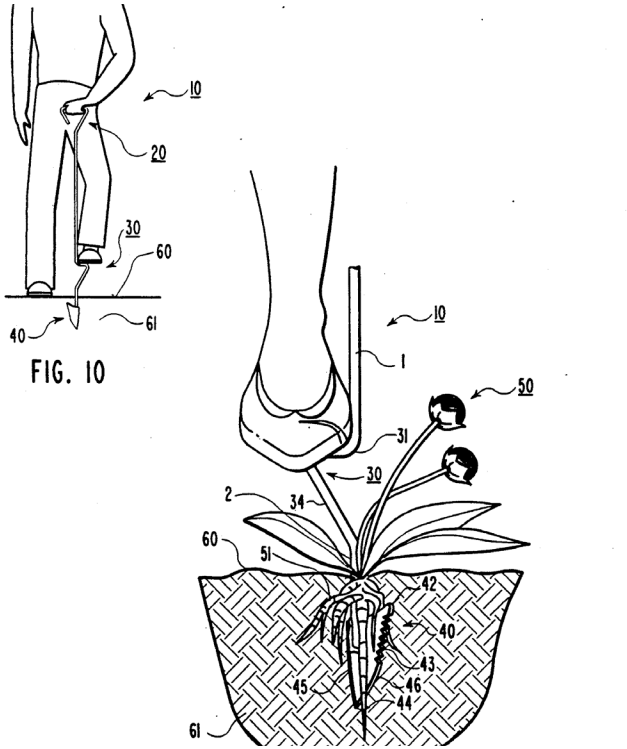
- **PROS:** Cast-aluminum angled head boosts leverage for uprooting in tough soil. Ergonomic handle with SoftGrip allows for more control of scratch tool and reduces fatigue.
- **CONS:** Hand grip is not in neutral position. Frequent usage of hand tools leads to back and knee pain.

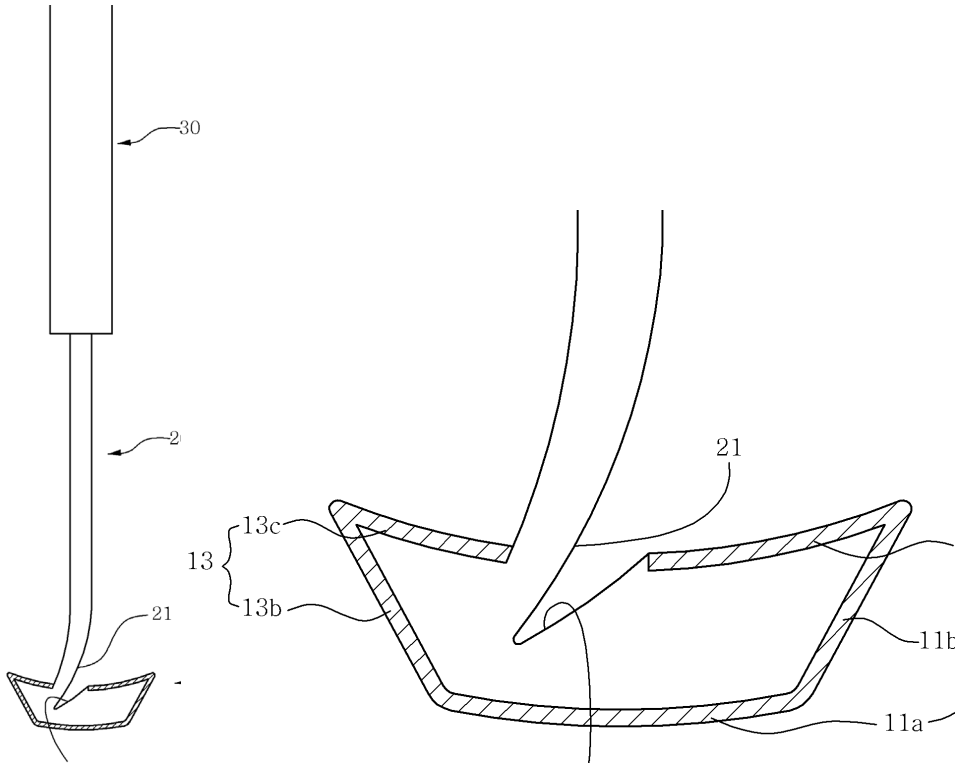
SIXCAR Weed Puller

Retail Price: $7.99

- **PROS:** Weed pulling design reduces strain. 13.3 inches is a comfortable length. Durable stainless steel design and multifunctional head. Ergonomic handle.
- **CONS:** Hand grip is not in neutral position. Handle can slip out of grasp without leverage, especially for users with arthritis whose hand grip strength is weakened.

VII. PATENT RESEARCH





Weed Extraction Device

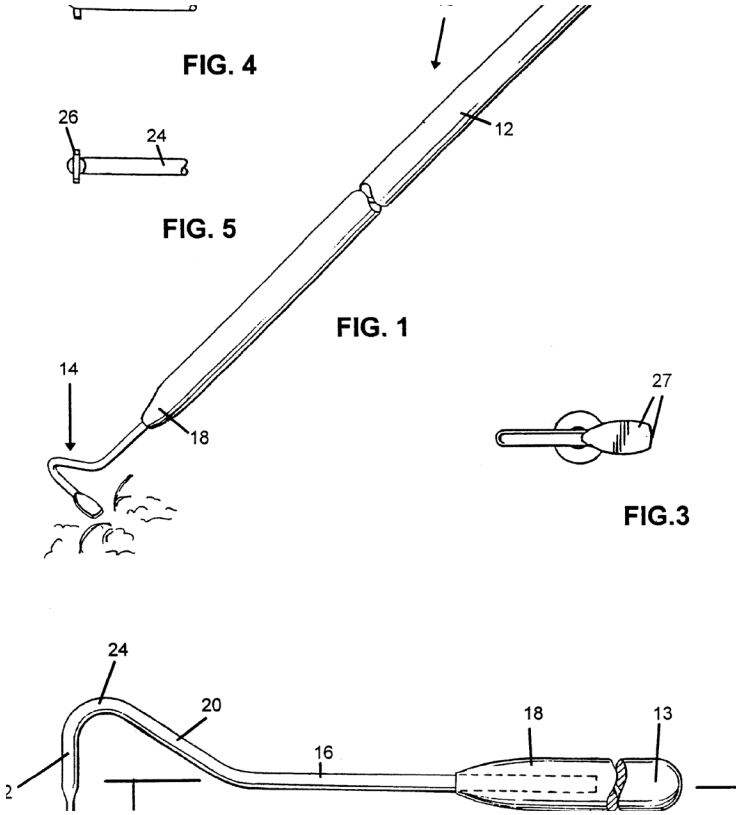
US5188340A, William J Greene, 1993

- **PROS:** Cuts roots all from a standing upright position with a minimum of physical force.
- **CONS:** Requirement of stepping can cause elderly to lose balance.

Weed Remover

KR20190110394A, South Korea, 2018

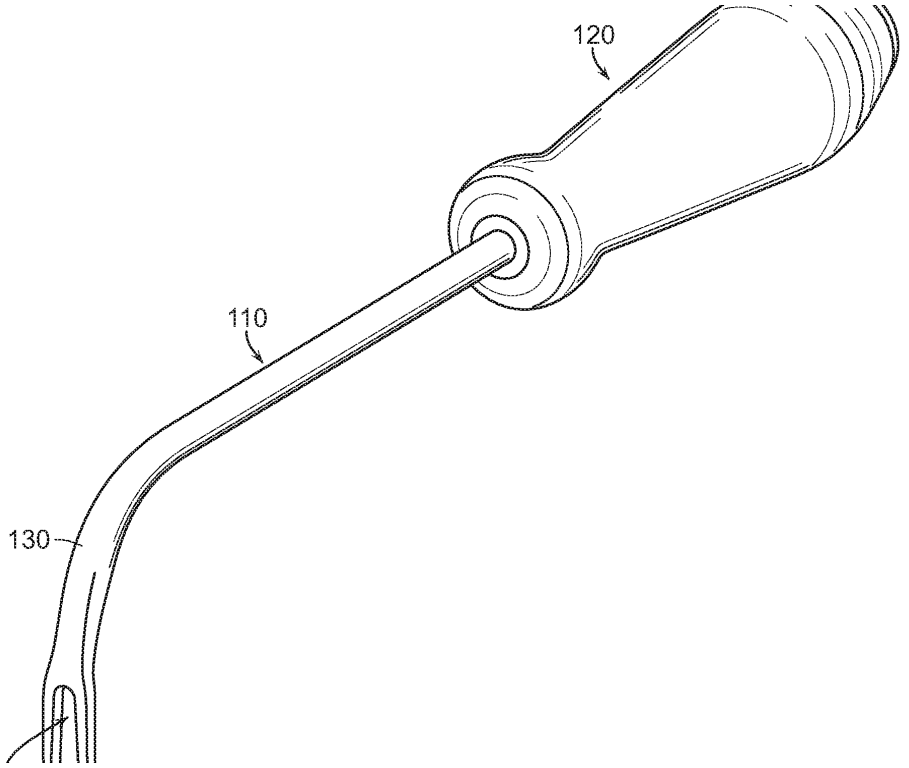
- **PROS:** For fine cutting work, affecting no damage to crops when weed roots are cut and pulled.
- **CONS:** Short, and requires strength in arm; unfriendly to older users.



