**Abstract**

The human race has been utilizing bees for pollination purposes for hundreds of years. Throughout history, this seemingly innocent use of a single organism for such a large responsibility. We relied on bees for the pollination of a huge variety of crops and food, of which acted as an economic resource. This spiraled into an over-reliance on one single source for our crop production. For years, bees were willing to pollinate for us and we decided to punish them rather than reward. Through the use or implementation of extremely harmful pesticides, development of urban societies, intensive farming, and human-led global climate change, we have been ignorantly pushing bees away.

These quite selfish decisions lead to the near extinction of bees in 2007. This was the first account of colony collapse disorder. This is a disorder affecting a majority of worker bees in a colony. They simply leave the hive and queen behind and never return. In 2007, beekeepers had recorded total bee losses ranging from 30-90% of the hive. The causes for this disorder were those previously outlined. During this time, the United States Federal Court deemed bees an economic resource rather than a natural resource, which only made the protection of bees more difficult to achieve. This declaration barred the EPA as well as other environmental groups from being able to protect bees. We continued to view bees as a source of monetary gain rather than a natural organism that does not solely live to serve humans.

Over the next ten years, our habits did not change and we continued to over rely on bees for pollination. In 2018, the terrorizing colony collapse disorder arose once again. Late 2018, farmers noticed a decline and delay of crop production and beekeepers were recording hive loss of sixty percent or more. The concern of disappearing and deceased bees continued to rise at an exponential rate through 2019. By 2020, there were no more operating hives and the bees were considered extinct. The effects of extinct bees were felt very quickly. Since we over-relied on them for our pollination, the delay and decrease of crop production was active immediately. Farmers and other industries found it very difficult to feed their livestock. There was also widespread sterilization of many food bearing plant species. In 2021, many nations joined forces using the European Union as an example. Many believed that a coalition of various scientists and environmentalists would help in distributing food supplies to its citizens and finding solutions to the bee-over-reliance issue we crafted. Hand pollination was one of the first solutions that nations turned to. Although the speed of pollination is nowhere near that of bees, it still proved to be an effective tool through 2040. With the help of volunteers in the locale, private farmers were able to receive a helping hand in pollinating their crops.

In 2023, the first Pollinator and Habitat Protection Act was enacted. This called for a change from bees as an economic resource to a natural resource. This allowed for further protection of bees to be produced. Additionally, acres of land were devoted to protecting the forests, meadows, and plants vital to pollinator species' survival. This system is very similar to that of national parks and forests. The following year, a worldwide ban of pesticide use was issued. In 2029, the production of the world's first robotic bee was introduced by a company named BuzzTech. The idea was a complete failure due to a high percentage of defective units. The hand pollination movement went corporate in 2025. Workers fought to increase salaries and living conditions for the next few years. In 2030, a group known as the Hot Buzz, advocated against hand pollination and wished for natural forms. There was a trade agreement between soil and food. Soil was much more fertile in certain areas of the world. These nations agreed to trade the soil for food from the areas with less fertile soil. This was in effect through the 2040s. Late in

the 2030s, the introduction of pollen distribution towers was initiated. Research has been conducted on this solution since the beginning of the colony collapse tragedy. Other pollinator species have been compensated in regions where be pollination lacked.

By 2040, the world called home to a more diverse pollinator family. In the United States a more diversified system has been put into place for pollinating food crops, ranging from artificial to natural. With the increased awareness of the natural systems that humans live near came a new appreciation for nature. The over emphasis and reliance humans created toward bees was a major factor in the downfall of bees and far from quick comeback. With the combination of a more natural diverse pollination habitat and the artificial, but highly successful pollen towers, the system is not overbearing on one single source. The world is better and stronger now that we have come to respect nature and welcome all forms of pollination assistance.

