

Southern Sustainable Agriculture Research and Education
Professional Development Program
Accessible Beekeeping Training Manual
2025 – 2026

This manual aims to provide resources and practical solutions for beekeepers of all abilities, supporting a community where beekeeping is accessible to everyone, regardless of physical limitations or mobility concerns.

Disclaimer

The information in this manual is not intended to be an exhaustive training manual from which someone can pick up beekeeping and acquire all the necessary knowledge to be successful. Please use the information from this manual as an introduction to topics that require further research and training to become a beekeeper.

Grant Recognition

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Any opinions, findings, conclusions, or recommendations expressed in this publication are those of Accessible Beekeeping and do not necessarily reflect the view of the U.S. Department of Agriculture.



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Introduction to Accessible Beekeeping

Beekeeping, also known as *apiculture*, is an ancient practice that involves the management of honeybee colonies for honey production, pollination services, and conservation. Honeybees (*Apis mellifera*) play an essential role in global agriculture by pollinating many of the world's food crops, making them indispensable to ecosystems and human food security. The practice of beekeeping has evolved over thousands of years, incorporating various hive designs, methodologies, and technologies to enhance honey production and colony health. The purpose of this manual is to provide a comprehensive guide to the history, biology, and management of honeybee colonies, as well as the importance of safety and accessibility in beekeeping.

Key Aspects of Beekeeping

- **Pollination Services:** Honeybees contribute significantly to crop production, ensuring higher yields and biodiversity.
- **Honey and Beeswax Production:** Beekeepers harvest these valuable resources for food, cosmetics, and medicinal uses.
- **Colony Management:** Maintaining healthy colonies requires knowledge of bee behavior, environmental factors, and disease prevention.

Beekeeping is an agricultural practice and a crucial environmental endeavor that supports global food security and biodiversity. To ensure the sustainability of their hives, beekeepers must be well-versed in the biological and environmental needs of honeybees.

History of Beekeeping

Early depictions of honey gatherings found in prehistoric rock art in Spain show the history of beekeeping. The ancient Egyptians, known for their advanced agricultural practices, documented beekeeping in tomb paintings and hieroglyphs, illustrating cylindrical clay hives and honey collection techniques. The Greeks and Romans advanced beekeeping by utilizing woven basket hives, often coated with clay for insulation. In medieval Europe, skep hives made from woven straw became widespread, although they required the colony's destruction during honey extraction.

Evolution of Hive Designs

Ancient Hives

- Egyptian cylindrical clay hives (2400 BCE).
- Greek and Roman woven basket hives.
- Medieval European skep hives made from straw.

Moveable-Frame Hives

- Langstroth Hive (1851) introduced the concept of bee space, allowing colony management without destruction.
- The Slovenian AZ Hive (1910) was developed in the early 20th century, around 1910
 - This innovative hive design was based on the traditional Slovenian beekeeping methods but improved for efficiency and ease of use.
- Top-bar hives and Flow Hives offered sustainable and minimal disturbance options.

Modern Innovations

- New hive systems developed.
- Ergonomic tools and hive lifters
- Electric honey extractors improve accessibility.

History of Accessible Beekeeping

Beekeeping has traditionally required significant manual labor, making it challenging for individuals with mobility impairments. However, advancements in accessible hive designs and adaptive beekeeping equipment have made it more inclusive. The history of accessible beekeeping spans centuries, with various figures and events contributing to adapting apiculture for individuals with disabilities.

François Huber and Early Beekeeping Innovations

One of the earliest known examples of accessible beekeeping comes from **François Huber (1750–1831)**, a Swiss naturalist and beekeeper who made groundbreaking discoveries in apiculture despite being blind. Unable to physically inspect hives himself, Huber developed the **leaf hive** (also called the **Huber Hive**) and relied on his assistant, François Burnens, to document observations. His work led to significant advancements in understanding honeybee behavior, including the role of the queen bee, swarming patterns, and hive organization. Huber's story remains a testament to how individuals with disabilities can contribute to scientific discoveries in beekeeping.

Beekeeping as a Vocation for Disabled Veterans of World War I

Following **World War I**, beekeeping was introduced as a **vocational rehabilitation program** for disabled veterans, particularly those with physical injuries or PTSD. Many returning soldiers who had lost limbs or suffered from emotional trauma found beekeeping to be a therapeutic and economically viable occupation. Programs were established in Europe and the United States to train veterans in hive management, honey production, and pollination services, providing them with a sustainable livelihood. These efforts set the foundation for recognizing beekeeping as an accessible trade for individuals with disabilities, leading to continued innovations in adaptive apiculture.

Today, Huber's legacy and post-war rehabilitation efforts continue to inspire modern accessible beekeeping initiatives, ensuring that individuals of all abilities can participate in apiculture.

History of Humans and Honeybees

Humans and honeybees have had a symbiotic relationship for millennia. Early humans engaged in honey hunting, as evidenced by cave paintings in Spain dating back 8,000 years. The Egyptians considered honey sacred, using it for food, medicine, and religious offerings. In Greek mythology, honey was known as "ambrosia," the food of the gods. The study of honeybee behavior and biology has advanced significantly in modern times, with Karl von Frisch decoding the "waggle dance," revealing how bees communicate foraging locations.

Overview of Advances in Accessible Hive Systems

1. Slovenian AZ Hives: Designed for ease of access, allowing beekeepers to manage hives seated.
2. Long Langstroth Hives: Reduce heavy lifting by placing frames horizontally rather than stacking them vertically.
3. Assistive Technologies: Hive lifters, ergonomic protective gear, and voice-activated record-keeping tools enhance beekeeping for those with disabilities.

As beekeeping continues to evolve, sustainable and accessible hive designs enable more individuals to engage in apiculture. These designs support both honey production and pollination services, proving their therapeutic value to the environment and individual people.

Biology of Honeybees

Honeybees are highly social insects that live in complex colonies that function as a single superorganism. Each colony consists of three primary castes: the queen, workers, and drones, all of which contribute to the hive's survival and efficiency.

Colony Structure and Roles

Colony Structure and Roles



Queen Bee

- Sole reproductive female, laying up to 2,000 eggs per day.
- Regulates colony behavior through pheromones.



Forager



Guard



Nurse



Drones

Worker Bees

Perform various roles depending on age:

- Nurses: Feed larvae and care for the queen.
- Foragers: Collect nectar, pollen, and water.
- Guards: Defend the hive from predators

Drones

Male bees whose primary role is mating with a queen. Expelled from the hive before winter due to their lack of contribution to colony maintenance

The Superorganism Concept

Honeybee colonies function as a superorganism, meaning that individual bees work collectively to sustain the hive. Each caste plays a vital role in maintaining the colony's stability and efficiency.

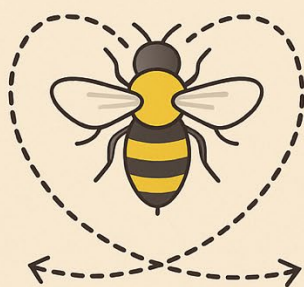
- **Colony-Level Decision Making:** Unlike solitary organisms, the hive exhibits collective decision-making, with worker bees using feedback mechanisms to regulate food collection, defense, and brood rearing.
- **Resource Allocation:** Bees distribute tasks dynamically, adjusting roles based on environmental conditions and colony needs.
- **Defense and Health Maintenance:** Colonies engage in social immunity, where behaviors like grooming, propolis use, and hygienic behavior help control disease spread.

The superorganism concept highlights the sophisticated level of cooperation among honeybees, reinforcing their status as one of nature's most efficient and well-organized insect societies.

Communication and Adaptation

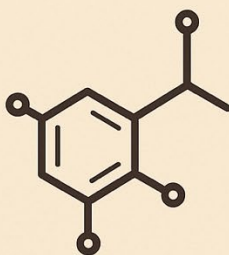
Communication and Adaptation

Honeybees exhibit highly sophisticated communication methods to maintain colony efficiency:



Waggle Dance

Communicates food source locations through precise movements.



Pheromones

Chemical signals regulate task allocation, colony defense, and reproductive suppression.



Thermoregulation

Bees cluster together in cold weather and fan their wings to cool the hive in warmer conditions

Safety While Beekeeping

Ensuring safety in beekeeping is essential to protect both the beekeeper and the colony. Bee stings, allergic reactions, and environmental hazards pose risks that require proper preparation and precautionary measures.

The information below is considered a broad overview and is not intended to be an exhaustive list of the safety measures within beekeeping. Please seek out training and/or more information to ensure proper safety measures are implemented.

Essential Protective Equipment

Protective equipment is essential for reducing the risks associated with handling honeybees. Beekeepers should invest in high-quality gear to prevent stings and ensure comfort while working with hives.

1. **Bee Suit:** A full-body suit made of thick fabric, usually white, to reflect sunlight and reduce aggression from bees. It should be well-ventilated for comfort.
2. **Gloves:** Leather or nitrile gloves offer protection against stings while allowing flexibility for hive manipulation.
3. **Veil and Hat:** A veil protects the face and eyes from bee stings, as bees tend to be more defensive around the head area. A well-fitted hat ensures the veil remains secure.
4. **Boots:** Closed-toe boots with high ankle coverage prevent bees from entering through pant legs.

Proper protective equipment significantly reduces the risk of stings, which can trigger allergic reactions or discomfort. Ensuring a proper fit and maintaining clean gear helps keep bees calm and prevents unnecessary agitation.

Managing Colony Aggression

This list is not exhaustive. However, below are some standard methods for calming the honey bees before inspections begin.

1. Using a Smoker
2. Sugar Water Spray

Using a Smoker

A smoker is an essential tool in beekeeping, as it helps calm bees and reduces aggressive behavior.

1. **How it Works:** Smoke disrupts alarm pheromones, making bees less defensive. This allows beekeepers to inspect hives without provoking an attack.
2. **Best Materials to Use:** Dry, natural materials like pine needles, wood shavings, or burlap produce cool, long-lasting smoke.
3. **Proper Usage:** Apply smoke at the hive entrance and under the lid before opening the hive. Avoid excessive smoke, as it can agitate the bees.

Use a Sugar Water Spray

1. Light misting with a 1:1 sugar-water solution keeps bees busy licking rather than flying.
2. A good alternative to smoke for minor inspections.

Other Options to Limit Honey Bees Aggravation During Inspection

1) Work During Optimal Weather

- a) Inspect hives on **warm, sunny days** with little wind.
- b) When bees are defensive, avoid inspections on **cold, rainy, or stormy** days.

2) Move Gently & Slowly

- a) Sudden movements can **startle** bees.
- b) Handle frames carefully and avoid **bumping the hive**.

3) Wear Proper Protective Gear

- a) A full bee suit or jacket with a **veil** reduces stress for both you and the bees.
- b) Avoid dark colors and strong scents (perfumes, sweat, etc.).

4) Minimize Hive Disruptions

- a) Keep inspections **brief and efficient**.
- b) Avoid **crushing bees** when moving frames.

5) Inspect During Midday

- a) Many forager bees are **out collecting nectar**, leaving fewer bees in the hive.
- b) Reduces colony disturbance.

6) Stay Calm & Confident

- a) Bees can sense nervousness—stay **relaxed and focused**.
- b) Avoid swatting at bees; they react to **aggressive movements**.

Allergy Precautions

Allergic reactions to bee stings can range from mild swelling to life-threatening anaphylaxis. Beekeepers should take the following precautions:

1. **Recognizing Symptoms:** Mild symptoms include redness and swelling, while severe reactions involve difficulty breathing, dizziness, and throat swelling.
2. **Carrying Emergency Medication:** Individuals with known allergies should always have an epinephrine auto-injector and antihistamines.
3. **Immediate Response to Stings:** If stung, remove the stinger quickly by scraping it off with a fingernail or card, then apply ice to reduce swelling. Seek medical help if severe symptoms occur.

By implementing these safety measures, beekeepers can ensure a secure working environment while maintaining a healthy and productive colony.

Safety in an Accessible Apiary

Beekeepers with disabilities or mobility impairments can continue their practice with modifications to apiary setups, ensuring safe and efficient management.



1. **Hive Placement:** Hives should be placed at a height that reduces the need for bending or lifting, such as raised hive stands.
2. **Accessible Pathways:** Smooth, level surfaces of gravel, packed dirt, or paving stones improve mobility and prevent tripping hazards.

3. **Modified Equipment:** Use hive lifters, lightweight frames, and ergonomic tools to reduce physical strain.
4. **Seated Beekeeping Options:** Slovenian AZ hives and long Langstroth hives allow hive inspections from a seated position.
5. **Adaptive Protective Gear:** Customized veils, gloves, and suits provide comfort while maintaining safety for beekeepers with limited mobility.
6. **Emergency Preparedness:** To ensure a safe working environment, accessible first aid kits, clearly marked exits, and emergency communication plans should be in place.

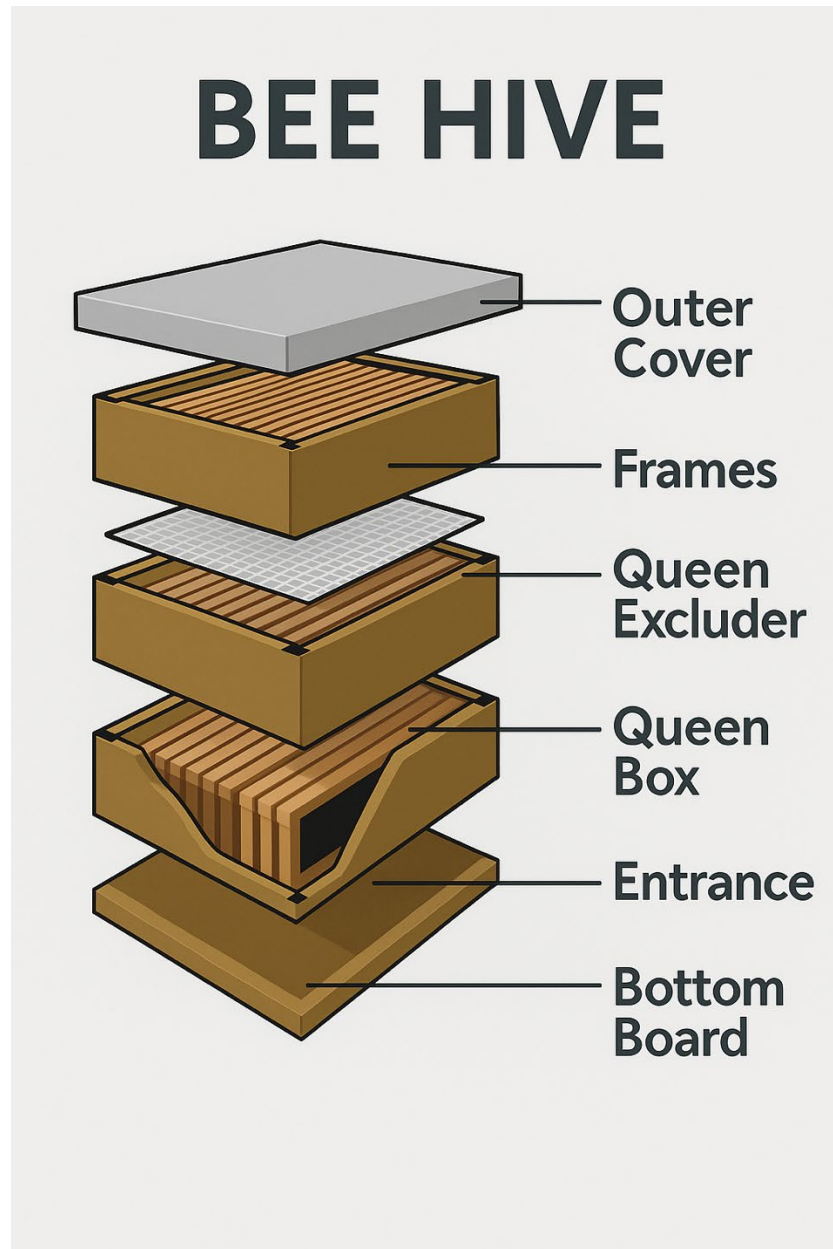
By implementing these measures, beekeepers of all abilities can engage in apiculture while maintaining safety and efficiency.