Weed Hook

US6360826B1, Marvin M. Barber, 2002

- **PROS:** Length allows for weeds to be removed without bending.
- **CONS:** “V”-tine chopping and prying motions strain the hands and wrists.



Hand-held Weed Extractor

US20170295712A1, Robert LaViano, 2016

- **PROS:** Curved end of the tool acts as leverage to remove the weed.
- **CONS:** Hand-held tool increases strain on the back and knees.

VIII. BRAND ANALYSIS

GARDEN GURU™
LAWN & GARDEN TOOLS

"Got a Green Thumb? Go with the Guru.
All the tools you need.
Unmatched quality. Eco-friendly."

- Targeted towards professionals, budding green thumbs, or weekend gardeners.
- Tools built to last with a lifetime warranty.
- Ergonomic designs make tools for comfort & practical use.
- Key focus on sustainability, and tools are responsibly produced, taking great care to minimize carbon footprint.
- Committed to giving 1% of gross sales each year to support causes focused on environmental preservation and sustainability.

Brand Aesthetics

BRANDING

- Hang tang includes logo and graphics that show Garden Guru's commitment to sustainability.
- Logo also displayed on the handle top

COLOR

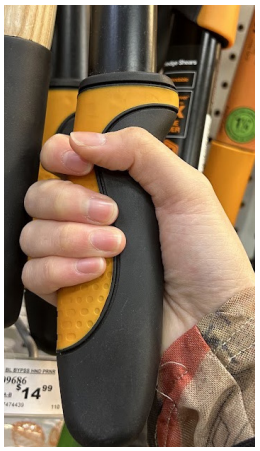
LIME

DARK GREY

MATERIAL

- 100% recycled stainless steel and wood from responsibly managed forests.
- Hang tags made from recycled and recyclable materials.

IX. HANDLES, WEIGHT, AND RETAIL ANALYSIS



In this phase of research, I went to Adler's Design Center and Hardware Store to research how various "ergonomic" grips fit in my hand. I also felt the difference in comfort between smaller, lighter hand tools, and larger heavier weeders. This gave me insight into where thumb grips are located as well as approximate sizing. Looking at how the products are sold in retail stores, hand tools are large tools alike are hung on the wall by their hang tag.

03

DESIGN PROCESS

26 Concept Sketch

28 Empathy Exercise

30 Initial Prototyping

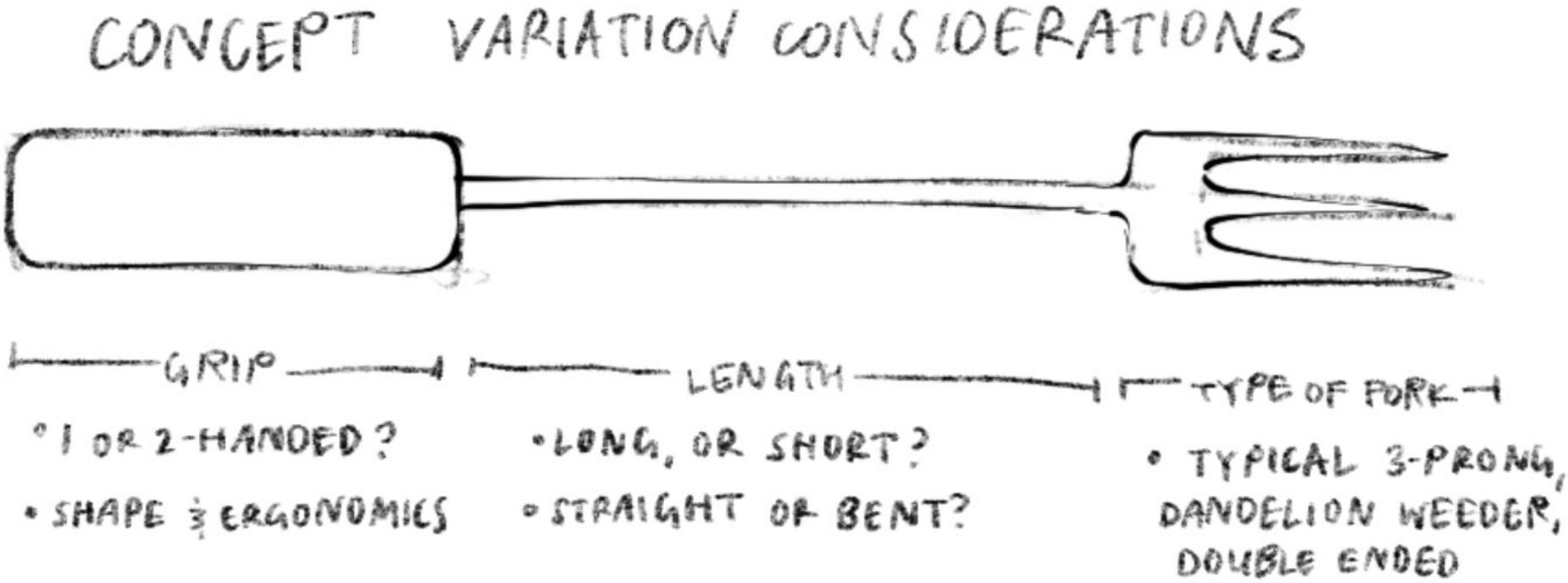
35 Feedback

36 Second Prototyping

38 Refinements

41 User Interviews

I. CONCEPT SKETCH



In my initial ideation and concept sketching, I considered variations in three areas: the grip, length, and type of fork. Then, I realized I didn't know enough about how it felt to garden with these different variations of tools.

Let's delve into empathy exercises ->

II. EMPATHY EXERCISE

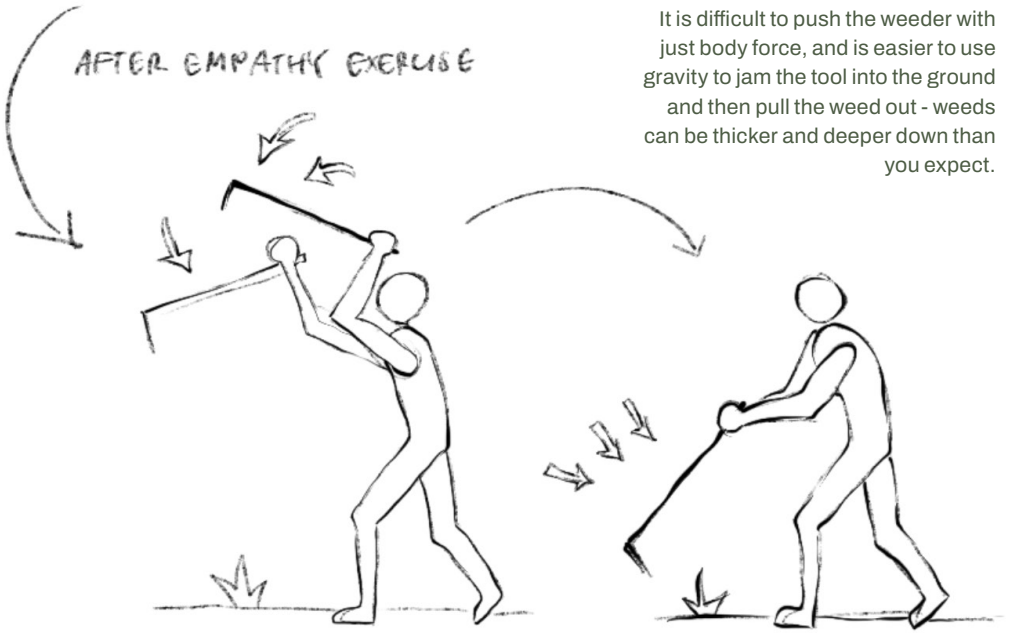
#1: Short or long weeder?

I used two different types of weeders for an hour to relate to users who are gardening for a long time, to understand which areas are most affected.

I found that not kneeling or squatting is best, due to dizziness and pain when you need to constantly stand and readjust for the next weed.

I observed that the palm hurts if you use it to force the tool into the ground.

I found that engaging in the hand weeder or a push weeder causes a considerable amount of fatigue and pain after prolonged usage. The least fatigueing tool I found was a standing weed puller tool.



It is difficult to push the weeder with just body force, and is easier to use gravity to jam the tool into the ground and then pull the weed out - weeds can be thicker and deeper down than you expect.