*The following is a conglomerate of historic interviews, documents and letters discussing the twenty two years of research and implementation of solutions to the sudden and disastrous loss of global bee populations from CCD. Data is taken from experts, specialists, citizens, workers and historians with applicable information regarding the process of recovering from our overdependence of bees. Some selections have been broken up to better discuss events chronologically.*

***2018-2020****: Beginning in 2018 we see a recurrence of Colony Collapse Disorder (CCD) emerging, and leading to the extinction of bees as a species by 2020. Though there is no immediate catastrophic consequence of CCD, news of it has quickly become global. Countries are now trying to figure out how to move forward, making food models, taking steps towards alternative pollination research, and looking at current policy. In the past, bees have been viewed as an economic resource and rather than an important aspect of the environment, causing their environmental needs to be overlooked. The over reliance on bees is starting to sting.*

# Before 2020

## Scientist

My name is Dr. Franklin Bronwin. As part of my duties in studying the prolonged collapse of all bee species across the planet earth and the repercussions of such a collapse, I am recording a written (read:typed) account of our findings up to this point. Our is that, in addition to our continued research, the recording of journals by each member of our team here at Research Station 0219 will help us make connections between findings we may not have noticed or thought of prior.

Before analyzing the systems that utilize bees in their entirety, it is highly important to look back at each piece of the system and understand what it is that is happening. We will start with pollen. At the most basic level, pollen is the male half of a plant's reproductive material. Pollen takes on a similar role to that of the human sperm, capable of fertilizing the female ovule contained within a plant, therein helping to create the fruits and vegetables that act, in many cases, as a seed transference device to propagate the plant species. While there exist some plants who are capable of self-fertilizing, meaning they do not necessarily need to spread their pollen to fertilize and create new plants, many flowering plants require the aid of other forces or creatures to spread their pollen and thereby reproduce. For some, the force of wind is enough to release pollen from the plant, causing the pollen to float in the breeze to other plants which it will then fertilize. Otherwise, plants need pollinator creatures, such as our bees.

Bees are an interesting creature in many respects. One piece of "pre-collapse" media contained a quote that, while the source media has been lost, remains as an example of how interesting the creatures were: "According to all known laws of aviation, there is no way a bee should be able to fly. Its wings are too small to get its fat little body off the ground. The bee, of course, flies anyway because bees don't care what humans think is possible."

In terms of our study of pollination, bees, and their related interactions, we see another interesting occurrence. Pollen acts as a major source of food for bees. The pollen contains a number of crucial nutrients for bees, and it is from this and the nectar of flowers that honey, that once-widely available commodity, is made. The bees, in terms of their relation to plant reproduction, now have symbiotic impetus to travel flower to flower and collect pollen with their

bodies. In their search for sustenance, the bees are unknowingly (or knowingly, we cannot see into the brain of a bee) perpetuating the reproduction of thousands of plant species.

This brings us to the system of bee-driven pollination. Each bee flies to a flower or pollen source, lands and vibrates its body so as to collect as much pollen as possible onto its body and legs. When the bee feels as though it has collected enough pollen, it alights and makes for the next flower or source it deems as full of pollen for the taking. On this new surface, the bee alights and repeats the process of vibrating and collecting. In doing so, some of the pollen it had collected from the first source is exchanged with new pollen, and this foreign pollen goes on to fertilize the female ovule of the new plant. Once satisfied, the bee returns to its hive with a bounty of nutritious pollen. The bees are fed and the plants are put through another stage of the reproduction cycle.

In times past, this is how the process was supposed to have worked., and bees had emerged as by far the most productive pollinators, and quickly dominated our agricultural market. Instead, we saw the rapid collapse of bee hive populations due to Colony Collapse Disorder (CCD). This affliction was caused by a number of factors affecting the bees together, weakening them and destroying hives. Among all contributing factors, there were that played a heavy role in the downfall of bees. The first were Varroa Destructor Mites, a small parasitic being that invaded hives and spread exponentially. A pregnant female Varroa Mite would work her way into a hive to the cells where bee pupae were kept. Before the pupae were sealed in to grow, the mite would latch on to a pupa where it would drink fluids from the pupa to sustain herself. She would lay eggs on the pupa, which continued as a source of food for the mother and her children, and the sealed cell would act as protection from other creatures. It is important to note that the pupa would not be killed in this process, only weakened. This is because the mites needed the pupa to chew out of the cell when its development was finished. Otherwise, the mites would be trapped in the cell and die out. After escaping with the weakened pupa, the mites would spread to new cells and their numbers would grow exponentially.