Apiary Management

Managing an apiary requires careful planning, observation, and routine maintenance. Whether you are a new beekeeper or looking to refine your skills, understanding how to set up, maintain, and inspect a beehive is essential. Below is a step-by-step guide to successful apiary management.

The information below is considered a broad overview and is not intended to be an exhaustive tutorial on apiary management. Please seek out training and/or more information to ensure proper apiary management is practiced.

Parts of a Hive



Understanding the components of a hive is crucial for successful beekeeping. A standard Langstroth hive consists of:

1. **Brood Box:** This is where the queen lays her eggs, and young bees (brood) develop. It is the heart of the hive, as it sustains colony growth.
2. **Supers:** Additional boxes are placed above the brood box to store honey. As the colony grows, beekeepers add supers to provide more space for honey production.

3. **Frames:** These are wooden or plastic structures that hold honeycomb, where bees store honey and raise their young. Proper frame spacing ensures healthy comb development.
4. **Bottom Board:** This is the foundation of the hive, providing ventilation and an entrance for bees. It can be solid or screened to aid pest control and airflow management.
5. **Inner and Outer Cover:** These protect the hive from weather and predators. The outer cover is typically waterproof, while the inner cover helps with insulation and ventilation.

Hive Inspections (Step-by-Step Guide)

Regular hive inspections are vital for assessing colony health, preventing diseases, and ensuring proper honey production. Below is a step-by-step guide for performing an inspection:



1. Inspection Planning

- Conduct inspections every 7-10 days during the active season (spring through fall) and reduce frequency in colder months.

- Gather essential tools: hive tool (for prying apart frames), smoker (to calm bees), protective gear (bee suit, gloves, and veil), and a notebook or digital log for observations.
- Plan your inspection based on weather conditions—preferably on a warm, sunny day when most foragers collect nectar.

2. Inspection Process

- Approach the hive calmly and apply a few puffs of smoke at the entrance and under the lid to pacify the bees.
- Gently remove the outer and inner covers, then begin lifting frames one by one, checking for the following:
 - **Presence of the Queen:** Either locate the queen herself or check for signs of her activity, such as freshly laid eggs.
 - **Healthy Brood Pattern:** A strong colony will have a solid, consistent pattern of capped brood and developing larvae.
 - **Sufficient Food Stores:** Look for ample honey and pollen in storage cells.
 - **Signs of Pests or Disease:** Check for Varroa mites, wax moth larvae, small hive beetles, or symptoms of bacterial and fungal infections.
- Replace frames carefully and reassemble the hive after completing the inspection.

3. Determining a Queen-Right Hive

- A “queen-right” hive is a colony with a healthy and productive queen. You can confirm this by observing fresh eggs, larvae, and a well-structured brood pattern.
- If the queen is missing or the hive is queenless, you may need to introduce a new queen or allow the colony to raise a new one from existing eggs.

4. Brood Chamber Layout/Basics

- Ensure the brood nest remains spacious and well-organized to prevent swarming.
- Proper spacing between frames prevents cross-combing and promotes good hive ventilation.

5. Honey Super Basics

- When the colony has stored ample honey in the brood chamber, place supers on top to encourage additional honey storage.

- Harvest honey only when the frames are at least 80% capped with wax, ensuring the moisture content is low enough to prevent fermentation.

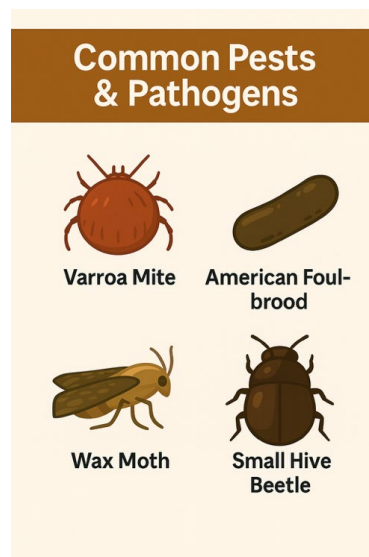
Record Keeping

Detailed records of your hive inspections help monitor progress and diagnose issues early. Here's what to track:

1. **Hive Health Observations:** Note the presence of eggs, larvae, and capped broods.
2. **Queen Status:** Record whether the queen was seen or if there are signs of her presence.
3. **Pest and Disease Monitoring:** Document any findings related to Varroa mites, small hive beetles, wax moths, or diseases.
4. **Honey Production:** Keep track of honey stores, super additions, and harvest times.
5. **Environmental Factors:** Log temperature, weather conditions, and floral availability to understand how this impacts colony behavior.

Common Pests and Pathogens

Despite best efforts, honeybee colonies are susceptible to various pests and diseases. Learning how to identify and manage them is crucial for apiary success.



1. Pests

- **Varroa Mites:** These parasites attach to adult bees and larvae, feeding on their bodily fluids and spreading viruses. Treatments include powdered sugar dusting, essential oils, and miticides.

- **Wax Moths:** These pests lay eggs in weak colonies, and their larvae tunnel through wax comb, causing structural damage. Strong colonies naturally defend against them, but additional traps can be used.
- **Small Hive Beetles:** These beetles lay eggs in hives, and their larvae consume honey and pollen, causing contamination. Using beetle traps and maintaining strong colonies help prevent infestations.

2. Pathogens

- **American Foulbrood (AFB):** A highly contagious bacterial disease that kills bee larvae. Signs include dark, sunken brood cappings and a foul smell. AFB-infected colonies often require burning to prevent spread.
- **Nosema:** A fungal disease affecting the digestive system of adult bees, leading to dysentery and weakness. Treating colonies with Fumagilin and maintaining dry hives reduces its impact.

By following these structured guidelines, beginner beekeepers can successfully manage their apiaries, ensuring their hives remain productive, healthy, and sustainable. A well-managed apiary leads to strong colonies, abundant honey harvests, and thriving pollinator populations contributing to the broader ecosystem.

Harvesting Your Apiary

Harvesting honey and beeswax is one of the most rewarding aspects of beekeeping. However, careful planning and proper techniques are required to ensure the colony remains healthy and productive. Below, we break down the process of harvesting honey and rendering beeswax in a way that is easy for new beekeepers to follow.

The information below is a broad overview and is not intended to be an exhaustive tutorial on harvesting honey from an apiary. Please seek out training and/or more information to ensure proper practices are implemented.

Honey Plants Basics

Bees need access to various nectar and pollen sources to produce high-quality honey. The type of plants they forage from will directly impact the honey's taste, texture, and color.

1. Best Plants for Honey Production:

- **Clover** – Produces mild, light-colored honey that is commonly preferred.
- **Wildflowers** – Results in multi-floral honey with a complex flavor.
- **Lavender and Rosemary** – Creates aromatic honey with floral notes.
- **Fruit Trees (Apple, Orange, Cherry)** – Adds a subtle fruity taste to honey.
- **Buckwheat** – Produces dark, strong-flavored honey rich in antioxidants.

2. Seasonal Nectar Availability:

- **Spring:** Fruit trees, dandelions, and early wildflowers.
- **Summer:** Clover, sunflowers, lavender, and blackberries.
- **Fall:** Goldenrod and aster, providing late-season nectar flow.

Honey Extraction Process

Extracting honey requires patience and the right equipment to avoid harming the bees or contaminating the honey. Below is a step-by-step guide for new beekeepers.

1. Check Readiness for Harvesting:

- Inspect frames to ensure that at least **80% of the honeycomb cells are capped** (sealed with wax), which indicates the honey has the proper moisture content.
- Unripe honey (uncapped cells) contains too much water and may ferment if harvested too early.

2. Removing the Honey Supers:

- Use a bee escape board or a fume board the night before harvesting to clear bees from the honey supers.
- Gently brush off any remaining bees using a soft bee brush before transporting frames.

3. **Uncapping the Honeycomb:**

- Use an **uncapping knife** or a capping scratcher to remove the wax seals covering the honey cells.
- Save the wax capping for later processing.

4. **Extracting the Honey:**

- Place the uncapped frames in a honey extractor (centrifugal method) and spin at moderate speed to remove the honey.
- Alternatively, use the **crush-and-strain method**, where the comb is manually filtered.

5. **Filtering and Bottling:**

- Strain honey through a fine mesh sieve or cheesecloth to remove impurities.
- Allow the honey to settle for 24 hours before bottling it into sterilized jars.

Wax Processing and Rendering

Beeswax is a valuable byproduct of beekeeping that can be used for candles, lip balms, and wood polish. The steps below will help new beekeepers safely process wax.

1. **Collecting Wax:**

- Separate wax cuppings from honey during extraction.
- Scrape excess wax from frames and comb cuttings.

2. **Melting and Filtering:**

- Use a **double boiler** or a **solar wax melter** to melt the wax slowly.
- Strain melted wax through cheesecloth to remove debris and bee particles.

3. **Molding and Storing:**

- Pour melted wax into silicone molds or small blocks for easy storage.
- Store in a **cool, dry place** until ready for use.

Preparing for Next Season

Proper seasonal preparation ensures colonies survive winter and emerge strong in the spring. Late-season management and equipment care play critical roles in preparing bees for success.

Note:

This information is location-dependent. Please refer to local weather and beekeeping clubs for location-specific steps.

Late Season Management

1. **Evaluating Colony Strength:**

- Inspect hives for population size, brood health, and food stores.
- Address any signs of disease or pests before winter begins.

2. **Ensuring Adequate Food Stores:**

- Colonies need **60–80 lbs of honey** to survive winter.
- If honey stores are low, provide sugar syrup (2:1 sugar-to-water ratio) or fondant as supplemental feeding.

3. **Minimizing Hive Disturbance:**

- Reduce unnecessary inspections to prevent heat loss.
- Secure hive entrances to avoid drafts and intrusions from mice or other pests.

Off-Season Equipment Storage

Proper storage of beekeeping equipment during winter ensures everything remains in good condition for the next season.

1. **Cleaning Equipment:**

- Scrape off excess wax and propolis from frames and hive boxes.
- Wash hive components with warm water and mild soap to remove debris.

2. **Storing Supers and Frames:**

- Store honey supers in a **dry, rodent-proof location** to prevent wax moth infestations.
- Freeze frames for **48 hours** before storage to kill any wax moth larvae.

3. **Inspecting and Repairing Gear:**

- Check for cracks or damage in hive boxes, covers, and bottom boards.
- Replace old or damaged frames and foundations to ensure a fresh start in spring.

Late Season Colony Preparation

Preparing hives for winter differs depending on the size of the colony. Below are strategies for both small and large colonies to ensure their survival.

Small Colony Preparation

1. Combining Weak Colonies:

When small colonies lack the population to survive winter, combining them with a more substantial colony improves their chances. The **newspaper method** is a safe way to merge two colonies gradually, reducing the risk of fighting between bees.

Step-by-Step Guide:

- **Choose a Strong Colony:** Select a healthy hive with a robust queen.
- **Prepare the Weak Colony:** Ensure the weaker colony is disease-free and does not introduce pests into the stronger hive.
- **Use Newspaper as a Barrier:**
 - Place a single sheet of newspaper over the top box of the stronger hive.
 - Poke a few small holes to allow slow pheromone mixing between the colonies.
- **Stack the Weaker Colony Above:**
 - Move the entire weak colony (including brood frames and honey stores) on top of the newspaper.
- **Allow Gradual Integration:**
 - Over several days, the bees will chew through the newspaper and merge naturally.
 - Check-in one week to ensure the integration was successful.

2. Providing Supplemental Feedings:

- Place sugar cakes or fondant inside the hive.
- Avoid liquid feeding once temperatures drop below **50°F**, which can cause moisture buildup.

3. Increasing Hive Insulation:

- Wrap hives with **insulated covers** or place them in a wind-protected area.
- Add a **moisture-absorbing material** such as burlap or quilt boxes inside the hive.

Large Colony Preparation

1. Reducing Excess Space:

During winter, beekeepers must **reduce unnecessary hive space** to help colonies maintain warmth and prevent extra work for the bees.

- **Steps to Reduce Space:**

- **Remove Unused Supers:**

- Take off mostly empty honey supers, as they create unnecessary space for heat retention.

- **Condense the Brood Nest:**

- Ensure brood frames are tightly grouped in the lower boxes to concentrate warmth.

- **Use a Follower Board (Optional):**

- Placing a follower board inside the hive can help reduce excess space without completely removing boxes.

- **Close Unused Entrances:**

- Block secondary entrances or ventilation holes that may cause drafts.

- **Wrap the Hive if Necessary:**

- Consider using **insulated hive wraps** in extremely cold regions to retain heat while allowing airflow.
- By following these steps, beekeepers can ensure their colonies remain strong throughout winter and emerge ready for the new season. A well-managed hive in the fall leads to a productive apiary in the spring.

2. Checking Ventilation and Moisture Control:

- Install a quilt box or moisture board to prevent condensation from dripping onto the bees.
- Ensure proper airflow to prevent mold and fungal growth.