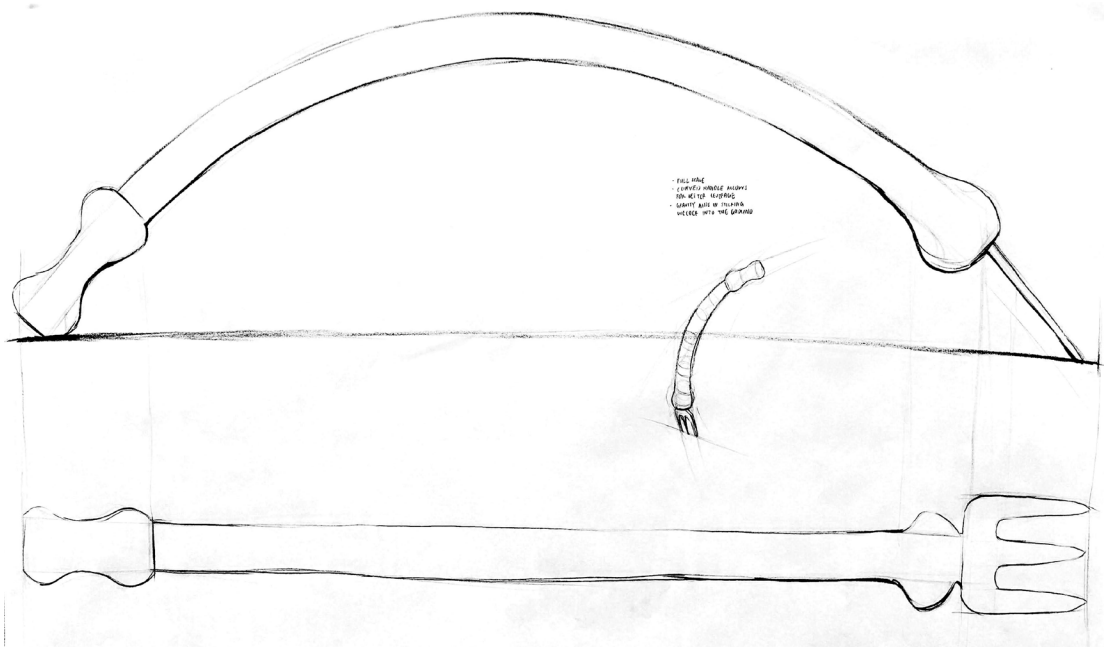
#2: Handle ergonomics for limited joint movement

I used masking tape as an inhibitor of movement to imitate and develop empathy for users suffering from rheumatoid arthritis in the hand joints in particular. This empathy exercise helps think about designing with the user in mind and a greater level of awareness of the stiffness and pain points they would be feeling.

There was extremely limited mobility in joints, proving neutral hand positioning in the grips is critical to think about.

I noticed that a larger and thicker handle that fills in the gap between the thumb and fingers is more comfortable on the joints, because it reduces vibrations that occur when the weeder tool hits the ground.

This thus changed my original perception was that a big handle would be too bulky and uncomfortable.



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III. PROTOTYPE EXPLORATION

25 Low-Fidelity Prototypes

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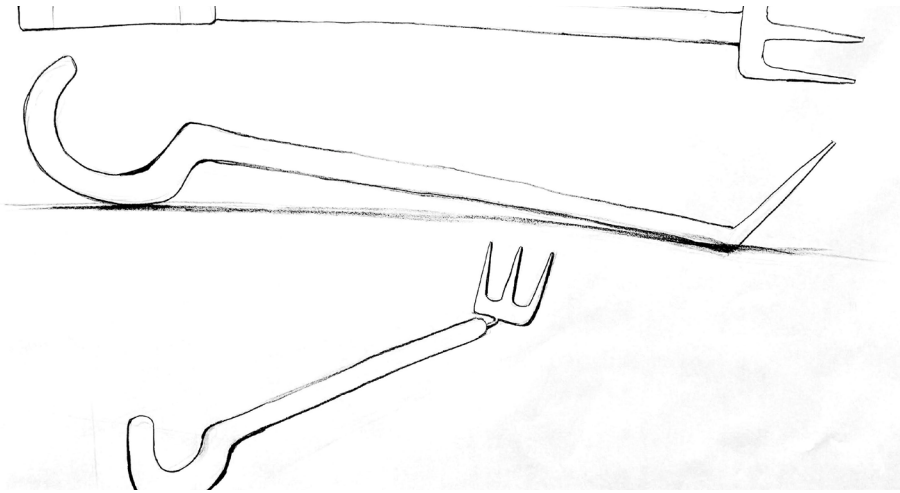

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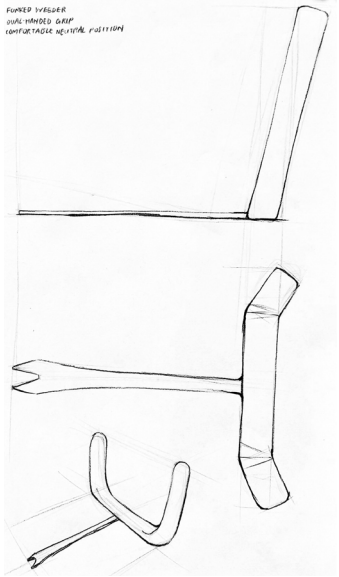
FUNNED WEEDER
DUAL HANDED GRIP
COMFORTABLE NEUTRAL POSITION

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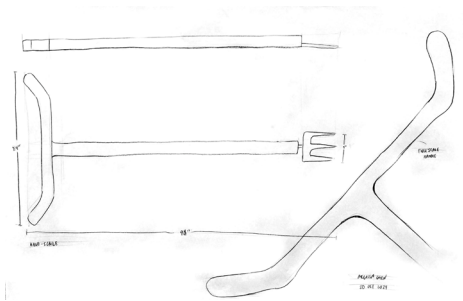

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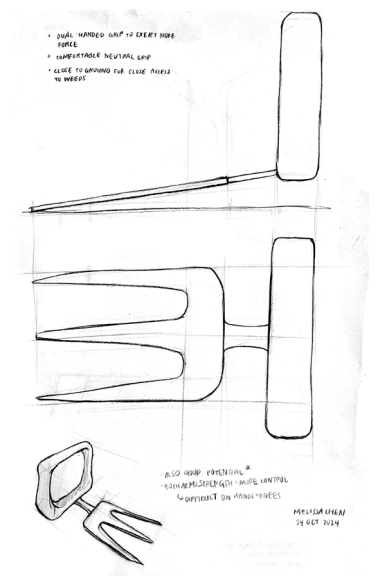
• DUAL HANDED GRIP TO EXERT MORE FORCE
• COMFORTABLE NEUTRAL GRIP
• CLOSE TO GROUND FOR CLOSE PICKS TO WEEDS
ALSO GOOD POTENTIAL
MELISSA CHEN
24 OCT 2024

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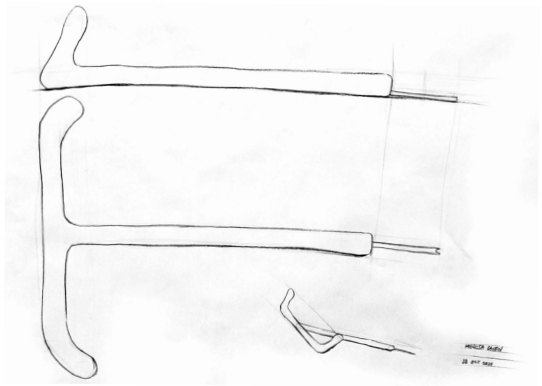

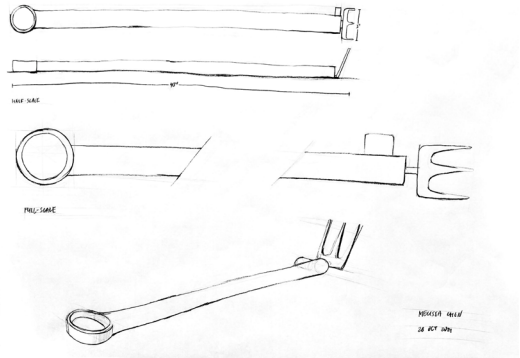

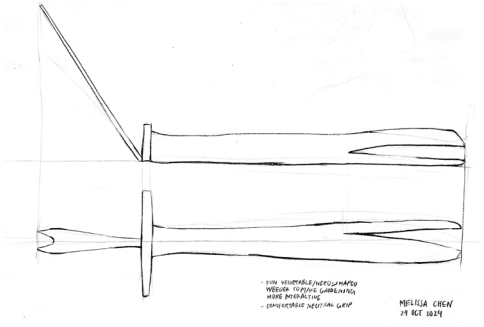

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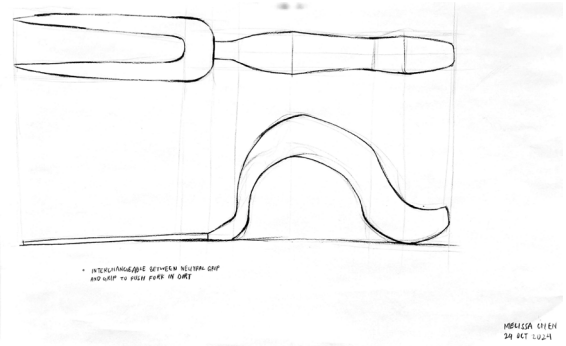