The next important contributor to Colony Collapse Disorder was the continued use of neonicotinoids. The chemical was found in many pesticides and was used in the treating of plant seeds to combat predatory insects and mites. The chemical, similar in composition to nicotine, would spread through a plant's pollen, petals and leaves, lying in wait for a creature to come into contact with it. In such quantities, the substance was relatively harmless to human consumers, but to insects it acted as a powerful nerve agent that would normally disorient their bodies and minds. For bees, coming into contact with the pollen would detrimentally impact their ability to navigate, and would at times lead to the bees getting lost after not being able to locate their hive and their eventual death by elements or predator creatures. In larger quantities, the neonicotinoids could cause immediate death in insects and bees, as the amount of nerve agent was too much for their bodies to handle.

The final contributing factor to CCD that I will be discussing in my journal for the day is mono-cropping and agricultural deserts. In the central plains and western coast of the (former) United States, farmers typically grew one crop over countless swaths of land. Called mono-cropping, the growing of a single type of crop made for easier care, cultivation, and field rotation for the farmers. For the bees, however, such large sections of land dominated by plants such as wheat and soybeans was troublesome. Wheat is pollinated through wind alone and soybeans are one of the aforementioned self-pollinating plants, so bees are left in the lurch. Additionally, because mono-cropping is the cultivation of a single plant, there were generally no flowering plants or plants that required bee cultivation, so any hives within these large ranges of territory

were in danger of starvation. Across California, the cultivation of large amounts of almond trees called for the use of roughly thirty percent of all pollinator bees in the (former) United States, so hives would be sent across the country to assist in the pollination of the large amount of crop. During the fall and winter, however, this land became a wasteland for bees, endangering a large percentage of all bees to starvation.

## Archivist 1

The birds are chirping, there is a nice cool breeze drifting through the trees, and more importantly the bees are buzzing. Millions of colonies are still flourishing with what appears to be no threat of collapse. However, sometime in the middle of the year a silent killer arose. This silent killer was known as colony collapse disorder, which causes adult bees to simply vanish from their hives leaving behind the queen, immature bees, and even food. In just a couple months, the amount of healthy bee colonies dropped significantly. In the last two years, beekeepers have recorded high levels of colony loss, and in 2020 that number rose to a loss of 100%. Foods like almonds, apples, berries, soybeans, squash, wheat, and other agricultural resources did not make it to market. The bees did not pollinate the plants which consequently became sterile, or non fruit producing. This posed a large threat to the already tepid stability of nature, and to humanity.

Instead of putting a stop to the use of toxic neonicotinoid pesticides which were causing CCD, farmers continued strong use of them deeming it necessary to protect our food supply. It was totally disregarded that we have been poisoning bees with no intention of finding an alternative solution. Rates of collapse were increasing by the day, but use of these pesticides continued. The decision not to alleviate neonicotinoid use was swayed by the fact that crops would be destroyed by pests. So either we comtinue killing the bees who provide pollination for vital and nutritious food or lose crop production due to pests. The situation was a lose-lose with one loss being greater than the other. Due to the amount of healthy, thriving bees being so high, no predicted disaster was foreseen. Unfortunately this disaster became the reality.

Another contributor to colony collapse was our selfish use of land without taking into consideration the habitats we were disrupting. Urban development and intensive farming greatly diminished habitats that were important for pollination. If a colony loses its habitat, it loses its food source, which is vital for survival. Pre-bee-apocalypse, nearly all wildflower meadows were mowed down, which reduced many pollination habitats including flowers, meadows, trees, and lakes and streams. If we had halted intensive farming and relied more on wildlife to weed out pests, we would not have had to rely on pesticides that contributed to widespread colony collapse as heavily. We basically eradicated these natural solutions to pests and came up with an artificial solution that only made a bad situation worse. Urban infrastructure is another culprit that affected the disappearance of the bee population; ‘Green infrastructure’ was a fantastic idea, but unfortunately evolved too, the damage was done and no bandaid was going to fix it. The construction of many buildings, towns, and cities we inhabit would not have been possible if not for the devastation of a natural habitats.

The evolution of global climate change undoubtedly contributed to the loss of bees impacting the bees’ winter seasonal emergence and nesting behavior. Additionally, bees’ reliance on consistent flowering and blooming of plants is crucial for their survival. Climate change impacted the timing of flowering, leading to a need for adaptation of bees. Specific plants could be in bloom at an inconvenient time for the bees as they may not be active yet. This also contributed to a loss of food and nutrients for bees.