3. Monitoring Winter Activity:

- Use a stethoscope or press an ear against the hive wall to listen for a steady buzz inside.
- Avoid opening the hive unless necessary to prevent heat loss.

By following these detailed steps, beginner beekeepers can successfully manage their colonies through the seasons and enjoy healthy, productive hives for years.

Overwinter Colony Loss Recovery

Here is some general information about handling overwinter colony losses. Please use this as a guideline to research and gain further knowledge.

- 1) Confirm the Colony is Truly Dead
 - Check for signs of life (clusters of live bees, queen activity).
 - Look for brood or bees deep inside the hive before declaring it lost.
- 2) Determine the Cause of Death
 - Starvation: Bees clustered but no food nearby?
 - Moisture issues: Moldy frames, excess condensation?
 - Varroa mites: High mite load, deformed wings, dead bees with mite signs?
 - Disease: Foul smell, abnormal brood patterns, or Nosema (diarrhea on frames)?
 - Queen failure: No queen, small dead cluster?
- 3) Clean & Salvage Hive Components
 - Frames & Comb:
 - Clean and reuse if there are no signs of disease or mold.
 - Freeze frames for 24-48 hours to kill pests.
 - Melt or discard moldy or foul-smelling comb.
 - Hive Boxes:
 - Scrape excess propolis & wax.
 - Torch or sanitize (if disease is suspected).
 - Allow to air out before reuse.
 - Leftover Honey:
 - It can feed future colonies (if there is no disease).
 - Store in an airtight container to prevent robbing or fermentation.
 - Pollen Stores:
 - It can ferment or mold, so inspect before reuse.
 - If clean, leave it for new colonies or freeze it later.
- 4) Plan for Next Season
 - Improve winter prep: Provide enough honey (at least 40-60 lbs in cold regions).

- Reduce moisture: Ventilation and absorbent materials (like quilt boxes).
- Varroa mite control: Regular mite checks and treatments in the fall.
- Stronger colonies: Combine weak colonies before winter.
- Protect from extreme cold: Windbreaks and insulating wraps if needed.

5) Start Fresh in Spring

- Order or split a new colony if frames and equipment are reusable.
- Monitor weather & blooms to time new installations.
- Keep detailed records to improve winter survival next year.

Current Beekeeping Assistive Technology

Advancements in assistive technology have made beekeeping more accessible for individuals with physical disabilities, mobility impairments, and other challenges. Modern tools and adaptations allow more people to engage in beekeeping without physical strain or limitations.

Examples of Assistive Technology in Beekeeping

1. Hive Lifters and Lifting Aids:

- Electric and manual hive lifters reduce the need for heavy lifting.
- It benefits beekeepers with **back pain, arthritis, or mobility impairments**.

2. Voice-Activated Record-Keeping Systems:

- Digital tools and apps allow hands-free note-taking during hive inspections.
- It is helpful for beekeepers with **limited dexterity or visual impairments**.

3. Adaptive Hive Tools:

- Ergonomically designed hive tools with easy-grip handles reduce strain on hands and wrists.
- Ideal for individuals with **arthritis or hand tremors**.

4. Automated Honey Extractors:

- Motorized honey extractors eliminate the need for manual spinning.
- Great for beekeepers with **limited arm strength or coordination difficulties**.

5. Flow Hives and Honey Extraction Aids:

- Allow honey to be harvested without opening the hive, reducing manual labor.
- It benefits those with **chronic pain, muscle fatigue, or limited mobility**.

These technologies make beekeeping more accessible, ensuring that individuals with disabilities can participate in apiculture with minimal physical strain.

Accessible Hive Bodies

Selecting the right hive body is essential for the beekeeper's ease of use and the well-being of the bees. To choose the right hive type for a specific limitation, you must assess what a person can do within their capabilities and make a plan to train them on safely using an accessible hive to limit the aggravation of a person's disability. Below is a detailed overview of

different hive types and their benefits, as well as a step-by-step tutorial on using each one effectively. Additionally, this section highlights specific disabilities each hive type can accommodate, making beekeeping more inclusive for individuals with mobility, strength, or dexterity challenges.

The three main classifications of beekeepers are hobbyist, sideline, or commercial. A hobbyist is classified as having less than 20 hives. A sideline beekeeper is classified as having up to 100 hives but more than 20. Last, the commercial beekeeper is classified as having more than 100 hives.

Langstroth Hive



Description:

The Langstroth hive is the most used worldwide. It consists of stacked rectangular boxes with removable frames, allowing for efficient colony management and honey extraction. This hive solution is well suited for all three levels of beekeepers.

Pros:

1. Standardized equipment and widely available parts.
2. Easy to expand by adding more supers.
3. Frames prevent excessive cross-combing.

Cons:

1. Requires heavy lifting when stacking and unstacking boxes.

2. Regular inspections are needed to prevent swarming.

Best for:

Beekeepers with **mild mobility issues or back pain** can still lift moderate weights but need a structured and standardized hive system. These hive systems are physically demanding but produce lots of honey and other byproducts that beekeepers can utilize.

How to Use:

1. Assemble a Langstroth hive with a bottom board, brood boxes, and honey supers.
2. Install frames with foundation to guide bees in building straight comb.
3. Place the queen excluder above the brood box to separate the brood from honey.
4. Add supers as the colony grows to provide more space for honey storage.
5. Inspect the hive every 7–10 days, checking for brood health, pests, and honey stores.

See [Appendix A](#) for compensating for physical limitations with Langstroth hives.

See [Appendix B](#) for mobility and overwintering with Langstroth Hives.

Slovenian AZ Hive



Description:

The Slovenian AZ hive is a horizontal hive designed for **beekeepers with mobility issues** or those who prefer a less physically demanding hive management system. This hive is enclosed in a cabinet-like structure, allowing back access instead of top lifting.

Pros:

1. No heavy lifting—frames are accessed from the back.
2. Great for indoor or shed-based beekeeping.
3. Protected from harsh weather due to enclosed design.

Cons:

1. Less ventilation than Langstroth hives.
2. It is more difficult to find in specific markets.

Best for:

It is ideal for beekeepers with **limited mobility, wheelchair users, or individuals with chronic back pain**, as it allows inspections without bending or lifting heavy boxes.

How to Use:

1. Position the hive inside a beekeeping shed or shelter for ease of access.
2. Open the rear access panel and slide out frames one at a time.
3. Use built-in frame holders to keep frames upright while inspecting.
4. Rotate honey frames into new positions as needed.
5. Monitor ventilation by ensuring proper airflow within the cabinet.

See [Appendix A](#) for compensating for physical limitations with Slovenian AZ Hives.

See [Appendix B](#) for mobility and overwintering with Slovenian AZ Hives.

Long Langstroth Hive



Description:

A modification of the traditional Langstroth hive, the Long Langstroth keeps the frames in a **single horizontal layer** instead of stacked boxes, reducing the need for lifting.

Pros:

1. No heavy lifting of boxes.
2. Uses standard Langstroth frames for easy compatibility.
3. It provides easy access to all frames without disassembling the hive.

Cons:

1. Requires more ground space.
2. Expansion is limited compared to stacked hives.

Best for:

Beekeepers with **limited upper body strength, arthritis, or joint pain**, as it eliminates the need to lift heavy hive boxes.

How to Use:

1. Place the hive on a raised stand for comfortable access.
2. Install Langstroth frames evenly across the horizontal chamber.
3. Inspect the hive from one end to the other without lifting boxes.
4. Add a follower board to partition the hive and manage colony size.
5. Ensure adequate insulation during winter since horizontal hives can lose heat.

See [Appendix A](#) for compensating for physical limitations with Long Langstroth hives.

See [Appendix B](#) for mobility and overwintering with Long Langstroth Hives.

Top Bar Hive

Description:

A **foundationless horizontal hive**, Top Bar hives allow bees to build natural comb structures attached to wooden bars rather than pre-formed foundation sheets.

Pros:

1. Minimal equipment is required; there is no need for pre-made frames.
2. Promotes natural comb-building behavior.

3. Reduces back strain as there is no heavy lifting.

Cons:

1. More prone to cross-combing if not correctly managed.
2. Less honey production compared to Langstroth hives.

Best for:

Beekeepers with **limited grip strength, arthritis, or joint pain**, as there are no heavy supers to lift.

How to Use:

1. Set up the hive with a sloped-bottom design to guide comb building.
2. Install **wooden bars** across the top without frames.
3. Inspect regularly to guide straight comb construction.
4. Harvest honey by cutting away comb sections and allowing bees to rebuild.
5. Ensure proper ventilation, as airflow is limited in enclosed hives.

See [Appendix A](#) for compensating for physical limitations with Top Bar hives.

See [Appendix B](#) for mobility and overwintering with Top Bar Hives.

Flow Hive

Description:

The Flow Hive incorporates **plastic frames with built-in honey extraction mechanisms**, allowing beekeepers to tap honey without opening the hive.

Pros:

1. **Minimal disruption** to the bees when harvesting honey.
2. Efficient and time-saving honey extraction.
3. It is suitable for beginner beekeepers.

Cons:

1. They are more expensive than traditional hives.
2. Plastic components may degrade over time.

Best for:

Beekeepers with **hand tremors, arthritis, or mobility limitations**, as it allows for honey extraction with minimal effort.

How to Use:

1. Assemble the Flow Hive with Flow Frames inside the honey super.
2. Allow bees to fill the Flow Frames with honey and cap them.
3. Turn the Flow Key to break the wax seal and release honey through the spout.
4. Collect honey directly into jars without removing frames.
5. Reset frames for bees to refill for the next harvest.

See [Appendix A](#) for compensating for physical limitations with the Flow hive.

See [Appendix B](#) for mobility and overwintering with the Flow Hive.

By selecting the right hive body, beekeepers can ensure a comfortable working environment while supporting the health and productivity of their colonies. Whether opting for traditional Langstroth hives, horizontal hives like the Layens, or innovative solutions like the Flow Hive, understanding the benefits and limitations of each hive type will help new and experienced beekeepers make informed decisions for their apiary. For those with physical limitations, choosing a hive design that reduces strain and enhances accessibility can make beekeeping an enjoyable and sustainable practice for years.

Hive Type	Hobbyist	Sideliner	Commercial	Notes
Langstroth Hive	Best choice	Common	Industry Standard	Most widely used hive for all levels of beekeeping due to modular design, scalability, and high honey production.
Slovenian AZ Hive	Great for small-scale	Limited use	Not practical	Ideal for hobbyists or those with mobility limitations; less scalable for large operations.
Long Langstroth Hive	Good option	Possible, but less common	Not efficient	Works well for backyard beekeepers but is harder to scale for large operations due to its horizontal layout.

Top Bar Hive	Popular with natural beekeepers	Not ideal for scaling	Not practical	Best for hobbyists interested in low-intervention beekeeping but unsuitable for large honey production.
Flow Hive	Very popular	Some use	Not practical	Easy for hobbyists, but the Flow Frames are too expensive and less practical for commercial beekeepers.

Table Cont.

Hive Type Suitability: Hobbyist, Sideliner, or Commercial Beekeeping

Each hive type is better suited for different levels of beekeeping. Here's how they compare:

Key Takeaways:

- **Best for Hobbyists: Langstroth, Slovenian AZ, Long Langstroth, Top Bar, Flow Hive** (all can work depending on personal preferences).
- Langstroth is best for Sideliners (some may use Flow Hive or Long Langstroth, but they are less common).
- **Best for Commercial Beekeeping: Langstroth** (industry standard due to efficiency and scalability).

Accessible Apiary Design

Designing an accessible apiary ensures that beekeepers of all physical abilities can comfortably and safely manage their hives. Terrain, hive height, and emergency preparedness are crucial in creating an inclusive beekeeping environment.

Location

Choosing the right location for an accessible apiary requires thoughtful planning to accommodate different physical needs.

1. Flat and Stable Terrain:

- Avoid uneven or rocky ground to reduce fall risks.
- Consider paved or compacted gravel paths for **wheelchair users and individuals with mobility impairments**.

2. Sheltered from Extreme Weather:

- Position hives near natural windbreaks or install barriers to protect against strong winds.
- Ensure adequate shade to prevent overheating in hot climates.

3. Easy Access to Water Sources:

- Provide a **nearby water source**, such as a shallow dish with floating corks or pebbles.
- It is essential for beekeepers with **limited mobility who may struggle with long walks to refill water sources**.

Hive Placement

Proper hive placement can significantly improve accessibility and ease of management.

1. **Raised Hive Stands:**

- Elevating hives reduces the need for bending or kneeling during inspections.
- It is ideal for beekeepers with **back pain or difficulty bending**.

2. **Side-Opening Hives:**

- Slovenian AZ and long Langstroth hives allow for frame inspections without lifting heavy boxes.
- It is beneficial for individuals with **limited upper body strength**.

3. **Wide, Clear Pathways Between Hives:**

- Ensure enough space between hives for **wheelchair or walker access**.
- Maintain level ground to prevent tripping hazards.

4. **Hive Labels and Markings:**

- Use large, high-contrast labels for **visually impaired beekeepers**.
- Implement QR codes linking to voice-recorded notes for additional assistance.

First Aid

Having an accessible first aid plan is essential for the safety of all beekeepers, particularly those with disabilities.

1. **Emergency Contact System:**

- Install a **wireless emergency alert button** or have a mobile phone on hand.
- Recommended for beekeepers with **seizure disorders, balance issues, or high allergic sensitivity**.

2. **EpiPen and Allergy Precautions:**

- Ensure an **EpiPen** is always available for individuals with severe bee sting allergies.
- Store antihistamines and a first aid kit in a **marked easily accessible location**.

3. **Accessible Workstations:**

- Provide seating or shaded resting areas for beekeepers with **chronic fatigue, MS, or mobility impairments**.

- Have assistive grab bars near hive stands for additional support.

By designing an apiary with accessibility, beekeepers with physical limitations can safely and efficiently care for their hives.

First Aid & Emergency Response Plan for a Disabled Beekeeper in a Remote Area

Beekeeping can pose risks such as **bee stings, allergic reactions, heat exhaustion, or falls**, especially for those with **physical limitations in remote locations**. Having a **first aid and emergency response plan** is crucial for safety.

Essential First Aid Kit for Beekeepers

Your **beekeeping first aid kit** should always be accessible and include:

Critical Emergency Supplies

- **Epinephrine Auto-Injector (EpiPen)** – If you or a helper have a severe bee allergy.
- **Antihistamines (e.g., Benadryl, Cetirizine)** – To reduce swelling and mild allergic reactions.
- **Aspirin or Pain Relievers** – For general discomfort.
- **CPR Mask or Face Shield** – If a severe reaction requires CPR.