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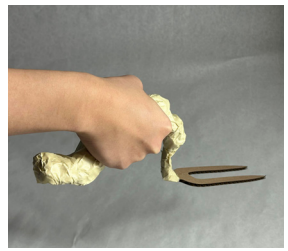

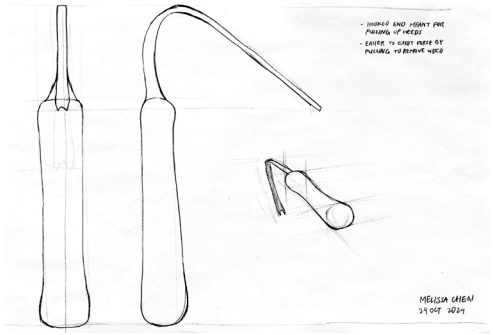

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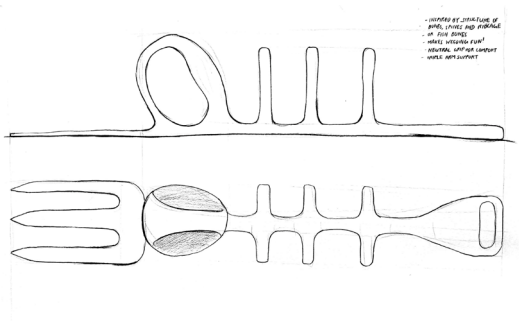

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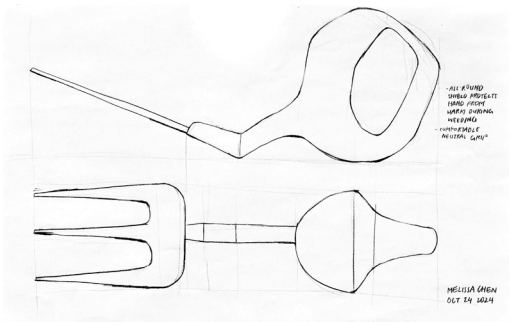

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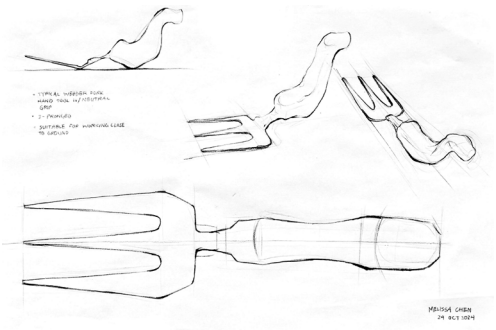

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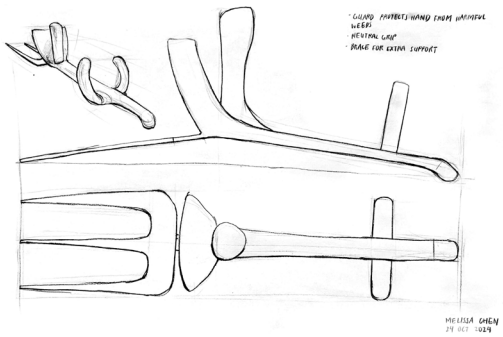

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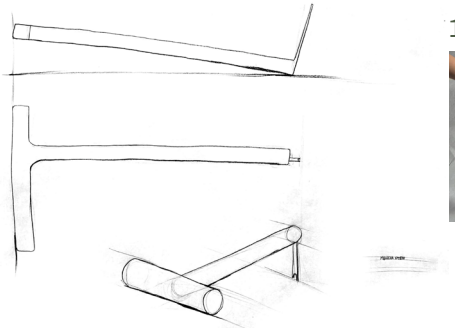

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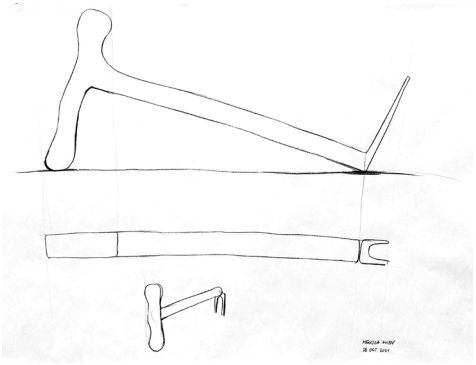

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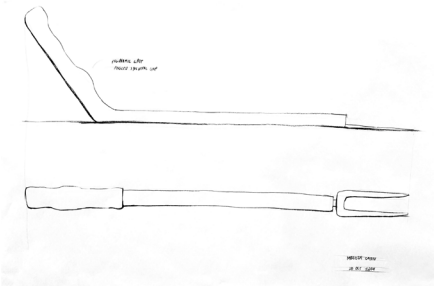

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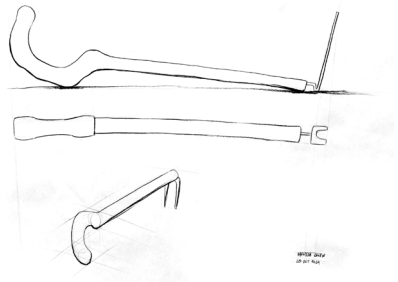

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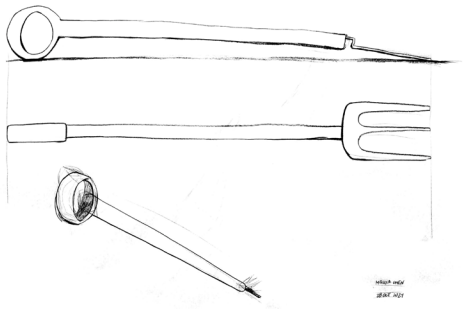

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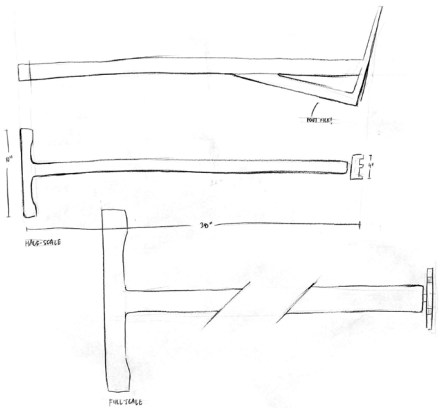

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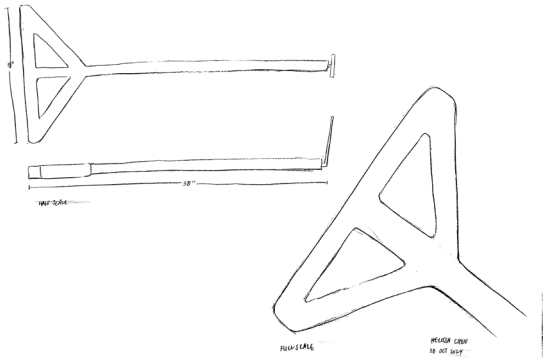

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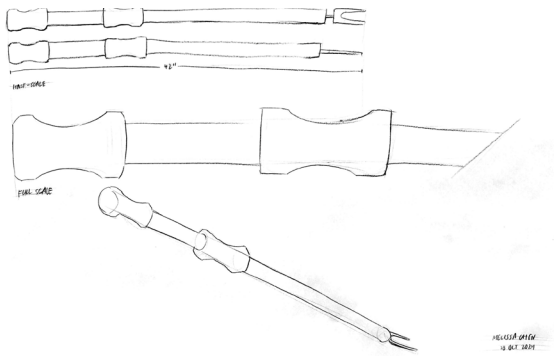

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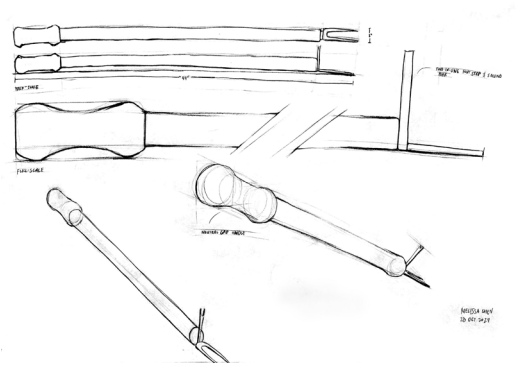

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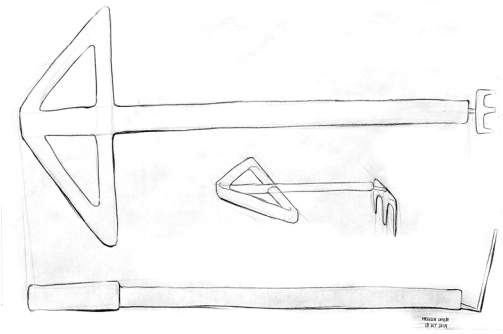