When the widespread collapse became evident to the public, panic ensued. Nobody was prepared for such a devastating and sudden loss; there was no plan to initiate in the event of something of this magnitude. News of this extinction was all over the media, and the public had questions and demanded answers. Alternatives to bee pollination were immediately investigated; there are other valuable pollinators, but after losing bees the total amount of pollinators has been diminished. Insects other than bees that provide pollination became extremely important, but the quality and effectiveness of their pollination is less than that of bees. Additionally, taken into consideration is the natural habitat of pollinators; bees have been moved around in order to provide pollination where we needed it, but this was not previously sustainable, and would not be sustainable for other insects.

**2025**: *By now the full effect of CCD is apparent and its effects are wide ranging. On a global scale, smaller, undeveloped, countries are being reformed and are grouping up with one another to help each other and better chances of survival. Hand pollination has been resorted for to save as many crops as it can. Policy on pollinators has already adapted and changed to promote them as a natural resource and to ensure habitats they live in are ensured to be safe. By now harmful pesticides like the neonicotinoids have been banned and even natural alternatives have been developed. There have been movements across the globe to give better working conditions, rights, and wages to hand pollinators. Although this decreased corporate profits, it allowed a sustainable economic opportunity to many. There areas of the world that are being affected by the absence of critical nutrients in the soil and lack of new pollinators and these were deemed as not arable land sites. The robotic bee was introduced in 2024 with very minimal success, with bugs popping up with their coding and becoming lost or not performing right.*

## 2020-2025

### Citizen 1a

*Yel O. Jaquet, was impacted in his career by the CCD crisis and kept a log on how his conditions developed and changed. He graduated from Lafayette College and decided to focus on environmental studies to make a difference. His logs portray his interpretation of the world as well as some of his day to day life.*

I've spent the latter half of my life in Easton, Pennsylvania. Luckily for me, the United States was among the first countries to find systems that could replace the old way after the bee population was decimated. Unluckily for me, seeing as I am 42 years old now, I lived through the whole incident and had to change to meet the new global circumstance. I went to school for engineering studies at Lafayette College, and during the 2020's I worked wherever I could find a job. I tried to work for private contracting firms handling government projects, largely because the United States took a leading position, given its wide array of resources, in finding solutions to the bee collapse and I wanted to do my part to help.

Only a few years after the CCD crisis, some countries couldn't feed their livestock. Without the typical amount of bee-pollinated produce supplementing people's diets, they dipped into their grain surpluses to pick up the slack, taking it away from farm animals. These surpluses only lasted so long when taxed so hard, and the nations who found themselves in trouble looked

for help. Sadly, this led to violent disputes and wars over territory to claim even small patches of fertile land that could be used to feed hungry populaces. Later, many of these areas were annexed or added to country conglomerates.

## Scientist 2

*An associate of Dr. Bronwin, Dr. Poly Nator, who is located in research station 0040 in central Florida has focused on the impacts of CCD on nutrient sources for humans. She has found correlations to the decline in human health due to the loss of bees as a pollinator for United States agriculture.*

In addition to the easily observed loss of livestock due to lack of grain surplus, our centralization of the entire agricultural market around bees as pollinators meant that many other food groups were sparse or eliminated when bees went extinct. For example, dietary sources of vitamin C are almost exclusively fruits which are pollinated by bees. Additionally, most vegetarian sources of Iron, like broccoli, were also pollinated by bees. This meant there were several nutritional gaps in our agricultural system in 2020 which need to be addressed for the sake of public health. As rural agriculturalists lost their land and occupations, they migrated toward urban city centers and there was a lot of pressure on public assistance and resources.

## Citizen 1b

*Richard Williams personal account for his appeal to the public housing authorities.*

To whomever it may concern,

My name is Richard Williams, and I am writing in response to my recent denial for public housing assistance, both as an appeal to my denial and an urge for the government to take policy action to address the national state of food insecurity and unemployment.