Bee Sting Care

- **Bee Sting Removal Tool/Tweezers** – To remove stingers quickly.
- **Ice Packs** – To reduce swelling.
- **Baking Soda or Sting Relief Wipes** – Helps neutralize venom.
- **Hydrocortisone Cream & Antihistamine Gel** – For itchiness.

Injury & Wound Care

- **Elastic Bandages & Wraps** – For sprains or strains.
- **Sterile Gauze & Adhesive Bandages** – For cuts or scrapes.
- **Disinfectant Wipes & Hydrogen Peroxide** – For cleaning wounds.
- **Medical Tape & Scissors** – For securing bandages.

Heat & Exhaustion Prevention

- **Electrolyte Packets (Gatorade, Pedialyte, etc.)** – To prevent dehydration.
- **Cooling Towel** – Helps regulate body temperature.

- Emergency Blanket – In case of cold exposure.

Communication & Navigation

- Fully Charged Cell Phone or Satellite Phone – If out of regular signal range.
- GPS Locator or Personal Emergency Beacon (PLB) – Essential for remote areas.
- Whistle or Air Horn – To signal for help if needed.

First Responder Plan: What to Do in an Emergency

In Case of a Bee Sting Reaction (Anaphylaxis)

1. **Call 911 or Emergency Services** immediately.
2. If prescribed, **use an EpiPen immediately**.
3. Take an **antihistamine** to slow the reaction.
4. **Lie down with legs elevated** to maintain blood flow.
5. Use a **CPR mask** if breathing stops.

In Case of a Fall or Injury

1. **Assess the injury** (bleeding, broken bones, head trauma).
2. If a **serious injury occurs, do not move**—call for help.
3. Use **elastic wraps for sprains** or **splints for fractures**.
4. Apply **pressure to stop bleeding** and use gauze.
5. **Keep the injured area elevated** if possible.

In Case of Heat Exhaustion

1. Move to **shade or a cool area immediately**.
2. **Hydrate with electrolytes** (avoid caffeine/alcohol).
3. Use a **cooling towel** on the head, neck, and wrists.
4. If symptoms worsen (confusion, vomiting, dizziness), **seek medical help**.

Preventative Measures to Reduce Risks

ALWAYS Have a Buddy or Check-In System

- Let someone **know where you are** before going out.
- Use a **check-in app or GPS tracker** (like Life360 or SPOT Gen3).

Wear Protective Gear & Clothing

- Always wear **gloves, a full bee suit, and a veil**.
- Use **lightweight, ventilated fabric** to prevent overheating.

Modify Your Apiary for Safety

- Keep **hives waist-height** to reduce bending and strain.
- Use a **rolling cart or hive lifter** to move boxes.
- Have a **seated work area** for inspections if needed.

Keep Emergency Contacts Handy

- **Local emergency number** (911 in the U.S.).
- Contact info of a **nearby beekeeper or neighbor**.
- **Medical alert ID** if you have a known allergy or condition.

Summary: Quick Checklist for Remote Beekeeping Safety

- Fully stocked first aid kit nearby.
- Phone, GPS, or emergency beacon charged and ready.
- Someone knows your location & schedule.
- Wear protective gear (bee suit, hat, gloves).
- Have hydration and cooling measures available.
- Keep an emergency plan printed & accessible.

By **preparing ahead** and **having the right gear**, disabled or mobility-impaired beekeepers can safely manage hives—even in remote locations!

Current Accessibility in the Beekeeping Community

The beekeeping community is becoming increasingly aware of the need for accessibility, and many organizations are working to create more inclusive opportunities for individuals with disabilities.

Programs Supporting Inclusive Beekeeping

1. Adaptive Beekeeping Workshops:

- Training sessions for beekeepers with disabilities featuring ergonomic tools and hive modifications.
- Led by organizations promoting accessibility in agriculture.
- **AgrAbility's Adaptive Beekeeping Initiatives:** AgrAbility offers programs to assist farmers and beekeepers with disabilities, focusing on adaptive tools and technologies to facilitate beekeeping activities. agrability.org
- **HIVES Program (Honeybee Initiative for Veteran's Empowerment and Support):** This program empowers veterans to utilize beekeeping as a way to manage their overall well-being and mental health through enjoyable leisure and mindfulness practices. [VA Marketplace](http://VAMarketplace)

2. Online Beekeeping Communities:

- Facebook groups, forums, and virtual meetups for beekeepers with disabilities.
- Allow for sharing experiences, troubleshooting challenges, and networking with like-minded individuals.
- **Beekeeping With Disabilities:** A platform showcasing how beekeeping is accessible to everyone, including individuals with visual impairments, PTSD, mobility issues, and more. [Beekeeping With Disabilities](#)
- **Accessible Beekeeping:** This organization uses research and public funding to make beekeeping accessible to all, regardless of limitations and age. [Accessible Beekeeping](#)
- **Beekeeping Forums:** A community dedicated to bee owners and enthusiasts, offering discussions on various topics, including adaptive beekeeping practices. [Beekeeping Forums](#)

3. Grants and Funding for Accessible Beekeeping Equipment:

- Many agricultural and disability support organizations provide financial assistance for adaptive equipment.
- It helps cover the cost of **hive lifters, ergonomic tools, and automated extractors**.
- **VA Adaptive Sports Grants:** The U.S. Department of Veterans Affairs provides grants to community organizations for adaptive sports and therapeutic recreational opportunities, which can include beekeeping programs for disabled veterans.
- **Heroes to Hives:** A free veteran beekeeping program that offers education and support, helping veterans improve their well-being through beekeeping. [Heroes to Hives](#)

Challenges in Accessibility

While progress has been made, there are still barriers that prevent full accessibility in beekeeping:

1. Limited Availability of Adaptive Equipment:

- Specialized hives, ergonomic tools, and assistive devices can be hard to find.

2. Lack of Awareness:

- Some beekeeping suppliers and educators are unfamiliar with adaptive solutions.

3. Financial Barriers:

- The high cost of assistive beekeeping technology can make it inaccessible to many individuals with disabilities.

Future Improvements for Inclusive Beekeeping

1. **Increased Collaboration with Disability Advocacy Groups:**

- Expanding research and development in accessible beekeeping tools.

2. **More Accessible Beekeeping Education:**

- Offering online courses with **captioning, audio descriptions, and hands-free learning options.**

3. **Integration of Technology:**

- Advancing hive monitoring systems with **AI-driven alerts, remote temperature monitoring, and hands-free data collection.**

By improving accessibility in beekeeping, more individuals with physical limitations can successfully engage in apiculture, ensuring that beekeeping remains an inclusive and sustainable practice for all.

Assessing a Person's Limitations and Suggesting Adaptations

Assessing a person's limitations and applying appropriate adaptations is important to ensure that beekeeping remains accessible to individuals with disabilities. This section provides a structured approach to evaluating needs and implementing modifications.

Step 1: Identifying Physical and Cognitive Limitations

Before engaging in beekeeping, individuals should assess their capabilities in the following areas:

- **Mobility:** Can the individual move freely around the apiary? Are they able to stand, kneel, or reach hives comfortably?
- **Strength and Endurance:** Can they lift and manipulate hive components or require assistance?
- **Dexterity:** Do they have sufficient hand function to use beekeeping tools and manage hive inspections?
- **Sensory Processing:** Are they sensitive to touch, sounds, or unexpected environmental stimuli?
- **Cognitive Function:** Can they follow a structured beekeeping routine and make hive management decisions?

Step 2: Matching Adaptations to Specific Needs

Based on the identified limitations, the following adaptations can improve accessibility:

For Mobility Impairments:

- Use **horizontal hives** (e.g., top bars or long Langstroth hives) to eliminate the need to lift heavy supers.
- Install **raised hive stands** to allow access from a seated position.
- Create **wheelchair-accessible apiary paths** using compacted gravel or pavers.
- Utilize **mechanical hive lifters** to move heavy hive boxes.

For Strength and Endurance Limitations:

- Use **lighter hive components**, like medium or shallow boxes, instead of deep brood boxes.
- Work in **shorter time intervals**, taking breaks between tasks to conserve energy.

- Partner with a beekeeping assistant or mentor to share responsibilities.
- Utilize 8-frame over 10-frame equipment for easier management of hive bodies.

For Dexterity Challenges:

- Select **ergonomic hive tools** with larger, cushioned grips to accommodate limited hand function.
- Use **frame grips** for easy handling of hive frames.
- Utilize **automated honey extractors** to minimize manual labor during harvesting.

For Visual Impairments:

- Apply **tactile markers** on hive components to distinguish different sections of the hive.
- Use **voice-recording apps** to document hive inspections instead of written logs.
- Work with a **sighted beekeeping assistant** to verify hive health and queen activity.

For Cognitive and Neurological Conditions:

- Implement **structured beekeeping checklists** to guide each hive inspection.
- Utilize **digital reminders** and mobile apps to track hive tasks and feeding schedules.
- Reduce sensory overload using noise-canceling earmuffs and soft gloves to minimize excessive tactile stimuli.

Step 3: Testing and Adjusting Adaptations

Once adaptations have been implemented, testing them in real-world beekeeping scenarios is essential. Individuals should begin with **low-risk, controlled tasks**, such as opening a hive for a brief inspection or using an ergonomic hive tool to manipulate frames. Feedback should be recorded to determine which adaptations are practical and need refinement.

Adjustments should be made based on:

- **Ease of use:** Does the modification reduce physical strain or improve efficiency?
- **Safety:** Does the adaptation lower the risk of injury, bee stings, or equipment mishandling?
- **Effectiveness:** Does the adaptation help the individual perform the necessary beekeeping tasks more independently?
- **Environmental Considerations:** Does the modification work well in different weather conditions and seasonal changes?

Testing should be conducted across different beekeeping tasks, including hive inspections, honey harvesting, and hive maintenance, to ensure that adaptations work for all aspects of apiculture. Beekeepers should consult adaptive beekeeping specialists, occupational therapists, or local beekeeping associations for additional recommendations if challenges persist.

By assessing an individual's limitations and incorporating adaptive strategies, beekeeping can become an accessible and rewarding activity for people of all abilities. Thoughtful modifications not only enable disabled beekeepers to participate fully but also improve overall efficiency and comfort in hive management.

Beekeeping With Limitations: Common Problems and Solutions

Beekeeping can be adapted to accommodate various disabilities, making it an accessible and enjoyable practice for all individuals. Below is an exhaustive list of challenges faced by beekeepers with disabilities and practical solutions to help them succeed.

Mobility Impairments (Wheelchair Users, Arthritis, Amputations, Limited Movement)

1. **Problem:** Difficulty lifting heavy hive boxes.

Solution: Use horizontal hives (e.g., long Langstroth or top-bar hives) that do not require lifting supers. Install hive lifters or mechanical aids for Langstroth hives.

2. **Problem:** Difficulty maneuvering around an apiary with uneven terrain.

Solution: Establish an accessible apiary with broad, flat paths made of gravel, compacted dirt, or paving stones. Keep hives at an ergonomic height for easy access from a seated position.

3. **Problem:** Limited ability to move quickly in case of bee agitation.

Solution: Wear extra protective gear, use a ventilated bee jacket to prevent overheating, and work in the hive during more incredible hours when bees are calmer.

Visual Impairments (Low Vision, Blindness)

1. **Problem:** Difficulty identifying brood patterns, queen cells, or signs of disease.

Solution: Use high-contrast hive markings, voice-activated hive inspection apps, or enlist a beekeeping partner for visual confirmation.

2. **Problem:** Increased risk of accidental contact with bees.

Solution: Implement haptic (touch-based) guides on hive components, such as raised markers or textured handles. Wear gloves that reinforce sensory feedback.

3. **Problem:** Inability to read traditional beekeeping logs.

Solution: Use audio recording devices or braille-based note-taking systems to track hive inspections and colony health.

Hearing Impairments (Deafness, Hard of Hearing)

1. **Problem:** Inability to hear hive sounds that indicate queen presence or swarming activity.

Solution: Utilize visual hive monitoring technology, such as infrared cameras, vibration sensors, or smart hive apps that provide real-time notifications.

2. **Problem:** Difficulty communicating with other beekeepers during group inspections.

Solution: Use notepads, whiteboards, or text-to-speech apps to facilitate communication in noisy environments.

Cognitive and Neurological Conditions (Autism, ADHD, Traumatic Brain Injury, Memory Impairments)

1. **Problem:** Difficulty maintaining a consistent beekeeping routine.

Solution: Use reminder apps and automated calendars, or work with a beekeeping mentor to develop structured schedules.

2. **Problem:** Sensory overload from buzzing, smoking, or handling sticky honeycomb.

Solution: Use noise-canceling earmuffs, wear non-latex gloves, and work in shorter intervals with planned breaks.

3. **Problem:** Forgetting hive management tasks, such as feeding or pest control.

Solution: Implement digital tracking apps with notifications for scheduled hive inspections and treatments.

Chronic Pain, Fatigue, and Autoimmune Disorders (Fibromyalgia, Multiple Sclerosis, Lupus, Chronic Fatigue Syndrome)

1. **Problem:** Limited endurance for hive inspections and maintenance.

Solution: Use lightweight hive tools and frames, schedule tasks in short increments, and work with a beekeeping partner to share responsibilities.

2. **Problem:** Increased pain or fatigue from lifting hive components.

Solution: Utilize hive stands to reduce bending, install mechanical lifts, or transition to hives that minimize lifting requirements.

3. **Problem:** Sensitivity to environmental conditions such as heat and cold.

Solution: Work in the hive during more incredible hours, wear temperature-regulating clothing, and ensure an easily accessible shaded area.

Hand and Dexterity Limitations (Arthritis, Carpal Tunnel Syndrome, Missing Fingers or Hand Tremors)

- Problem:** Difficulty gripping hive tools, frames, or manipulating small objects.
Solution: Use ergonomic hive tools with larger handles, frame grips, or adaptive gloves that provide additional wrist support.
- Problem:** Difficulty controlling hand tremors while handling bees.
Solution: Use weighted gloves, stabilize hands against hive structures while working, and take breaks to minimize fatigue.
- Problem:** Pain when performing repetitive beekeeping tasks.
Solution: Invest in automatic hive lifters, powered honey extractors, and tools designed to reduce manual effort.