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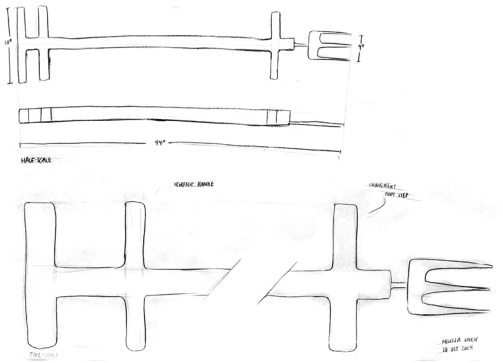


25

IV. FEEDBACK

- Make weeder forks longer in general
- Leverage such as a curved bar would be helpful
- Handles need to fit the curve of the palm when it is closed
- A medium length is comfortable and can act as a cane
- Pulling is more comfortable than pushing
- Too much arm support is unneccessary
- Stepping with the foot causes one to lose balance

LOOKING AHEAD

Incorporating this user feedback, in the next round of prototyping, I aim to hone in on longer weed pullers, testing lengths between 36” to 46”. I will be comparing the comfort of a single versus double-handed grip, different fork ends for efficient weeding, and various grip shapes and diameters for ergonomy.

V. SECOND ROUND OF PROTOYPING

5 Medium Fidelity

26

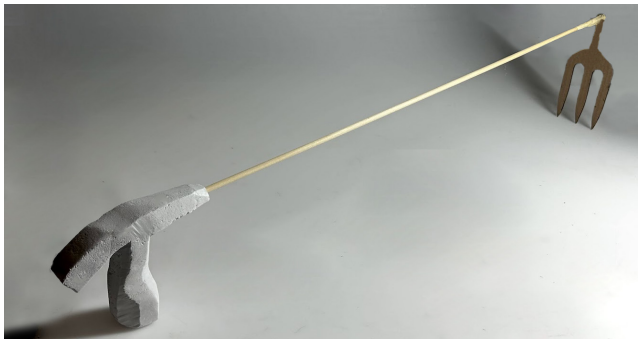
27

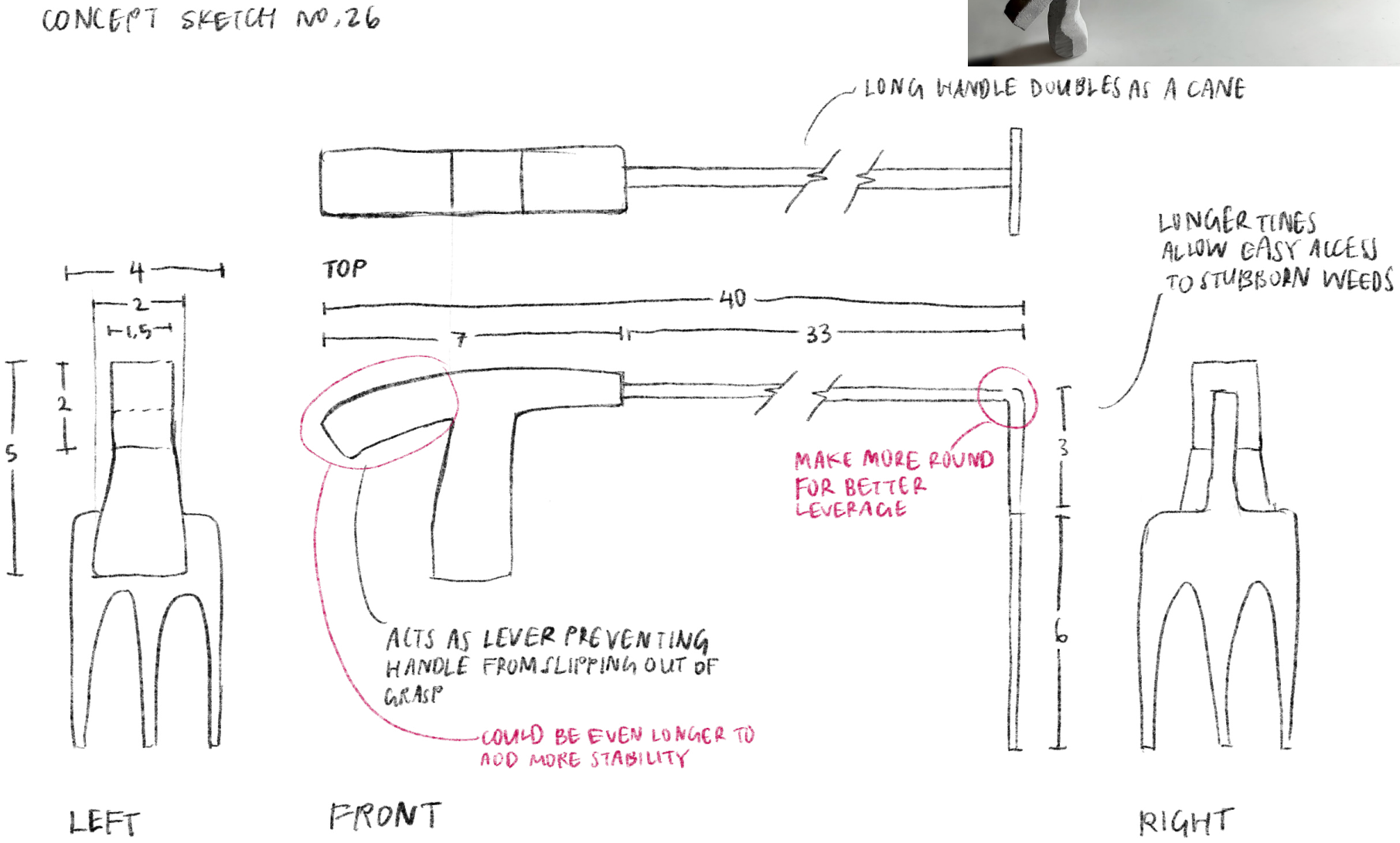
28

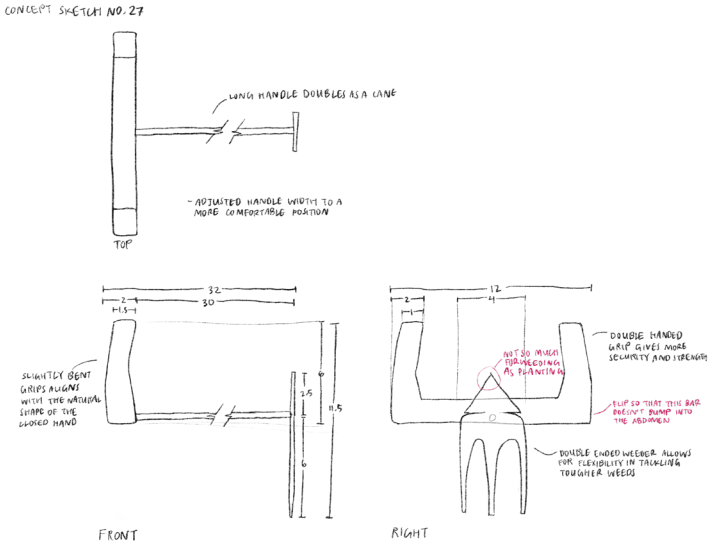
29

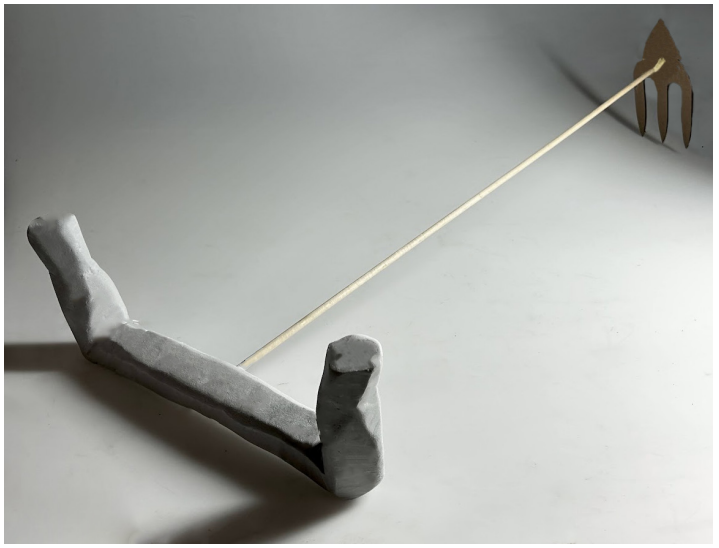
30

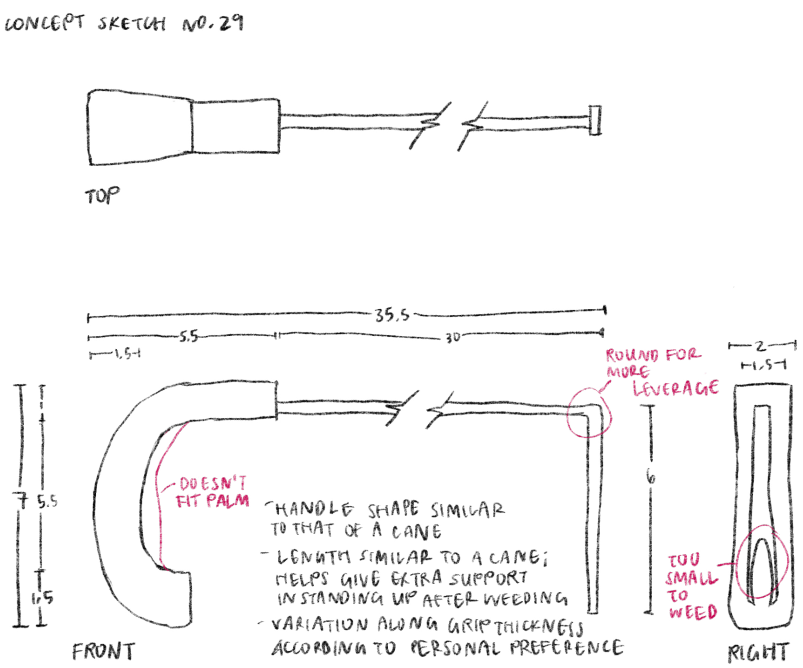
VI. REFINED CONCEPT SKETCHES

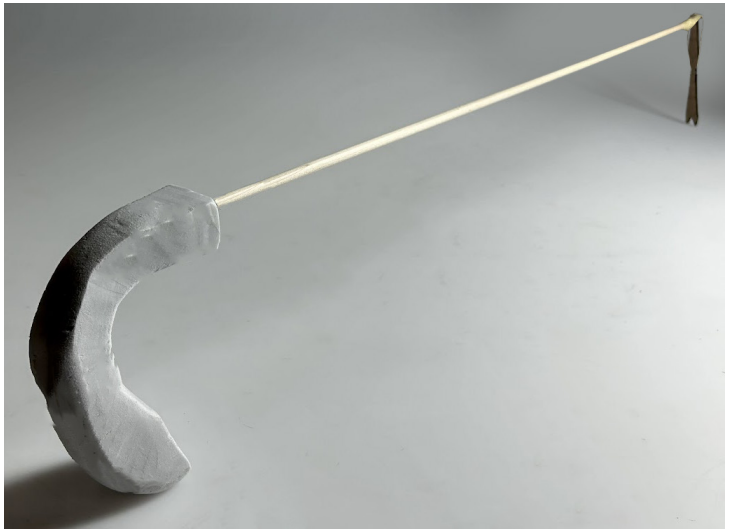


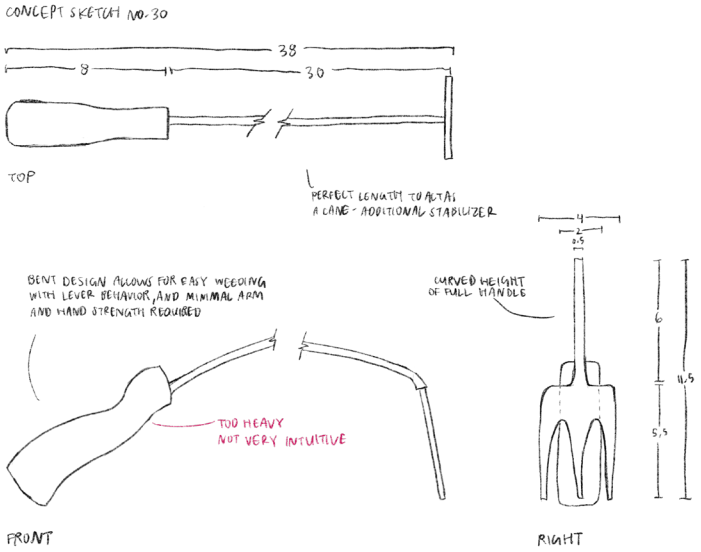


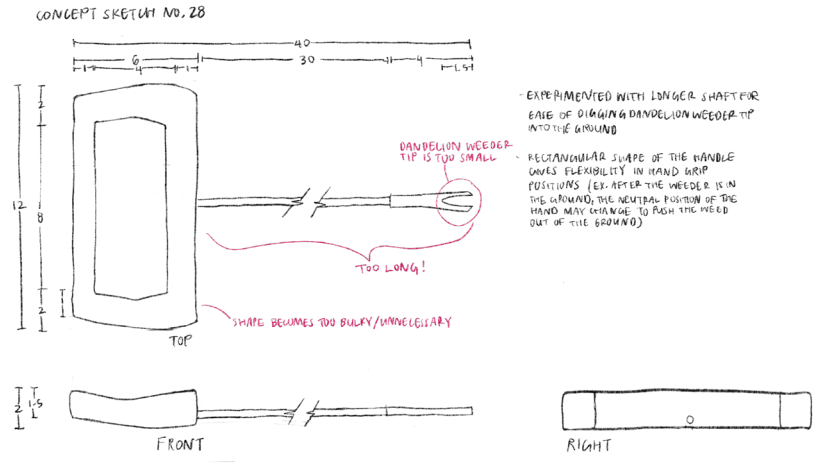

CONCEPT SKETCH NO. 27
LONG HANDLE DOUBLES AS A CANE
- ADJUSTED HANDLE WIDTH TO A MORE COMFORTABLE POSITION
TOP
32
30
2
1.5
SLIGHTLY BENT GRIPS ALIGNS WITH THE NATURAL SHAPE OF THE CLOSED HAND
9
2.5
11.5
6
FRONT
12
2
4