In 1977 my father used the last penny to his name to buy a small four acre orchard in southeastern Iowa, and then used his bare hands, the only resource he had left, to restore it. Until 1981, the year he met my mother, his diet consisted of loaves of just-expired bread from the local baker, whose lawn he occasionally mowed in return, and whatever he was able to produce in the 10’x10’ plot nearest the small one-bedroom shack on his property. The fertility of the rich Iowa soil, though, mixed well with his incredible dedication, and by 1983 he owned a completely functional, profitable orchard. In 1986 my parents married, and as a team were able to expand the orchard twice in the 90s, to an ultimate size of 25 acres. This meant they could harvest a wider variety of apples, with broader harvesting seasons, and would therefore have income for a larger part of the year. This allowed them the economic stability necessary to have a family, and I was born in 1988 as the first of three siblings.

Due to my father’s hard work and persistence, while my siblings and I were growing up the orchard grew to forty acres and was in full swing, profiting enough to secure us a consistent

spot in the rural middle class. We were bordered tightly by neighboring farms; on three sides by corn, and on the fourth by an onion farm; all of which were experiencing posterity throughout the late 1990s and early 2000s. In 2008 our Orchard experienced the first large decline in profits in years, as the world saw its first glimpse of Colony Collapse Disorder (CCD). This decline in the population of bees was gradual over the next four or five years. Across the world, as bee populations declined, certain regions saw a complete disappearance of them, leaving important crops with no mechanism for pollination and reproduction. My father blames the abundance and density of corn farms in the midwest for his radical decline in bees around this time (corn is pollinated by wind and does not provide food/habitat for bees). After the first year of bee population decline, hearing projections of its continuance, my father bought bees for our farm to be shipped over; this was effective, but by the end of the population decline period, even this was proving to be costly, and still less effective than the natural pollination of native bees he experienced beforehand.

This population decline ended around 2012, and by 2014 the orchard's bee population was comparable to that of the early 2000s, but the lack of pollination of many of the trees caused damage to the orchard as a whole, and it was only producing about half of the apples it had previously. In 2014, my parents were no longer able to live off of the orchard they built together, and were forced to move into a small apartment in town. After sorting it out together, my siblings and I agreed that I was the most equipped to take over the orchard (well, they agreed), so I moved back home after just a few years of being our on my own, and called my dad when I needed advice.

After carefully tending to each apple tree (with the help of three workers my father had employed for years), and even hand pollinating ones that hadn't fruited in years, eventually the orchard was back on an upward swing, even profiting slightly once again. As I worked with the land, learning about it's needs and functionality, I finally began to understand my father's closeness to his orchard; his devotion to it. I was relying on the soil and the trees to work together and produce my source of food and income, but the orchard was also relying on me, in a way, to maintain it and provide steady access to necessary resources. Until 2016 I was able to enjoy the fruitful success of the family orchard that my dad had experienced at his height, and was even lucky enough to meet the absolute love of my life, Sandra Brown, in 2017 on a trip into the city to buy groceries. We dated for two years before getting married in 2019, but if you'd asked me that day we met, next to the artificial apple sauce, I'd have told you that was the woman I'd marry. What I wouldn't have told you was that in fifteen years she and our children would be all I had to my name.

The year we married, Sandra gave birth to our daughter Lily. The same year, I began to notice a sickeningly familiar pattern around the orchard; the population of bees was quickly declining, and in 2020, our production of apples declined by a staggering 15%/. I acted quickly to buy and install several hives from California to aid in pollination, but I knew that I'd have to surpass the efforts of my father two decades earlier in order to keep the orchard afloat. What I anticipated was spending more and more money buying bees each year, hoping not to allow trees to become sterile due to lack of pollination. The reality, however, was much worse. Bees as an entire species had officially gone extinct by 2020, and Sandra and I, along with the two employees we had managed to retain, had to pour all of our efforts into the orchard if we wanted to keep afloat. With my very little world experience before returning to the farm, we had few other options. After brainstorming, we resorted to hand pollinating each of our trees using paintbrush-like tools which carried pollen from flower to flower. Although this is effective in

pollinating plants, it was incredibly tedious and taxing for our family; spending long hours in the sun meticulously working with a small brush. After the first year, we realized we would have to change our model of production with a new system of pollination; we could not effectively and sustainably hand pollinate as many trees as we currently had. We agreed to focus on about half of the orchard, which produced the most desirable apples, and allowed the other trees to naturally sterilize.