PTSD and Anxiety Disorders

- Problem:** Stress or panic caused by bee proximity or unexpected stings.
Solution: Begin with small hive management tasks, wear extra protective gear for security, and use calming breathing techniques while working.
- Problem:** Discomfort in unpredictable beekeeping situations.
Solution: Establish a structured approach to inspections, work in familiar settings, and have a designated exit strategy in case of distress.
- Problem:** Difficulty concentrating on hive management tasks.
Solution: Utilize written checklists, follow a step-by-step beekeeping guide, and work with a mentor for additional support.

Beekeeping is an inclusive activity that can be adapted to meet the needs of individuals with disabilities. By utilizing specialized tools, modifying hive setups, and implementing structured routines, beekeepers with physical, cognitive, and sensory impairments can fully participate in apiculture. The growing availability of adaptive beekeeping equipment, assistive technology, and community support networks continues to make beekeeping accessible, ensuring everyone can experience the joy and benefits of working with honeybees.

Appendix A

Detailed Comparison of Hive Types for Beekeepers with Physical Limitations

Hive Type	Lifting Requirement	Ease of Honey Harvesting	Accessibility Features	Best For
Traditional Langstroth	High (heavy boxes)	Requires extractor	Can use Flow Frames, hive lifters, carts	Those with moderate lifting ability who want a standard hive
Long Langstroth	Low (frames only)	Traditional extraction	No box lifting, can use waist-height stand	Those wanting standard Langstroth frames without lifting boxes
Slovenian AZ Hive	None (rear access)	Requires frame extraction	No lifting, waist-height, ideal for indoor use	Those with back pain, wheelchair users, or limited mobility
Top Bar Hive	Very Low (one bar at a time)	Crush-and-strain (low effort)	No box lifting, waist-height setup, natural comb	Beekeepers with severe mobility or strength limitations
Flow Hive	Low (brood box only)	Easiest turnkey to drain honey	No-lift honey harvesting, minimal handling	Those who want effortless honey extraction

Best Hive Choice for Your Needs

- If you have severe mobility issues → Slovenian AZ Hive (no lifting, easy access).
- If you want the simplest hive with no heavy lifting → Top Bar Hive.
- If you want traditional frames but no box lifting →, Long Langstroth Hive.
- If you want the easiest honey harvesting method →, Flow Hive.
- If you have some lifting ability and want a classic hive →, Langstroth Hive with modifications.

Traditional Langstroth Hive

Best for: Beekeepers who want a widely used, modular system but can manage moderate lifting.

Advantages:

- Modular design allows for flexibility in hive expansion.
- Uses widely available frames and tools.
- Compatible with Flow Frames for easier harvesting.

Challenges for Physical Limitations:

- Heavy lifting required—deep boxes can weigh 60-80 lbs when full.
- Frequent handling of supers, frames, and covers.
- Requires a honey extractor (unless using crush-and-strain).

Modifications for Accessibility:

- Use medium or shallow boxes instead of deep ones.
- Install a hive stand to reduce bending.
- Use a hive lifter or rolling cart to move boxes.
- Combine with Flow Frames for easier honey extraction.

Long Langstroth Hive (Horizontal Langstroth)

Best for: Those who like Langstroth frames but must avoid lifting heavy boxes.

Advantages:

- No heavy lifting—frames slide in/out instead of lifting supers.
- Uses standard Langstroth frames (easy compatibility).
- The hive sits at waist height for easier access.

Challenges for Physical Limitations:

- Requires bending or reaching for deep frames in long hives.

- It still requires traditional honey extraction (unless modified).

Modifications for Accessibility:

- Add a hinged lid or lightweight covers for a more effortless opening.
- Install sliding trays for mite monitoring.
- Use a frame holder or cart to reduce hand strain.

Slovenian AZ Hive (Alberti-Žnideršič Hive)

Best for: Beekeepers who want a no-lift, back-access hive, especially for indoor bee houses.

Advantages:

- No lifting is required; frames are accessed from the back instead of lifting boxes.
- A hive can be built into a shelter for weather protection.
- Frames slide out horizontally, reducing arm strain.
- Often waist-height for easy access.

Challenges for Physical Limitations:

- Less modular than Langstroth hives—expansion is more complicated.
- Limited availability outside of Slovenia/Europe.

Modifications for Accessibility:

- Build into a bee house at an ergonomic height.
- Use removable side panels for even easier access.
- Combine with a Flow Frame hybrid system for simplified harvesting.

Top Bar Hive

Best for: Those who want the most manageable hive to work with and no lifting at all.

Advantages:

- No heavy lifting—frames are removed one at a time.
- Hive sits at waist height, preventing bending or kneeling.
- Requires minimal equipment (no extractors or additional tools).

Challenges for Physical Limitations:

- The natural comb is fragile—and requires careful handling.
- Honey is harvested by crushing and straining (manual effort).

Modifications for Accessibility:

- Use a lightweight hinged lid for a more effortless opening.
- Attach a side shelf or rotating stand for frame support.
- Utilize a simple honey press to minimize hand strain.

Flow Hive

Best for: Those who want the easiest honey harvesting method with minimal lifting.

Advantages:

- No lifting is required for honey extraction—turn a key, and honey flows out.
- Reduces hive disturbance—less frequent inspections are needed.
- Uses Langstroth frames in the brood box for easy management.

Challenges for Physical Limitations:

- It still requires some lifting (brood box maintenance).
- Higher initial cost than other hives.

Modifications for Accessibility:

- Elevate the hive for waist-height access.
- Use a gravity-fed hose to extract honey without handling jars.
- Pair with AZ Hive-style rear access for full no-lift functionality.

Appendix B

Mobility Around Apiary and Overwintering

Hive Type	Mobility	Over Winter Ease	Key Considerations
Langstroth Hive	Moderate (Stackable but heavy)	Good	Requires good moisture control, insulation, and food stores for winter survival
Slovenian AZ Hive	Low (Fixed in bee house)	Excellent	Naturally insulated; best suited for stationary setups; easy winter management
Long Langstroth Hive	Low (Bulky and hard to transport)	Moderate	Requires extra insulation and careful feeding placement
Top Bar Hive	Moderate (Lighter but fragile comb)	Difficult	Needs strong insulation and good moisture control
Flow Hive	Moderate (Same as Langstroth)	Moderate	Flow Supers should be removed before winter; plastic frames may impact insulation

Summary:

- Best for Mobility: Langstroth & Top Bar Hive
- Best for overwintering: Slovenian AZ Hive
- Most stationary: Slovenian AZ & Long Langstroth Hive
- Most fragile combs: Top Bar Hive

- Most dependent on insulation: Top Bar & Long Langstroth Hive

Langstroth Hives: Mobility & Overwintering in Cold Climates

Mobility & Positioning in Different Bee Yards

- **Modular Design:** Langstroth hives are made of stacked boxes, making them easy to disassemble and transport in sections.
- **Weight Considerations:** When full of honey, a deep Langstroth box can weigh up to 80 lbs (36 kg), making it heavy to lift and move. Using medium or shallow boxes can make handling easier.
- **Hive Stands & Leveling:** Langstroth hives should be placed on level ground to ensure proper comb building and prevent tilting.
- **Accessibility:** They can be placed on hive stands to facilitate inspections, especially for beekeepers with mobility concerns.
- **Strapping for Transport:** When moving hives between bee yards, ratchet straps should be used to secure the hive boxes together.

Overwintering in Cold Climates

- **Hive Insulation:** Wrapping the hive with insulated covers or foam board insulation can help retain heat.
- **Moisture Control:** Excess moisture is a more significant threat than cold temperatures. Quilt boxes, upper ventilation holes, or moisture-absorbing materials (burlap, wood shavings) can help prevent condensation.
- **Food Stores:** For winter survival, colonies need 60-80 lbs of honey. If food stores are low, sugar bricks or fondant can be used for emergency feeding.
- **Reducing Heat Loss:** Reducing excess hive space by removing empty supers helps the colony conserve heat.
- **Wind Protection:** Positioning hives near windbreaks (trees, fences, or man-made barriers) helps reduce exposure to harsh winds.

Slovenian AZ Hive: Mobility & Overwintering in Cold Climates

Mobility & Positioning in Different Bee Yards

- **Designed for Stationary Beekeeping:** Unlike Langstroth hives, AZ hives are typically installed in bee houses or sheds, making them difficult to relocate once set up.

- **Not Easily Transportable:** Because the hive is built into a structure and accessed from the back, it is not meant for frequent moving.
- **Built-in Frames:** The fixed frame rails make it easier for the beekeeper to manage the hive without lifting heavy boxes but also mean that entire hives cannot be easily moved.
- **Requires Proper Setup:** To function correctly in a bee yard, the hive must be placed inside a shelter or a permanently installed hive stand.

Overwintering in Cold Climates

- **Built-in Insulation:** The cabinet-style structure provides better natural insulation than a standard Langstroth hive. The thicker walls and enclosed bee house protect colonies from harsh winter temperatures.
- **Reduced Wind Exposure:** Since AZ hives are typically housed in a structure, they are protected from direct wind and snow, reducing temperature fluctuations.
- **Ventilation & Moisture Control:** Proper ventilation is crucial. Some beekeepers drill small vent holes or use quilt boxes to prevent condensation buildup inside the hive.
- **Easy Winter Feeding:** AZ hives allow for rear access, meaning beekeepers can feed colonies without opening the hive and exposing bees to cold temperatures.
- **Cluster Stability:** The horizontal frame orientation helps stabilize the winter cluster without requiring bees to move vertically through boxes.
- **Natural Heat Retention:** Because multiple hives are often stacked inside a bee house, colonies can share warmth, further aiding winter survival.

Long Langstroth Hive: Mobility & Overwintering in Cold Climates

Mobility & Positioning in Different Bee Yards

- **More Stationary than Vertical Langstroth:** Long Langstroth hives are heavier and bulkier, making them harder to move than standard stacked Langstroth hives.
- **Easier for Individual Frame Inspections:** Since frames remain in a horizontal layout, beekeepers don't need to lift heavy boxes, which is helpful for those with mobility limitations.
- **Best for Permanent or Semi-Permanent Locations:** Due to their larger footprint, they work best in stable setups rather than migratory beekeeping.

Overwintering in Cold Climates

- **Requires Additional Insulation:** Heat retention can be more challenging because the hive is spread horizontally. Adding insulation boards or wrapping the hive can help.
- **Cluster Movement Challenges:** In a vertical Langstroth, bees can move upward toward honey stores, but in a Long Langstroth, they must move sideways, which can be more challenging in deep winter.
- **Moisture Control is Essential:** Proper ventilation holes or a quilt box are needed to prevent condensation buildup, which can be fatal.
- **Feeding is Easy:** Since the hive is horizontal, fondant or sugar bricks can be placed directly above the cluster for easy access.

Top Bar Hive: Mobility & Overwintering in Cold Climates

Mobility & Positioning in Different Bee Yards

- **More Portable than a Langstroth:** Top Bar Hives are typically lighter and can be moved as a whole unit, making them more adaptable for relocation.
- **Self-Contained Design:** No boxes stacking, making transport easier but requiring careful handling to avoid disturbing comb attachments.
- **Best for Stationary or Small-Scale Beekeeping:** Works well in backyard setups but is not ideal for large-scale beekeeping due to lower honey yields.

Overwintering in Cold Climates

- **More Challenging than Vertical Hives:** The cluster must move horizontally to find food since heat does not rise to additional supers.
- **Additional Insulation Required:** Many beekeepers use straw bales, foam boards, or insulated hive covers to help retain heat.
- **Moisture Control is Critical:** Excess moisture is a risk, so adding ventilation holes or using absorbent materials like burlap or shavings can prevent condensation buildup.
- **Small Colony Survival Can Be Difficult:** A weak colony may struggle to generate enough heat, so combining weak colonies before winter can improve survival rates.

Flow Hive: Mobility & Overwintering in Cold Climates

Mobility & Positioning in Different Bee Yards

- **Similar Mobility to Standard Langstroth:** Since the Flow Hive is a modified Langstroth, it has the same stacking structure, meaning it can be moved but requires securing with straps.
- **Weight Considerations:** The plastic Flow Frames add some weight, but the hive is just as transportable as a regular Langstroth.
- **Best for Stationary Beekeeping:** While it can be moved, its unique honey harvesting method suits it best for backyard beekeepers or small-scale operations.

Overwintering in Cold Climates

- **Plastic Frames Can Affect Heat Retention:** Some beekeepers report that the Flow Frames do not insulate as well as traditional wooden frames so that additional hive wrapping may be needed.
- **Removing Flow Supers in Winter:** Since honey is harvested without removing frames, Flow Hives require supers to be removed before winter to help bees conserve heat.
- **Ventilation is Key:** Like Langstroth hives, proper ventilation control is needed to avoid moisture issues. A moisture-absorbing quilt box or vent holes help prevent condensation buildup.
- **Feeding Considerations:** If bees need supplemental feeding in winter, a top feeder or sugar brick placement inside the brood box may be necessary.

Appendix C

Popular Beekeeping Books

For further reading, consider these highly regarded books on beekeeping, categorized by expertise level.

Basic Beekeeping Books (For Beginners)

If you are new to beekeeping, these books provide an excellent introduction to the fundamentals of hive management, bee biology, and honey production.

1. **Beekeeping for Dummies** – Howland Blackiston
2. **The Backyard Beekeeper** – Kim Flottum
3. **The Beekeeper's Handbook** – Diana Sammataro & Alphonse Avitabile
4. **First Lessons in Beekeeping** – Keith S. Delaplane
5. **Storey's Guide to Keeping Honeybees** – Malcolm T. Sanford & Richard E. Bonney
6. **Natural Beekeeping: Organic Approaches to Modern Apiculture** – Ross Conrad

Intermediate Beekeeping Books (For Experienced Hobbyists and Small-Scale Beekeepers)

These books are ideal for those with basic beekeeping knowledge who want to deepen their hive management and bee health skills.

1. **Keeping Bees with a Smile** – Fedor Lazutin
2. **Top-Bar Beekeeping: Organic Practices for Honeybee Health** – Les Crowder & Heather Harrell
3. **Queen Rearing Essentials** – Lawrence John Connor
4. **At the Hive Entrance** – H. Storch
5. **Beeswax Alchemy: How to Make Your Candles, Soap, Balms, Salves, and Home Décor from the Hive** – Petra Ahnert
6. **Healthy Bees: A Practical Guide for Beekeepers** – Pamela Hickson

Expert Beekeeping Books (For Professional and Commercial Beekeepers)

These books focus on advanced beekeeping techniques, large-scale operations, and beekeeping economics.