NOT SO MUCH FOR WEEDING AS PLANTING
DOUBLE HANDED GRIP GIVES MORE SECURITY AND STRENGTH
FLIP SO THAT TEH BAR DOESN'T BUMP INTO THE ABDOMEN
DOUBLE ENDED WEEDER ALLOWS FOR FLEXIBILITY IN TACKLING TOUGHER WEEDS
RIGHT



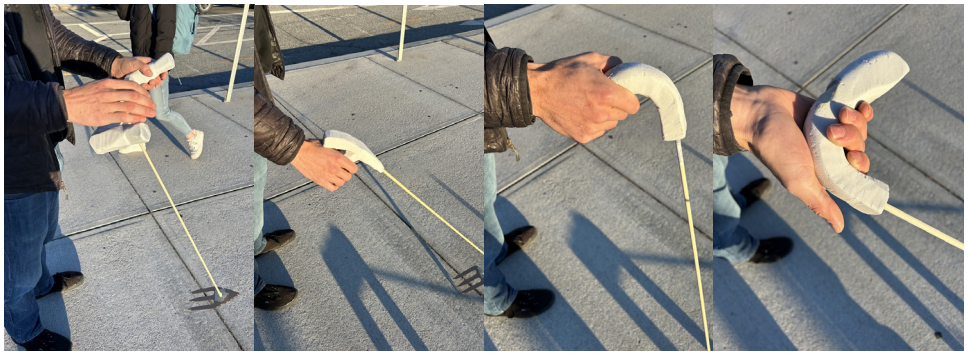

CONCEPT SKETCH NO. 29
TOP
35.5
5.5
30
1.5
ROUND FOR MORE LEVERAGE
2
1.5
7
5.5
1.5
DOESN'T FIT PALM
- HANDLE SHAPE SIMILAR TO THAT OF A CANE
- LENGTH SIMILAR TO A CANE; HELPS GIVE EXTRA SUPPORT IN STANDING UP AFTER WEEDING
- VARIATION ALONG GRIP THICKNESS ACCORDING TO PERSONAL PREFERENCE
6
TOO SMALL TO WEED
FRONT
RIGHT




CONCEPT SKETCH NO. 30
38
8
30
TOP
PERFECT LENGTH TO ALSO AS A CANE - ADDITIONAL STABILIZER
BENT DESIGN ALLOWS FOR EASY WEEDING WITH LEVER BEHAVIOR, AND MINIMAL ARM AND HAND STRENGTH REQUIRED
TOO HEAVY
NOT VERY INTUITIVE
FRONT
CURVED HEIGHT OF FULL HANDLE
4
2
2.5
1.5
6
11.5
5.5
RIGHT


CONCEPT SKETCH NO. 28
40
6
30
4
1.5
2
12
8
2
DANDELION WEEDER TIP IS TOO SMALL
TOO LONG!
SHAPE BECOMES TOO BULKY/UNNECESSARY
TOP
EXPERIMENTED WITH LONGER SHAFT FOR EASE OF DIGGING DANDELION WEEDER TIP INTO THE GROUND
RECTANGULAR SHAPE OF THE HANDLE GIVES FLEXIBILITY IN HAND GRIP POSITIONS (EX. AFTER THE WEEDER IS IN THE GROUND, THE NEUTRAL POSITION OF THE HAND MAY CHANGE TO PUSH THE WEED OUT OF THE GROUND)
2
1.5
FRONT
0
RIGHT

VII. USER INTERVIEWS



USER 1

“I like the double handed design, but I would prefer if it was flipped upside down so the handle doesn’t bump into my abdomen.”