With half of the apple production we previously had, we struggled tremendously to maintain necessary resources like food and clothes for our daughter. After several years of declining economically, we came to the realization that our orchard would no longer be sustainable without pollinators. We finished off the season of 2024 with a meager 15% of the apples our orchard was once able to produce. We officially put it up for sale (for land) several years earlier, but trying to sell land in such an agricultural depression was like selling expired sushi, and we ended up abandoning the land heading for the city.

With no family in the area, my parents having passed and siblings scattered, and no source of even a lump sum of money, Sandra, Lily and I resided in my vehicle for two weeks before we were able to find an opening in a nearby shelter. In the city, we were shocked at the level of overcrowding in shelters, and at the population in them. Where an outsider would stereotype a shelter-goer as homeless, poor, addicted, or mentally ill, shelters throughout the city were filled to the brim with rural inhabitants, who had no place to escape to after the failure and sterilization of their land. As soon as we found a spot in a shelter, I was able to obtain resources to apply for public housing through the administration. However, I realized that I would not be able to submit the application immediately, but instead would have to jump through several hoops such as attending three housing preparation classes beforehand (which are located across the city), and applying to at least 10 jobs. However, these jobs are filled to the brim with applicants who graduated from high school and went in to manual labor; the type of unskilled worker who is almost obsolete in the highly technical world of business today. After completing these tasks, I was finally able to file for public housing, but unfortunately received a response three months later denying my application, in which time we had only deteriorated in health and morale. The reasons cited for our denial are my having two siblings who are not below the poverty line, although they live across the country and are, in that sense, unreachable. The second reason cited was our ownership of forty acres of land outside of town; said land is infertile, will not produce crops, and is therefore not an asset that can be liquidated in any sense. I would be more than happy to sign my land over to the state in exchange for a review of my application, as my family is struggling tremendously living in such a crowded, unhealthy space. Thank you so much for your consideration.

Sincerely,

Richard Williams

## Archivist 2

*Arthur C. Beeman, the chairman of the Hot Buzz in 2040, was a very active and vocal advocate for policy changes and started in Easton, PA. He helped spur hand pollination rights changes as*

*well as communal efforts on local  farms for composting. He also collaborated with major textbook companies compiling historical data on the CCD Crisis.*

Unprepared for the effects of such widespread colony collapse, countries and their populations suffered heavily. Surpluses depleted, people revolted, and starvation on a before-unseen scale struck hard. In 2028, the United States, China, Russia, and many other countries banded together to assist less fortunate countries. As international aid efforts reaching the highest they ever had, countries began to slowly recover. Together, nations saw the importance of studying and implementing other pollinators as well as avoiding putting as much pressure on them as they did bees. By the end of 2028, groups on every continent were being created and funded, working together on an international level to find a fix to these results.

**2030**: *These not arable sites became known as brownfield sites and by 2027 they were more defined as not usable. The "Hot Buzz" movement was created by those who believed that all pollination should be done by humans and natural pollinators, not artificial ones. In the past decade, with the absence of bees, the world has hit its low. Now, however, the world is becoming more stabilized and adapting to their new circumstances and making changes. The worst has past.*

## 2025-2030

### Citizen 1a

In the late 2020s, attempts to fix the pollen issue started to be used on a large scale, mainly to patch what was broken, therefore not as a permanent fix.

Since I turned 30 and was able to afford a house with modest land. I also decided to invest in self-pollination, or the process of spreading pollen by hand. The is a tedious system, but proves to be very efficient. After work, I come home and hand pollinate my garden to produce the berries and vegetables I call mine. It may take an hour or so, but ends up being fulfilling when I can sustain it.