1. **Honeybee Ecology: A Study of Adaptation in Social Life** – Thomas D. Seeley

2. **The Practical Beekeeper: Beekeeping Naturally** – Michael Bush
3. **Bees and Beekeeping: Science, Practice, and World Resources** – Eva Crane
4. **Managing Alternative Pollinators** – Eric Mader, Marla Spivak, & Elaine Evans
5. **Commercial Beekeeping: How to Build a Profitable Honey Business** – Frank Linton
6. **Queen Rearing and Bee Breeding** – Harry H. Laidlaw Jr. & Robert E. Page Jr.

Scientific Beekeeping Books (For Those Interested in Bee Biology and Research)

These books focus on the science of honeybees, including their behavior, communication, and ecological role.

1. **Honeybee Democracy** – Thomas D. Seeley
2. **The Buzz about Bees: Biology of a Superorganism** – Jürgen Tautz
3. **The Wisdom of the Hive** – Thomas D. Seeley
4. **The Biology of the Honeybee** – Mark L. Winston
5. **The Superorganism: The Beauty, Elegance, and Strangeness of Insect Societies** – Bert Hölldobler & Edward O. Wilson
6. **Pheromones of Social Bees** – João M. F. Camargo & David G. Baker

These books cover various topics, from hobbyist beekeeping to commercial production and scientific research, ensuring there is something for every level of interest and expertise in beekeeping.

Appendix D

Comprehensive Glossary of Beekeeping Terms

This glossary provides an extensive list of beekeeping terms and definitions essential for beekeepers at all levels.

- **Abseonding** is when an entire colony of bees leaves the hive permanently, usually due to poor conditions or disturbances.
- **Apiary**: A location where multiple beehives are kept and managed.
- **Bee Bread**: A fermented mixture of pollen and nectar stored in the hive to feed larvae and young bees.
- **Bee Space**: The optimal spacing (approximately 3/8 inch) within a hive that bees naturally maintain between combs.
- **Brace Comb**: Irregular wax comb built by bees to fill gaps between frames.
- **Brood**: The developing eggs, larvae, and pupae of honeybees.
- **Brood Chamber**: The section of a beehive where the queen lays eggs and brood is raised.
- **Capped Brood**: Brood cells sealed with wax, indicating pupation is occurring inside.
- **Capped Honey**: Honey that the bees have sealed with wax, indicating it is fully ripened.
- **Colony Collapse Disorder (CCD)**: A phenomenon where most worker bees disappear, leaving behind the queen and a few nurse bees.
- **Comb**: The wax structure built by bees to store honey, pollen, and brood.
- **Cross-Combing**: When bees build combs in irregular patterns, hive management is complex.
- **Drone**: A male honeybee whose primary function is mating with a queen.
- **Dwindling Colony**: A colony that is shrinking in population due to disease, poor nutrition, or other stress factors.
- **Forager Bee**: A worker bee that collects nectar, pollen, and water for the hive.
- **Foulbrood**: A bacterial disease that affects honeybee larvae, often requiring the destruction of the hive.
- **Hive Tool**: A metal tool beekeepers use to pry apart hive components and scrape off wax or propolis.

- **Honey Flow:** A period when nectar is abundantly available, increasing honey production.
- **Laying Worker:** A worker bee that begins laying unfertilized eggs without a queen.
- **Nectar Flow:** The seasonal availability of nectar from flowering plants.
- **Nucleus Colony (Nuc):** A small colony of bees used for hive expansion or queen rearing.
- **Package Bees:** A group of worker bees and a mated queen were purchased to establish a new colony.
- **Pheromones:** Chemical signals released by bees to communicate within the colony.
- **Propolis:** A resin-like substance bees collect from tree buds and seal gaps in the hive.
- **Pupa:** The final developmental stage of a bee before emerging as an adult.
- **Queen Cell:** A specially constructed cell where a new queen bee develops.
- **Queen Excluder:** A perforated sheet of metal or plastic that prevents the queen from accessing honey supers.
- **Robbing:** When bees from one colony invade another hive to steal honey.
- **Royal Jelly:** A nutrient-rich secretion used to feed larvae and develop new queens.
- **Screened Bottom Board:** A ventilated hive base that improves airflow and aids in Varroa mite management.
- **Swarm:** A large group of bees that leave the original hive to establish a new colony.
- **Swarm Trap:** A specially designed container used to attract and capture swarms.
- **Varroa Mite:** A parasitic mite that attaches to bees and transmits harmful viruses.
- **Worker Bee:** A female bee responsible for foraging, hive maintenance, and brood care.

Appendix E

Beekeeping Equipment Checklist

A well-prepared beekeeper requires the following equipment:

1. **Protective Gear:** Bee suit, gloves, and veil for inspection safety.
2. **Smoker and Fuel:** Used to calm bees during hive management.
3. **Hive Tool:** Essential for prying apart hive components and cleaning surfaces.
4. **Bee Brush:** A soft-bristled brush to gently remove bees from frames.
5. **Queen Excluder:** Helps manage the movement of the queen in the hive.
6. **Hive Stand:** Elevates the hive, protecting it from ground moisture and pests.
7. **Frame Grip:** Assists in lifting frames from the hive.
8. **Uncapping Knife:** Used during honey extraction to remove wax caps from the honeycomb.
9. **Varroa Mite Monitoring Board:** A tool to assess mite infestation levels.
10. **Honey Extractor:** A device to spin the honey out of frames without damaging the comb.
11. **Feeders:** Devices for supplementing colonies with sugar syrup when nectar is scarce.

Appendix F

General Seasonal Beekeeping Calendar

This seasonal beekeeping calendar is for general use, and your local weather affects the timelines and steps taken.

A seasonal guide to managing bee colonies effectively:

- **Spring**
 - Inspect hives for overwintering survival and food stores.
 - Stimulate brood production by providing supplemental feeding if necessary.
 - Add supers as the nectar flow begins to accommodate honey storage.
- **Summer**
 - Monitor hive population and manage swarming.
 - Add additional honey supers and maintain pest control measures.
 - Conduct regular inspections for diseases and queen productivity.
- **Fall**
 - Reduce hive space to prepare for colder temperatures.
 - Ensure colonies have enough honey stores for winter survival.
 - Treat for Varroa mites and insulate hives if needed.
- **Winter**
 - Limit disturbances to the hive.
 - Provide emergency feeding if food stores run low.
 - Monitor hive entrances for blockages and pest invasions.

Appendix G

Common Beekeeping Problems and Solutions

Beekeepers face a variety of challenges throughout the year. Below are some of the most common problems encountered in beekeeping and the recommended solutions to address them.

1. **Problem: Swarming**

Solution: Provide ample space in the hive by adding supers as needed, perform hive splits before colonies grow too large, and inspect regularly to remove swarm cells.

2. **Problem: Varroa Mite Infestation**

Solution: Implement an integrated pest management (IPM) strategy, use screened bottom boards, apply organic treatments like oxalic acid or formic acid, and conduct regular mite counts.

3. **Problem: Queen Loss or Failure**

Solution: Introduce a newly mated queen, allow the colony to raise a replacement, or combine with a more substantial colony if the queen replacement is unsuccessful.

4. **Problem: Colony Weakness**

Solution: Provide supplemental feeding with sugar syrup or pollen substitutes, combine weak colonies, check for signs of disease, and ensure environmental factors do not overly stress the hive.

5. **Problem: Chalkbrood Disease** (A fungal infection affecting brood)

Solution: Improve hive ventilation, replace infected frames, avoid excessive moisture, and maintain strong colonies that can naturally fight off infections.

6. **Problem: American Foulbrood (AFB) or European Foulbrood (EFB)**

Solution: For AFB, burn infected equipment and treat remaining colonies with antibiotics where legally permitted. EFB requires the colony and reduces stress factors.

7. **Problem: Nosema Disease** (A fungal infection of adult bees)

Solution: Provide proper hive ventilation, use Nosema-resistant queens, and treat with fumagillin if necessary.

8. **Problem: Hive Robbing by Other Bees or Wasps**

Solution: Reduce hive entrances during nectar shortages, remove exposed honey, and keep strong colonies that can defend themselves.

9. Problem: Small Hive Beetles (SHB)

Solution: To keep hive beetles in check, use beetle traps, reduce excess moisture in the hive, and maintain strong colonies.

10. Problem: Wax Moth Infestation

Solution: Keep strong colonies, store unused frames in sealed containers or freezers, and use moth traps.

11. Problem: Lack of Honey Production

Solution: Ensure a diverse range of flowering plants are available, avoid overharvesting honey, and relocate hives if nectar sources are insufficient.

12. Problem: Winter Die-Offs

Solution: Ensure colonies have enough food stores (60–80 lbs of honey), provide proper hive insulation, and avoid excessive disturbances during cold months.

13. Problem: Excessive Drone Population

Solution: Monitor drone comb production, ensure a healthy laying queen is present, and remove excessive drone cells if necessary.

14. Problem: Poisoning from Pesticides

Solution: Avoid placing hives near pesticide-treated crops, educate local farmers about bee-friendly practices, and provide water sources to prevent bees from drinking contaminated water.

15. Problem: Cross-Combing in Foundationless Hives

Solution: Inspect regularly and straighten the comb as needed. Use guide strips to encourage straight comb building and ensure frames are appropriately spaced.

16. Problem: Drifting Bees (Bees entering the wrong hive)

Solution: Position hives at different angles or paint them different colors to help bees recognize their home.

By proactively addressing these issues, beekeepers can maintain healthier colonies and improve hive productivity year-round.

Appendix H

Exploratory Data on U.S. Beekeepers with Disabilities

Abstract

Over 500 beekeepers in the United States contributed to a survey concerning beekeeping and disabilities, providing the first exploratory, contemporary data regarding the range of disabilities, limitations of current equipment and approaches, and ideas for innovation and change across the beekeeping industry. The results should provide inspiration for individuals with disabilities who may have been told that beekeeping as a hobby or profession is not an option for them. The insight provided should also fuel innovation for new tools, equipment, and approaches to beekeeping that are more inclusive to all individuals, including those with disabilities.

Introduction

According to the most recent estimate, there are approximately 120,000 beekeepers in the United States.ⁱ It is challenging to maintain an accurate count of beekeepers given the various approaches states take to register and inspect apiaries (the technical term for a space with one or more beehives), the number of non-registered apiaries, and the fluctuation of beekeepers from year to year. Such fluctuation is due to many beekeepers losing their colonies and giving up beekeeping, as well as the many new individuals who start beekeeping each year. The U.S. Department of Agriculture (USDA) has historically defined this population to include hobbyist beekeepers (with fewer than 25 hives), sideline beekeepers (with between 25 and 300 hives and producing a partial income from the activity), and commercial beekeepers (full-time beekeepers with approximately 300 or more hives).ⁱⁱ According to data from the USDA, the number of honeybee colonies is estimated to have declined by 22% as of 2022.ⁱⁱⁱ Honeybees play a critical role in enabling the managed large-scale agriculture and pollination in the U.S., and it is estimated that they contribute at least \$15 billion USD to the U.S. economy.^{iv} They also provide a popular hobby for many individuals as well as an outlet to deal with anxiety, stress, and even post-traumatic stress disorder (PTSD).

It is estimated that 26% of adults in the U.S. live with some type of disability. In the 65 years and older population, that estimate increases to 40%.^v There is little known about the number of beekeepers with disabilities. Similarly, there is a lack of available data regarding approaches, adaptations, and equipment that could assist beekeepers with disabilities, excepting some limited studies focused on agriculture and ergonomics.^{vi} It is probable that the mental health,^{vii} physical health, social, and employment gains of beekeeping and beekeeping-related activities could benefit people with disabilities provided barriers to beekeeping activities are identified, adaptive equipment is designed, and technology is leveraged to improve the accessibility of beekeeping. To further explore the potential for additional research, initial data is needed to gauge the number of current and aspiring beekeepers with disabilities,

barriers they might experience, and adaptations and technology that they use. Innovations in technology, such as smartphone apps that analyze pictures or interpret sounds, provide potential for augmenting the needs of some beekeepers with disabilities, and the Internet of Things (IoT), connecting temperature and humidity sensors as well as hive scales to wireless network or Bluetooth, also provide promise for assisting beekeepers with disabilities.

This project surveyed current and aspiring beekeepers in the United States to provide exploratory data on the number of beekeepers with disabilities. It also examined how their disabilities impact beekeeping activities, including: barriers that prevent them from beekeeping, resources and equipment adaptations that might decrease accessibility barriers, and technology that could make beekeeping more accessible to all.

Background

Data from the U.S. Bureau of Labor Statistics indicates that in 2022, only 21.3% of people with disabilities were employed.^v This lack of employment is certainly not because of a desire to be employed, but complexities that can often include the lack of accessibility, accommodation, and even discrimination.^{vi} While apiculture, aka commercial beekeeping, may not immediately spring to mind of people with disabilities when considering employment opportunities, this does not have to be the case. There are a variety of jobs available, ranging from beekeeping field work^{vii} who are successful at varying scales of apiculture.^{ix} A recent study evaluated an approach towards making vocational beekeeping a potential option for adults with autism spectrum disorder (ASD).^x

Beekeeping can also serve as a form of exercise and cognitive stimulation while providing a social activity if done with a partner or group.^{xi} and new programs are exploring ways that beekeeping might help today^{xii} veterans with PTSD and anxiety.[?] ^{xiii}approximately 30% of military veterans in the U.S. have some type of disability.[?] There has also been a growing awareness of the broader benefits that beekeeping can provide for health, well-being, and exercise. Since the global COVID-19 pandemic, beekeeping has also ^{xiv}^{??}

Methodology

There is no single repository of beekeepers in the U.S., and there is no record of beekeepers with disabilities in the U.S. As a result, the survey was widely distributed through a variety of forums including all U.S. state beekeeping organizations, the Bee Informed Partnership, American Bee Journal, Bee Culture Magazine, American Bee Federation, EAS, WAS, accessiblebeekeeping.org, and the respective AgrAbility community of interest.