“The back lever is good security for my hand.”

“The cane grip is probably the most comfortable. I like that there’s variation in thickness for personal preference, but the handle here doesn’t quite fit my palm.”

USER 2

“The curved tool is so heavy.”

“I feel like I’ll get a blister here if I work for too long.”

“This reminds me of a steering wheel! I can twist it to pull out the weed.”

“This is the perfect length tool for my height.”

USER 3

Experiences joint and back pain.

“This handle is short, and it feels like I could slip in this central area. I would also probably get cramping in my pinky.”

“The two-handed grip would be good for a wheelchair, but standing up it makes me feel like I’m going to start crouching. I get the impulse to bend down when I’m holding the tool with both hands, and would probably get back pain.”
“The lever handle helps me feel mch more in control, and the grip is thicker, which is great to prevent slipping.”

“The curved one is so heavy and not very intuitive.”

USER 4

Psychiatrist who experiences limited mobility in joints.

"The leverage could be longer, to lock your hands in. It does add more stability."

"The double handed would work nicely, but it doesn't have the cane function anymore."

"Certainly, if you're in a wheelchair, the two-handed would be nice because you don't have to worry about balance."

USERS 5 AND 6

Users with arthritis and limited joint mobility.

"The dandelion weeder tip is too small!"

"Round the fork instead of having a right angle, so it can act as a lever and do the work in pulling up the weed."

"I actually like the curved one. It's starting to get to where you can start weeding."

"The double-handed is good for someone with less strength in their hands."

"The dual-ended fork is not so much for weeding as it is for planting."

04

FINAL MODEL

45 Product Description

46 Environmental Photographs

48 Orthographic View

49 Exploded View

50 Color, Material, Finish

51 Retail Hang

52 Sequential Use

53 Self-Reflection

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I. PRODUCT DESCRIPTION

Garden Guru Long-Reach Garden Weeder

A must-have tool for every standing gardener, this long weed puller is perfect for weeding, loosening and transplanting soil, turning, and spreading mulch in preparation for planting flowers and vegetables.

The handle is positioned at a right angle to the tool. This ergonomic handle positions the wrist and hand in a stress-free neutral position, and the wooden handle serves as a natural shock-absorber. This prevents pressure and pain in the wrist, palm, and fingers, to reduce fatigue that is common when gardening for extended periods of time. The back piece of the handle features a support that stablizes the hand and prevents the tool from slipping out of one's grasp.

The stainless steel tines are rust resistant and sturdy, allowing for easy penetration of soil. Measuring 42 inches long, the Garden Guru Long-Reach Garden Weeder is slightly longer than existing long-reach sitting weeders, making it the perfect length for standing and also serves a double function as a cane. This long fork allows people with back pain to reach stubborn weeds without bending. The end of the weeder is curved, acting as leverage for easy and efficient weed extraction.

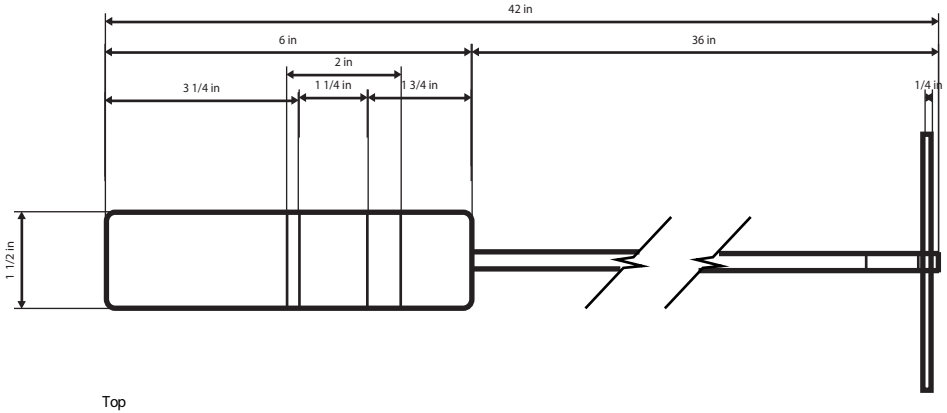
This tool features an intuitive three-part design which allows for easy repair or replacement of parts.

Responsibly Produced: Garden Guru uses recycled and recyclable materials where possible, and is committed to reducing environmental impact. This product is certified carbon neutral, and all emissions impacts are offset from the start of manufacturing to the end of the product's lifecycle.

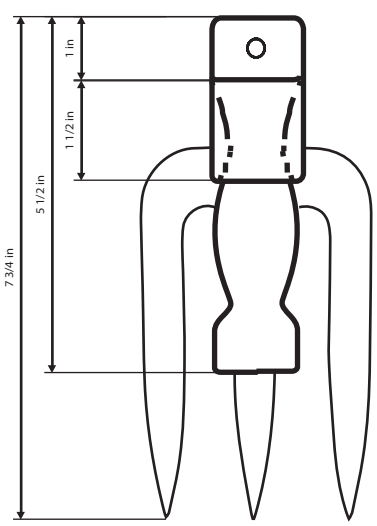
Garden Guru donates 1% of sales to protect the environment and replenish resources as a member of 1% For The Planet.