Before the pollen crisis, my lifestyle was structured differently. I used to be very lackadaisical about what I buy and when. I could go to the grocery store anytime of the year and buy fresh fruits and vegetables, canned fruits/veggies, fruit juice, dried fruits/veggies, and additionally any type of meat. As I would toss my leftover food in the trash, never would the thought of saving or preserving cross my mind. This has all changed. The widespread influence pollinator bees had on the environment was astounding. Yesterday, I went shopping and was able to buy assorted vegetables, but very little fruit. Some plants are self-pollinated and did not change, but others, are very sparse. Therefore, supermarkets halted the sale of seasonal fruits out of season because they were now unavailable at certain times of the year. Growing food at home and pollinating the plants myself compensates for this because it eliminates my reliance on the supermarket. Unfortunately, there are certain things that did affect my family greatly. Livestock everywhere suffered greatly because of the lack of food, and the US surplus ran out before 2030 and therefore many food producing animals died of starvation. When I was looking for protein yesterday I found a package of steak for $40, so I decided to purchase it and cook it for dinner tonight. Buying meat is not something we can afford to do every day in 2030, even things like beef jerky, just are not around anymore. My wife told me that I should not buy steak again for a

very long time, and I agreed. Nowadays, steak is a treat, and it is not the same as when I was a child, it tastes different.

## Scientist 2

Our lack of fruits, veggies, and livestock lead to a consequential surge in illnesses. Such illnesses include scurvy and iron deficiency, which was an indicator that we still had work to do to re-balance our system. A policy change was a must in order for people to be healthy and contribute to society. In considering a new system to offer more balance, a policy change that guaranteed nutritional health for all Americans while subsidizing vitamins and supplements for those receiving public aid might prove successful and spark solution. This would drastically decrease the amount of malnourished cases coming into the emergency rooms and decrease the public cost from rampant health issues and poverty.

## Archivist 2

As 2027 started, countries with surpluses were weary of sharing and many ceased, focusing internally to ensure their own safety first. Within the course of the year small countries surrounding larger nations, or satellite nations, were annexed by larger ones in hopes that their land could be used for farming. Minor conflicts broke out across the globe as countries and conglomerates formed for better chances of growing food. Existing structures like the European Union were stressed, but the structure succeeded in helping Western Europe stay alive, Eastern Europe was engulfed in conflict.

Farmers in 2019 decided to forgo the crop rotation schedule and use crops that they know could be planted and grown to harvest. In localized areas, some farmers used recycled food waste manure to help replenish some vital nutrients in the soil. This was done in small communities where farmers had easy access to these resources. Livestock across the globe endured with much less food and many food animals were killed or starved to death in order to allow the remaining animals to be fed. A common site in the United States was a filled supermarket, and in 2019, there were signs that food would eventually not stock every shelf.

## Citizen 2b

*Interview With Hand Pollinator*

*The following is a transcript of an interview conducted on April 23, 2030 and aired on television on May 15, 2030. Reporter Stephanie Colby to [LOCATION REDACTED] to speak with [NAME REDACTED], called Sergei over the course of the interview.*

*Names and official location have been removed from transcripts and broadcasts to protect the lives of the interviewees.*

*Narration provided by Stephanie through post-interview voice over.*

* * *

Narrator: Bees. Small yellow and black insects who once supported around thirty percent of all pollination in the world. The creature that can only be found in history textbooks nowadays was once a common sign of spring's coming warmth and beautiful weather. But twenty years ago, the bees disappeared. Since the loss of the bees, scientists and politicians have scrambled to find solutions to support the job the bees once handled. Over the last two decades, many different