The survey was conducted through the Qualtrics online survey software from May 1 until July 31, 2022. Survey participants were required to agree that they were 18 years or older prior to completing the survey. The survey was comprised of up to a maximum of 10 optional questions, which could vary based on responses to prior questions (e.g., if a respondent said they did not have a disability, they would not be

shown the questions relating to having a disability). The survey received 508 responses, and six responses were discarded for a lack of validity. The survey contained the following questions and responses:

1. How long have you been a beekeeper?
 - a. I am trying to become a beekeeper
 - b. Less than a year
 - c. 1-2 years
 - d. 3-5 years
 - e. More than 5 years
2. How many hives do you typically have?
 - a. I am not yet a beekeeper
 - b. 1-2 hives
 - c. 3-24 hives
 - d. 25-100 hives
 - e. 101-299 hives
 - f. 300 or more hives)
3. Do you identify as having a disability?
 - a. Yes
 - b. No
4. What is your disability (or disabilities)?
 - a. Free text entry
5. Does your disability prevent you from becoming a beekeeper?
 - a. Yes
 - b. No
6. Does your disability impact your beekeeping?
 - a. Yes
 - b. No
7. Please describe any ways in which you have adapted your beekeeping as a result.
 - a. Free text entry
8. What hardware or adaptation could help you as a beekeeper?
 - a. Free text entry
9. Do you use any technology such as temperature sensors, humidity sensors, hive scales, or smartphone apps to assist you with beekeeping?
 - a. Yes
 - b. No
10. Please describe any technology that you use to assist you with beekeeping.
 - a. Free text entry

Results

From the 502 valid responses, 24 respondents were not yet beekeepers. Of the 478 beekeepers, 12% were new beekeepers for 2022, 27% had 1-3 years of beekeeping experience, 21% had 3-5 years of experience, and 40% had over 5 years of

beekeeping experience. Based on the USDA example, less than 1% of the survey respondents would be considered to be commercial beekeepers, with over 300 hives. Sideline beekeepers (between 25 and 300 hives) made up 12% of the respondents, and 88% of the respondents were hobbyists (1-24 hives).

When asked about disability, 42% of the respondents reported having a disability of some type. Only 12 of those respondents answered the question as to whether disability prevents them from beekeeping altogether, so that data will not be reported. When asked if their disability impacts their beekeeping, 89% of beekeepers reporting a disability responded that their disability does impact their beekeeping. When asked if they use technology to assist them with their beekeeping, only 22% of beekeepers with disabilities reported that they do. When reporting their disability, many respondents described more than one disability. This was open-ended text, so there was not a restricted list of categories to choose from. Table 1 below outlines the various types of disabilities and the number of times each was described by a respondent. These were self-reported as disabilities by the respondents to the survey.

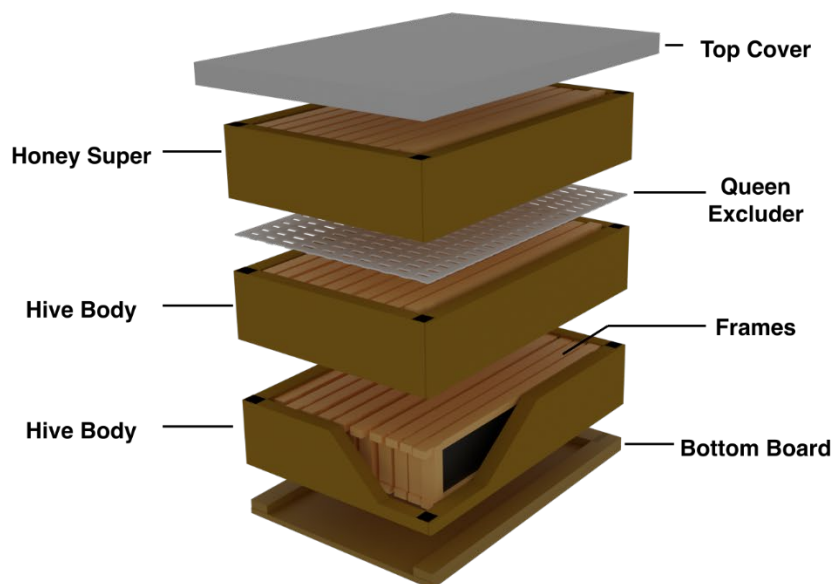
Table 1: Frequency of Disability Types

Disability as Reported	Number of Times Reported
General Back Issues	45
Limited Use of Appendage	22
Post-Traumatic Stress Disorder	21
Arthritis	15
Hearing Issues	12
Age	11
Vision	10
Traumatic Brain Injury	9
Anxiety	8
Back Surgeries	8
Knee Replacement	7
Chronic Obstructive Pulmonary Disease	7
Fibromyalgia	7
Heart Issues	7
Cancer	6
Osteoarthritis	6
Migraines	5
Stroke	5
Degenerative Disc Disease	5
Diabetes	5
Rheumatoid Arthritis	5
Autism	4
Attention-deficit/Hyperactivity Disorder	4
Chronic Pain	4
Limited Mobility	4
Multiple Sclerosis	4

Depression	3
Herniated Disc	3
Nerve Damage	3
Hip Issue	3
Rotator Cuff Issues	3
Asthma	3
Balance Issues	3
Myasthenia Gravis	3
Epilepsy	2
Inclusion-body Myopathy	2
Post Concussive Syndrome	2
Ankylosing Spondylitis	2
Bee Allergy	2
Charcot-Marie-Tooth Disorder	2
Lupus	2
Postural Orthostatic Tachycardia Syndrome	2
Cerebral Palsy	1
Neck Surgeries	1
Panic Disorder	1
Cauda Equina	1
Bone Fusions	1
Hand Strength Issues	1
Joint Issues	1
Nerve Damage	1
Amputee	1
Bone Issues	1
Complex Regional Pain Syndrome	1
Ehlers-Danlos Syndrome	1
Endometriosis	1
Gastrointestinal	1
Guillian-Barre Syndrome	1
Holt Oram Syndrome	1
Hypermobility Spectrum Disorder	1
Lyme's Disease	1
Muscular Dystrophy	1
Parkinson's	1
Spina Bifida	1

Figure 1 shows some basic components of the most common style of beehive (known as the Langstroth hive) to help the reader understand some of the results and discussion.

Figure 1: Basic drawing of a Common Langstroth Beehive



When asked how they have adapted their beekeeping as a result of their disability, there were many descriptions of approaches and adaptations. Examples of responses included “I run all 8 frame mediums and have just started running horizontal hives to reduce lifting” and “Bending over is difficult, I’ve built a mobile beekeeping workbench that has everything I need on it and allows me to not have to set hive box components on the ground (and then have to bend over to pick them up again).” Table 2 outlines the various adaptations and the number of times various respondents noted the same or very similar adaptation. Many respondents described more than one adaptation. “Deep” versus “medium” versus “shallow” in these results refers to the depth of the box and the size of the frame of bee brood or honey that fits in the box.

The note of 10 frame versus 8 frame refers to the width of the box, which determines the maximum number of frames that will fit in that box. This also correlates to weight, which is why this is mentioned.

Table 2: Beekeeping Adaptations

Adaptation	Times Mentioned
Help from an assistant	26
Removing frames to a transfer box	17
Medium boxes instead of deeps	16
“Long Langstroth” style hives	15
8 frame instead of 10 frame boxes	14
Raised boxes/platform, to avoid bending	11
Some type of wagon or dolly	9
“AZ” style hives	8

Keeping fewer colonies	6
Working slowly	6
“Top bar” style hives	5
Taking many breaks	5
“Layens” style hives	5
Hive lifter of some type	5
Small colonies (4 or 5 frames)	4
Careful plan before inspection	4
Shallow boxes	4
Morning work for cooler temperatures	4
Stool nearby to rest	4
Light-weight plastic or polystyrene boxes	4
Flat, stable ground, without debris to avoid falling	4
Fewer hive inspections	3
Full suit, antihistamines, EpiPen, to avoid allergic reactions	3
Boxes near the ground to enable sitting	3
Frame Grip	2
Cooling towels for heat intolerance	2
Bench or table nearby	2
“Flow Hive” to avoid lifting honey supers	2
Track wheelchair	2
Sunglasses	1
UTV for equipment and transportation	1
Using touch and sound for bee sounds and inspections	1
Single brood management to avoid lifting brood boxes	1
Music to help keep calm	1
Smartphone for magnification	1
Special handles for easy lifting	1
Reminder notes	1

When asked about hardware or adaptations that could help with their beekeeping, beekeepers with disabilities outlined a variety of ideas and approaches that are outlined in Table 3, with the number of times the same idea was mentioned by different respondents. Some of the ideas mentioned are similar to the ideas that other beekeepers reported using in Table 2, and some respondents listed multiple ideas. Sample responses to hardware or adaption ideas included “hinged roofs/covers, ways to lower or raise hives” and “Hive tool with a thicker more ergonomic handle.”

Table 3: Hardware or Adaptation Ideas

Idea	Times Mentioned
Hive lifter that is affordable	37
Horizontal hives	11
Cart for various terrains, designed for beekeeping	6
Way to lower and raise hives	5

Light weight equipment options	4
AZ style hives	4
Better frame holder	4
Ergonomic frame puller	3
More ergonomic hive tool	3
Auto pumping smoker	3
App that notifies me of what needs my attention	2
Hinges on lids	2
More accessible extraction equipment	2
Frame lift or stand for single arm beekeeping	2
Cooler bee suits	2
Magnifier	1
8 frame supers	1
Rotating brood boxes to avoid lifting	1
Rotating supers to avoid lifting	1
Taller hive stands	1
Single frame hive styles to avoid lifting	1
Pull behind cart for mobility walkers	1
New technology for prying hive boxes loose	1
Ergonomic back support for hive inspection	1
Smaller boxes	1
A lift belt	1
More rugged walker and wheelchair options	1
Fluid delivery systems for inside bee suit	1

The responses to the question regarding technology that could help beekeepers was met with a variety of responses that are detailed in Table 4. Some respondents provided multiple ideas. For example, technology mentioned went from basic (“I record hive inspection notes on my phone”) to more advanced (“Broodminder for temp and humidity. SmartPhone for data collection record via HiveTracks and photos”).

Table 4: Technology Used to Assist Beekeepers

Technology Used	Times Mentioned
Smartphone app	19
Smartphone camera	15
Temperature, humidity, sound, or weight sensors	11
Hive scale	3
Digital notebook	3
Infrared camera	2
QR codes on hives	1
Voice to text for inspection notes	1
Digital magnifier	1
Hearing aid	1
Thermal gun	1

Discussion

The most reported disability in the survey, with 45 mentions, is general back injury, which includes damage to the back due to injury, health events, or age. Use of the industry standard “Langstroth” hives requires the beekeeper to manipulate heavy boxes using lifting, twisting, and pulling. These boxes are stacked on top of each other and increase in height and weight during the honey production season. The propolis^{xv} that is naturally used by the bees also contributes to the difficulty in separating and lifting these boxes to access the honeybee colony. Studies have been done on the ergonomics of beekeeping in the agriculture sector.² During hive inspections, a beekeeper makes box lifts and twists covering 45 degrees to 90 degrees. A limited use of appendage ranks second on reported disabilities. Limited use of appendages inhibits beekeepers during hive inspections and honey extraction due to weight restrictions or mobility issues. The weight and mobility requirements of Langstroth hive would impact most disabilities recorded in our list including but not limited to fusions, wheelchair users, brain injuries, and those with autoimmune diseases that limit mobility.

Beekeeping difficulties are not limited to physical ability. The factors imposed on a beekeeper due to mental health (i.e., PTSD, depression, anxiety, etc.) also causes limitations. Any mental illnesses that limit attention, focus, or mood can affect the success of a beekeeper in the long run. Requiring, at a minimum, a loose schedule of inspections and extractions can cause a sense of self-assurance until a colony swarms or fails. The resulting effect of a colony leaving on someone emotionally struggling can cause worsening symptoms. It is important to focus on the design and implementations of hive systems and tools that remind beekeepers to focus energy on something they are passionate about. A study on beekeeping improving mental wellbeing during ^{xiv15}² In another study, beekeeping was taught to veterans through vocational rehabilitation to combat the effects of PTSD (formerly known as shell shock) and traumatic brain ^{Error!} ^{Bookmark not defined.}¹³² As a result, there are many nonprofits such as, but not limited to, Hives for Heroes, Heroes for Hives, and Bees4Vets that focus on the health and wellbeing of veterans through beekeeping.

The list of disabilities is a reminder that the “status quo” standard is not always the most beneficial. Table 1 should provide insight into the hardships and struggles beekeepers have faced in the past and present. The efforts placed into research, design, and implementation not only benefit those who are currently disabled, but also those that may experience a disability later in life due to injuries, health events, or age. To make beekeeping inclusive is to make it accessible, usable, and sustainable for individuals of all range of abilities. The list of many creative adaptations reported by beekeepers with disabilities should provide insight to beekeeping manufacturers and entrepreneurs alike regarding the needs of those beekeepers. Many of these same adaptations, if broadly available and affordable, would be welcomed by the broader beekeeping community. It is not a new revelation that increased accessibility and usability benefits a much broader audience than initially targeted (for example, curb cuts on sidewalks, text-to-voice, etc.). The most mentioned adaptation by beekeepers with disabilities was the use of help from an assistant. While the goal of true independent

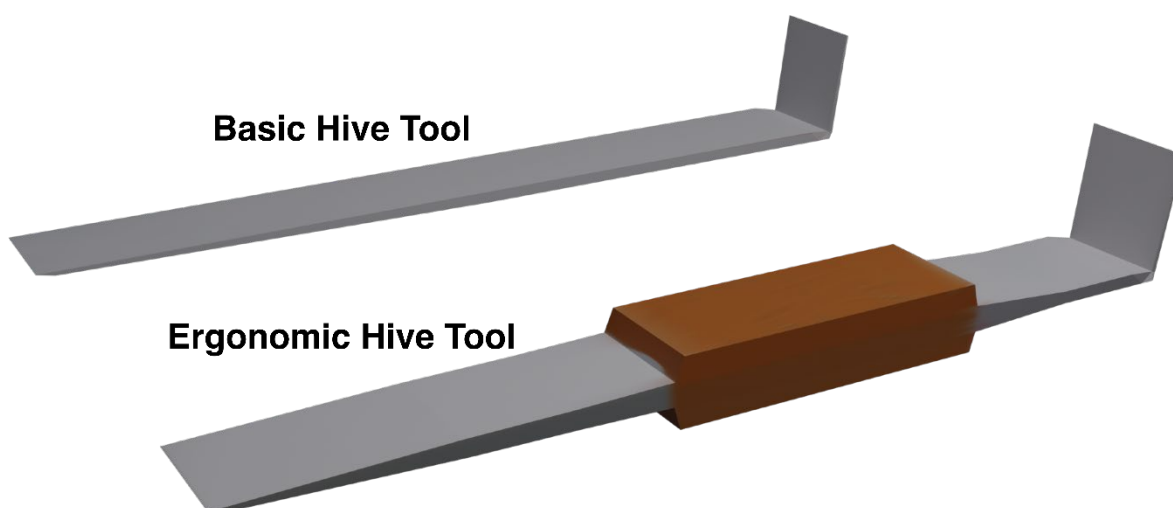
living should be accessibility and adaptations that minimize the necessity of external help, certainly it will not eliminate this need for all individuals, and this could present a potential opportunity as there are many new beekeepers who are looking for mentorship and help as they explore beekeeping. An effective way to pair these needs (offers of mentorship with requests for assistance) should benefit both parties.