I. ENVIRONMENTAL PHOTOGRAPHS

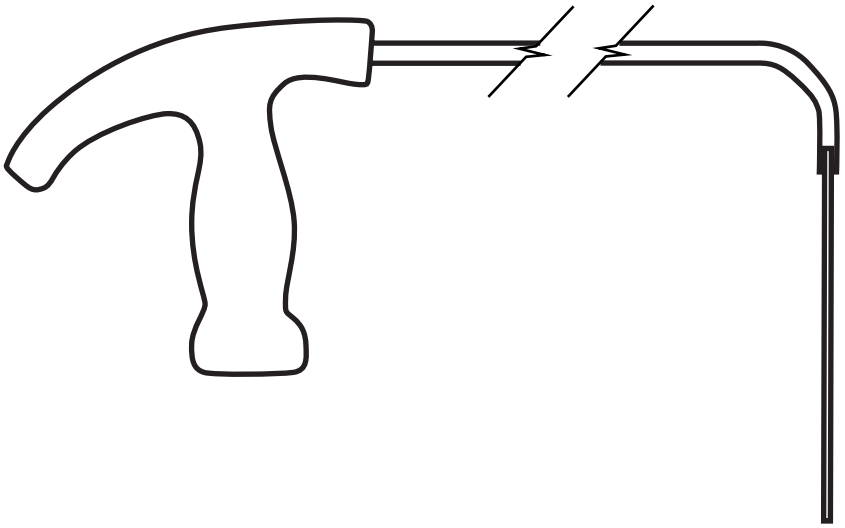
II. ORTHOGRAPHIC VIEW



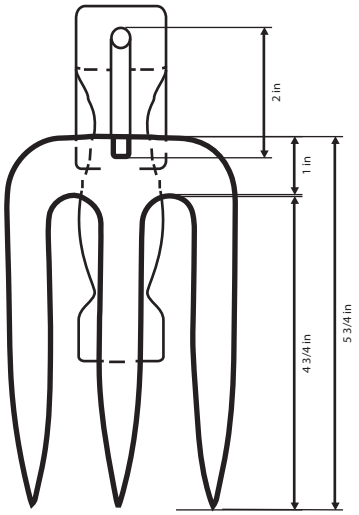
Top



Left



Front

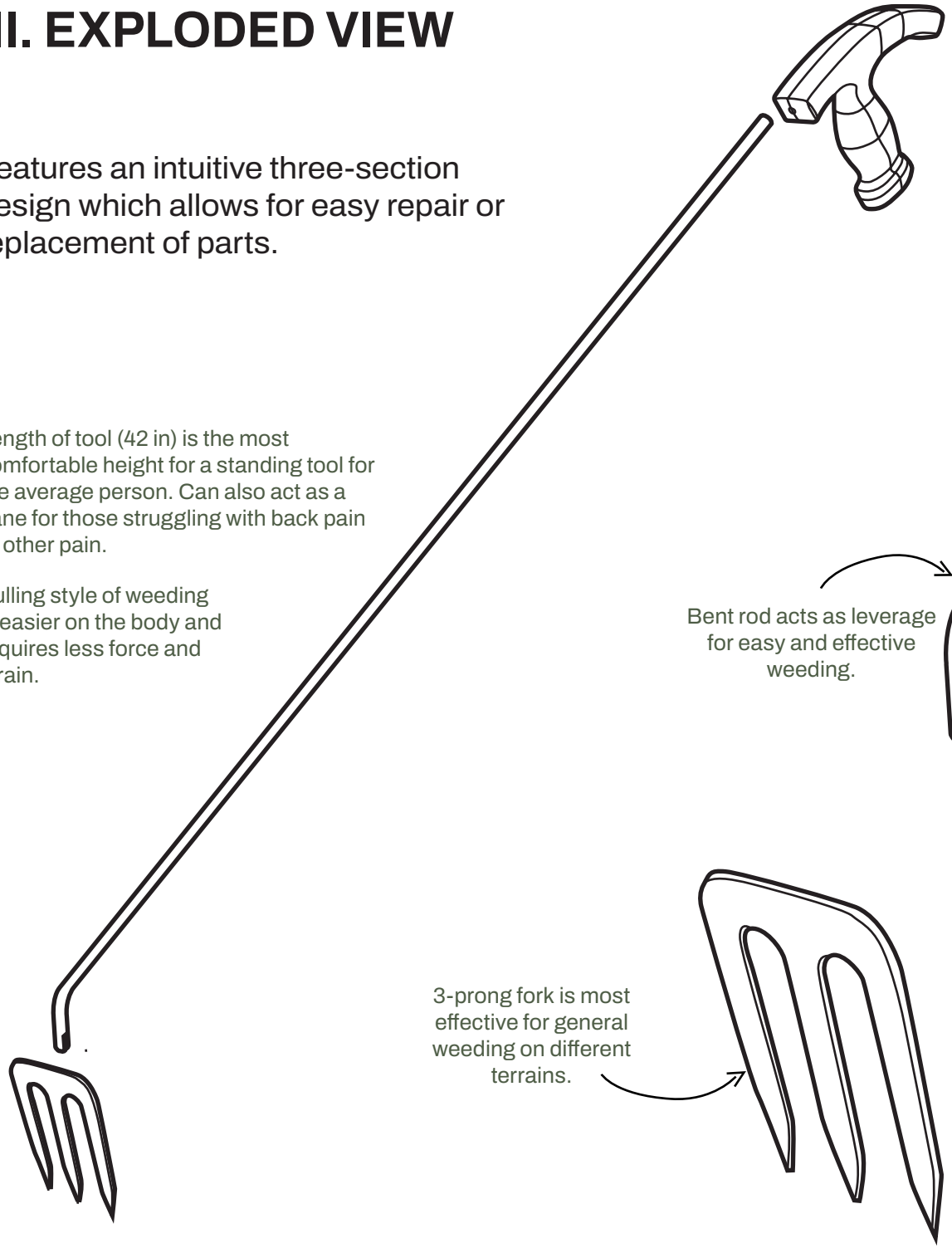


Right

Graphic Scale

III. EXPLODED VIEW

Features an intuitive three-section design which allows for easy repair or replacement of parts.



Back piece that stabilizes the hand and prevents the tool from slipping out of grasp.

Ergonomic and shock-absorbing handle in neutral position that aligns to the natural curve of the palm.

Length of tool (42 in) is the most comfortable height for a standing tool for the average person. Can also act as a cane for those struggling with back pain or other pain.

Pulling style of weeding is easier on the body and requires less force and strain.

Bent rod acts as leverage for easy and effective weeding.

Tip joint designed for easy repair or replacement.

3-prong fork is most effective for general weeding on different terrains.

IV. COLOR, MATERIAL, FINISH BOARD

COLOR

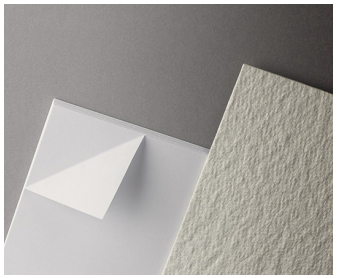
LIME

DARK GREY

MATERIAL

100% recycled stainless steel or aluminum

Wood from responsibly managed forests



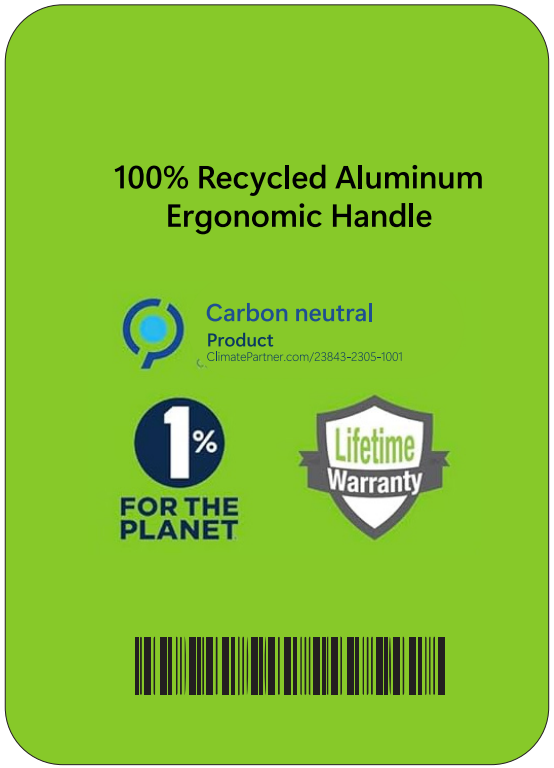
Hang tag made from recyclable materials

FINISH

High gloss finish

Matte

V. RETAIL HANG TAG

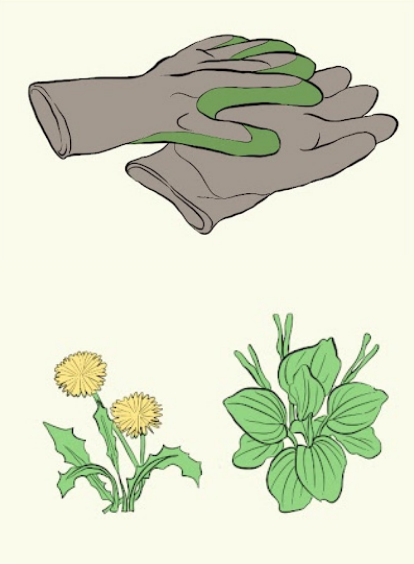


TYPOGRAPHY

Aa
Segoe UI
Variable
Regular

Aa
Segoe UI
Variable
Semibold Display

VI. SEQUENTIAL USE



1. Grab some gardening gloves to protect your hands, identify your weeds, and let's get started!

2. Remain in the upright position to make the process easier on your back.

3. Use a sweeping motion to dig the weeding fork just below the soil, tackling the roots of the weed.

4. With the help of the bent end acting as a lever, pull up to remove the weed. Exercise caution and aim for accuracy.

VII. SELF-REFLECTION

Managing this redesign project was a vital opportunity for self-growth and learning how to work within real-world constraints. I learned a lot about how to approach design thinking through inclusive design, research methods, iterative prototyping, and incorporating feedback from working with the user group.

Abundant background research provided a solid starting point for me to understand and feel comfortable working within the problem space, including existing garden tools and patents, as well as their limitations. Through empathy exercises, I gained a deeper understanding of how constraining rheumatoid arthritis can be and realized the importance of designing products that improve the quality of life for this demographic while ultimately benefiting everyone.Communicating design rationale and working directly with the target user group to gather feedback, particularly from those experiencing arthritis or joint pain, was critical in helping me appreciate the iterative nature of design and the value of user collaboration. Combined with biomechanical research, this process gave me the knowledge of the human body and its limitations needed to conceptualize and develop an ergonomic tool.

Starting broad and iterating through more than 30 prototypes taught me how to effectively generate and evaluate solutions based on user needs, feasibility, and desirability. I developed an aesthetic sensibility, learning that while I might prefer how one prototype looks, it might not be the most functional. This required balancing aesthetics and functionality to ensure even simple tools could be both effective and visually pleasing. Selecting Garden Guru as the brand to design for, with its emphasis on sustainability, further influenced my material choices. Instead of 3D printing, for instance, I opted for sustainable materials like recycled wood and aluminum.

Ultimately, I learned to never make assumptions about anything, seek abundant feedback and be open-minded to disagreements, and learn how to familiarize yourself with an unknown problem space by conducting many methods of design research. This industrial design sophomore project gave me a crucial set of skills for addressing real-world problems, and leaves me prepared to be an effective, empathetic, and well-rounded designer.

VIII. BIBLIOGRAPHY, REFERENCES, SOURCES

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User 1: Jacob. Personal interview. 12 Nov. 2024.

User 2: J.W. Personal interview. 12 Nov. 2024.

User 3: Garlan. Personal interview. 14 Nov. 2024.

User 4: F.F. Personal interview. 14 Nov. 2024.

User 5: L.A. Personal interview. 14 Nov. 2024.

User 6: Wanda. Personal interview. 14 Nov. 2024.

...and a final thank you to Professor Amy Leidtke and classmates of DPI.