The demand for hive styles that lower the impact of heavy lifting is illustrated by the number of respondents in Table 2 who listed “Long Langstroth,” 8 frame hives, small or medium supers, “AZ style” hives, “Top Bar” hives, “Flow hives,” small (4 or 5 frame) colonies, single brood management, and polystyrene hives. This itself speaks to the demand for lighter weight options than are being used. The use of a hive lifter, or raised (or lowered) platform, and special handles for lifting indicate another area of potentially widespread demand, with 37 mentions of an affordable hive lifter as shown in Table 3. An affordable and effective lifting device would be embraced by many beekeepers, including those who are concerned about repetitive strain or back injuries.

The rest of the items listed in Table 3 again provide an opportunity for the beekeeping industry or entrepreneurial individuals to innovate and produce products that would be helpful to both the community of beekeepers with disabilities and the broader beekeeping community. Dedicated beekeeping carts that work on various terrains would be a very practical product to be considered by many beekeepers. Ways to easily and affordably raise and lower hives would also be welcomed, hinges for lids might be helpful, and the demand for light weight equipment options was clear, with horizontal hives, AZ hives, 8-frame hives, and smaller boxes once again being mentioned.

Ergonomic options for tools such as frame holders, frame pullers, and hive tools were also noted. One individual described an example of a wider grip on a hive tool that would be more ergonomic for holding and repetitive use. Figure 2 shows a basic hive tool used to pry boxes and frames loose along with a prototype of a more ergonomic design.

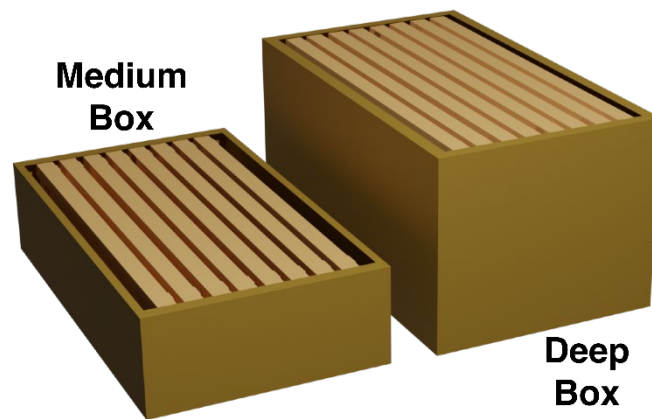
Figure 2: Basic versus Ergonomic Hive Tool



Automatically pumping or battery-operated bee smokers have existed in various forms over the years, but not in a design that was of good long-term quality or widely embraced. This was mentioned by multiple respondents and would be valuable for individuals who are not able to repetitively pump a standard smoker. Perhaps a reliable rechargeable unit with a built-in fan or something similar could be designed, or an effective and inclusive alternative that does not even involve the use of smoke. Equipment for single arm beekeeping could also be of benefit to not only beekeepers with disabilities but also beekeepers who are holding something in their other hand. Cooler bee suits would be welcomed by much of the beekeeping community. There are a variety of vented suit and jacket options on the market, but it is a stretch to say that any of the available products are truly able to keep you cool.

Some very innovative ideas included brood and super boxes that would have some way of rotating to the side for inspections to avoid the need to lift those boxes. The issue of the potential total weight of a box when filled with brood or honey is behind the choice hive style and box size. For example, an 8-frame medium box can weigh up to 40 pounds, while a 10-frame medium box can weigh 50 pounds. An 8-frame deep box can weigh up to 64 pounds, while a 10-frame deep box can weigh as much as 80 pounds.^{xvi} Figure 3 shows a side-by-side comparison of a medium versus deep box used for bees.

Figure 3: Medium versus Deep Box



Also mentioned was an ergonomic back support for inspection, to avoid back injuries or strain. New tools and technology for prying hive bodies loose would be welcomed by many beekeepers beyond only beekeepers with disabilities.

Smartphones were the primary technology tool used by beekeepers with disabilities, with beekeeping apps and the camera itself being used to assist with beekeeping. The second most reported tool was various sensors to assist with monitoring bee colony temperature, humidity, sound, or weight. Three respondents also reported using some form of scale under the hive, which removes the need to lift the boxes simply to assess their weight. In addition, weight, temperature, and humidity sensor technology can reduce the frequency of physical visits to the bees for reasons related to weight, temperature, and humidity.

Conclusion

This study has compiled the first known significant survey of beekeepers with disabilities across broad categories (i.e., not a narrow population, such as veterans with PTSD). The challenges and limitations of this study include the lack of access to a national repository of beekeepers or beekeepers with disabilities. Further research that includes a larger sample would enhance the results. In addition, the self-reported nature of the data presents a limitation that could be addressed in future research through the use of focus groups, observation, and user studies using adaptive technology. The results show the barriers that are faced by beekeepers with disabilities, and the opportunities that are also created by the adaptations being utilized and proposed by these individuals. The importance of this data is to show the importance of modifying the thought process that beekeeping is not an option for individuals without disabilities. This can lead to the research, design, and implementation of modified accessible tools and adaptations that support the inclusiveness of beekeeping. The results highlight opportunities for collaboration and innovation in beekeeping technology and approaches that focus on inclusion and usability. This study also underscores the need for additional, more comprehensive and targeted research in this area.

About the Authors

Justin Ruger started out as a Ph.D. student at the Catholic University of America before a car accident changed his trajectory in life through a TBI and the onset of seizures. From there, he took up beekeeping with his family and found out it was great for mental stability when dealing with a chronic disability. He furthered his place in the beekeeping community by writing and illustrating children's books that teach kids about honeybees and beekeeping. His love of beekeeping and advocating for those with chronic disabilities led to the creation of the nonprofit Accessible Beekeeping. The nonprofit, established in March 2022, aims to bridge the gap between beekeeping and disabilities. Through research, design, and implementation, it works to make beekeeping accessible and sustainable for all walks of life.

Brian Wentz is a Professor of Information Systems and Analytics at Shippensburg University of Pennsylvania. For more than 17 years, he has been involved in a variety of projects related to accessibility and usability for people with disabilities. His research expertise focuses on HCI, accessibility, usability, inclusion, and the intersection with public policy and law. The Pennsylvania Council of the Blind awarded him the 2013 Honorary Service Award, and he is also the Research Advisor for My Blind Spot in New York City. His most recent publication, "Quantifying the Cost of Web Accessibility for Blind Users" can be found in the journal *Interacting with Computers*. He is also a passionate and experienced beekeeper and a collaborator with the nonprofit Accessible Beekeeping.

Appendix I

Accessible Beekeeping Professional Training Professional Team Activity & Scenario Packet

Training Purpose

This professional training packet is designed to help participants understand real-world accessibility barriers in beekeeping and develop adaptive solutions that improve safety, participation, and independence for individuals with disabilities or functional limitations.

Throughout the day, each team will work with one assigned client scenario. Teams will identify barriers, create accessibility plans, design hive layouts, practice communication strategies, and evaluate physical accessibility challenges.

Team Instructions

- Each team will draw one client scenario number.
- Your team will use the same client throughout all scenario-based activities.
- Build on previous activity discussions and solutions.
- Focus on safety, dignity, independence, and accessibility.
- Document your team's decisions and recommendations throughout the training.

Client Scenario Descriptions

Scenario 1 — Wheelchair User

Marcus is a 42-year-old veteran who uses a wheelchair after a spinal cord injury. He recently became interested in beekeeping as part of a therapeutic outdoor activity program. Marcus has strong upper body strength but has difficulty navigating uneven terrain, reaching high hive boxes, and accessing narrow pathways between equipment. He wants to independently inspect hives and organize his apiary safely without needing constant assistance from others.

Accessibility Focus Areas

- Pathway accessibility
- Hive height and reach range
- Seated workstation setup
- Turning radius and mobility safety
- Reducing dependence on others

Scenario 2 — Arthritis & Limited Grip Strength

Linda is a retired teacher with severe arthritis in both hands and wrists. She enjoys gardening and wants to begin beekeeping with her grandchildren. Linda struggles with opening tight hive boxes, gripping small hive tools, lifting frames, and performing repetitive movements for long periods. She becomes frustrated when equipment requires significant hand strength.

Accessibility Focus Areas

- Adaptive grip tools
- Reducing repetitive strain
- Lightweight equipment
- Alternative hive styles
- Simplified hive management

Scenario 3 — Low Vision Beekeeper

Samuel has progressive vision loss and struggles seeing fine details such as eggs, brood patterns, labels, and small hive pests. He can still identify larger objects and navigate independently in familiar environments. Samuel wants to continue participating in beekeeping activities safely while improving physical organization and accessibility in his workspace.

Accessibility Focus Areas

- Large-print labeling
- High-contrast organization
- Consistent tool placement
- Tactile identification methods
- Reducing clutter and hazards

Scenario 4 — Heat Sensitivity & Fatigue

Angela has a medical condition that causes heat intolerance and chronic fatigue. She enjoys outdoor activities but becomes physically exhausted after prolonged standing, lifting, or working in direct sunlight. Angela wants to manage a small apiary while minimizing fatigue, overheating, and physical strain.

Accessibility Focus Areas

- Shade and cooling strategies
- Energy conservation
- Shorter inspection workflows
- Reducing lifting and bending
- Rest areas and hydration planning

Scenario 5 — PTSD & Sensory Overload

Derrick is a military veteran who experiences PTSD and sensory overload in chaotic or overstimulating environments. Loud noises, crowded spaces, and sudden stressors can trigger anxiety and difficulty concentrating. Derrick enjoys the calming nature of beekeeping but benefits from predictable routines, quiet environments, and clear communication.

Accessibility Focus Areas

- Reducing sensory overload
- Calm and organized workspaces
- Clear communication methods
- Predictable inspection routines
- Stress reduction and emotional safety

Scenario 6 — Limited Mobility & Back Pain

Karen has chronic back pain and limited mobility after multiple surgeries. She cannot repeatedly bend, squat, or lift heavy hive boxes without pain flare-ups. Karen wants to continue participating in beekeeping independently while avoiding reinjury or overexertion.

Accessibility Focus Areas

- Raised hive stands
- Reducing bending and lifting
- Efficient workstation layouts
- Safe lifting techniques
- Alternative hive configurations

Scenario 7 — Cognitive & Memory Challenges

Thomas experienced a traumatic brain injury several years ago and occasionally struggles with memory, organization, and completing multistep tasks. He enjoys routine-based activities and hands-on learning but may forget inspection steps or misplace equipment during hive work. Thomas wants to safely participate in beekeeping while building confidence and independence.

Accessibility Focus Areas

- Simplified workflows
- Visual checklists
- Color-coded organization
- Step-by-step routines
- Reducing task complexity

Scenario 8 — One-Handed Beekeeper

Rachel lost the use of one arm after an accident several years ago. She is highly independent and motivated but finds it difficult to stabilize equipment while manipulating hive tools and frames. Rachel wants to perform hive inspections as independently as possible while minimizing safety risks.

Accessibility Focus Areas

- One-handed workflows
- Equipment stabilization
- Tool placement and access
- Adaptive workstation design
- Reducing unnecessary movement

Activity 1 — Barrier Breakdown

Teams identify physical, environmental, and organizational barriers affecting their assigned client.

Team Discussion Questions

1. What barriers may affect safety?

2. Which tasks may become difficult or impossible?

3. What environmental conditions create challenges?

4. How might traditional hive layouts create limitations?

Team Notes

Activity 2 — Build the Best Accessible Apiary

Teams design a safer and more accessible hive yard tailored to their assigned client.

Team Discussion Questions

5. How can pathways improve access?

6. What hive style best fits the client?

7. How can equipment organization reduce strain?

8. How can the setup improve independence?

Team Notes

Activity 3 — Professional Support Roleplay

Teams practice respectful communication and client support strategies.

Team Discussion Questions

9. How will you support independence?

10. What communication methods work best?

11. How do you maintain safety without taking over?

12. How would you explain adaptive solutions professionally?

Team Notes

Activity 4 — Accessible Hive Olympics

This standalone activity allows participants to physically experience accessibility barriers commonly faced during beekeeping.

Dexterity Challenge

- Open hive equipment while wearing limitation gloves
- Organize hive tools one-handed
- Move frames safely with limited grip strength

Reflection Notes:

Vision Challenge

- Identify physical hive components
- Locate tools using workstation organization
- Read large-print vs small-print labels
- Navigate workstation layout safely

Reflection Notes:

Wheelchair & Mobility Challenge

- Navigate accessible pathways
- Reach tools and equipment while seated
- Evaluate hive height and workstation access
- Organize an efficient seated inspection station

Reflection Notes:

Final Reflection Worksheet

One accessibility idea I learned today:

One change I would recommend for traditional hive setups:

One strategy I will use when supporting others professionally:

One thing that surprised me during training:

Additional comments or recommendations:

Appendix J

Accessibility Standards and Best Practices

ADA Considerations

Pathway Recommendations

- Minimum width: 36 inches
- Recommended width: 48 inches
- Stable compacted surface
- Minimal slope

Hive Height Recommendations

- Ideal inspection height: 28–36 inches
- Reach zones should minimize overhead lifting

Seating Areas

- Provide:
 - Shade
 - Back support
 - Accessible table height
 - Nearby hydration

Signage Recommendations

- Use:
 - Large high-contrast text
 - Braille where possible
 - Pictograms
 - QR code audio guides

Appendix K

Mental Health and Therapeutic Benefits of Beekeeping

Therapeutic Value of Beekeeping

Beekeeping provides physical activity, routine, sensory engagement, and purpose-driven tasks that may positively support mental wellness.

PTSD and Veteran Rehabilitation

Beekeeping has historically been used as a therapeutic vocational activity for veterans returning from war.

Benefits may include:

- Routine and structure
- Reduced isolation
- Outdoor activity
- Confidence building
- Community engagement
- Stress reduction

Anxiety and Depression Support

Beekeeping encourages mindfulness and focused attention.

Common reported benefits include:

- Reduced stress
- Improved mood
- Sense of accomplishment
- Increased outdoor exposure
- Social connection

Important Note

Beekeeping is not a replacement for professional medical or mental health care.

Appendix I

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