answers to the question of “What can replace bees?” have sprung up, one of which was the Human Pollination movement. Government-funded farms hired people affected by agricultural loss to manually pollinate fruit and vegetable bearing plants to help sustain market and nutritional demands. Recently, I had the chance to sit down with Sergei, a lifelong farmer who, like many, turned to Human Pollination after his farm suffered from the disappearance of bees.
Cutaway: The screen displays a man in his forties, shabby clothes spotted with dirt too deep embedded in the cloth to be washed away. His face is wrinkled and tan, hardened from years of work under the sun. He stands in front of a small, plain looking wooden building, his home shared by his wife and two daughters. An old rocking chair sits in the grass near their front door. Sounds of his children playing drift to the camera from inside the house.
Sergei: My family had always been farmers. My mother was raised alongside our apple trees, as was her father, and his father, and his mother before him. Each child added to the orchard and brought a piece of themselves to the land. It was as indelible a part of them as their smile, the sparkle in the eyes, or the wrinkles like seed rows that lined their faces. I had already started clearing land for my eldest daughter’s first plot when the bees disappeared. Even though she was only one at the time, I wanted to think ahead and have things ready. Plans changed fast.
Cutaway: The pair sits inside at a ramshackle dining table. The inside of the house is small and in need of repair. Papers, tools and books litter the floor.
Stephanie: You weren’t the only one to be affected where you lived correct? Other farmers in the area started to take hits and lost their land in the agriculture collapse.
Sergei: You are correct. We and many of our neighbors took bad hits in the first year or two. I recall losing almost half of my orchard within that time. And we were the lucky ones. I remember old [NAME REDACTED] lost everything. He and his family struggled, but the community being as tight-knit as it was, we all stepped in and tried to help them how we could. Some work here, food there, money for various necessities. We lasted longer than most because we figured out how to pollinate our own crop by hand, but it was hard work. Other creatures, bats and insects mostly, could do some of the work, but we had put too much emphasis on bees that the system collapsed without them. Hand pollinating covered only so much, and in total we lost probably eighty-five percent of our orchard.
Narrator: Sergei’s loss was large, but in reality it was on the low end for many farmers. Most privately-owned orchards shut down in the first five years of the bees’ disappearance.
Stephanie: Now, you came to the conclusion of hand pollination on your own, but many were not in that position. Did you have a hand in the Human Pollination movement or did that happen on its own?
Sergei: I wouldn’t say I had a direct hand in the movement’s beginnings, but I think I and many other farmers who figured out the tricks to hand pollination were indirectly responsible. It was a necessity to us. There weren’t many solutions at that time, and the few that existed were wildly expensive. We shared what we learned, farmer to farmer down the line, and it blossomed into what it is now.
Cutaway: A poster hangs on the wall. It is reminiscent in design of mid-1900’s propaganda posters. A stylized bee in flight makes up the backdrop on which a man and woman pollinate a tree. Bolded are the words “Natural Pollination. The Only Pollination”.
Stephanie: Since its beginnings, the Human Pollination movement has sprouted many different reasonings and purposes. Many look for payment and work reform, while others seek it to be the only, or at least national, solution to pollination. What are your thoughts on this?

Sergei:  As I said earlier, I think a lot of this has roots in the early methods and feeling that farmers like me felt. Solutions crafted by scientists were complex, technical and too expensive for farms to employ on large scales. We all felt left behind as they tried to take the human element out of farming. Our solution came from the inaccessibility of their methods. Large government farms, like this one, employ hundreds of former farmers to hand pollinate, and while I appreciate the method, I have to admit we are not compensated nearly enough. Agriculture is the backbone of the world. How can you work if you're hungry? We do something vital but get little in return. From that perspective, I appreciate what the movement has done. While there is more work to do, I am happy I can give apples to my daughters. Such a luxury was not possible before.
Stephanie: How do you feel about the movement some members have taken regarding the "purity" or naturalness of hand pollination as opposed to other solutions, such as the robotic bees that were introduced commercially?
Sergei: I still can't believe the way some of those airheads act. Rioting, attacks on farms that employ only robotic pollination, and that damned Arthur C. Beeman and those Hot Buzz weirdos are making things difficult on the rest of us. I understand where they are coming from through the perspective of "people or robots" and what's closer to natural, but the violence is ridiculous. I just want to give my daughters a proper life.
Narrator: Sergei's feelings are echoed by many farmers and human pollinators across the globe. In the past few months, the Human Pollination movement has worked to distance itself as best as it can from pollination naturalists and the Hot Buzz, a body of people who maintain that pollination should be done by creatures only, and any technological solution is an affront to the Earth and the natural order. For people like Sergei and his family, human pollination is good, honest work and a way to make a life for themselves, not a political tool as many have turned it into. We wish them the best.
Stephanie Colby. Out in the world.
[END TRANSCRIPTION]

***2035****: Since the advent of CCD, negative consequences have been found that were not immediately noticeable. One of these was the brown field occurrence. The infertile soil led to the natural increase in the soil economy and led to soil being traded internationally. On a community level there were shifts towards composting waste and foods that havent been eaten, or food scraps. By the year 2035 the soil economy was expanded and was becoming larger than the oil economy.  Trade agreements were made, the most notable being an international trade agreement that soil can be traded for food in quantifiable amounts. The goal here is to spur countries to support each other by sharing resources and supporting the nitrogen cycle. In the mid 2030s is when alternative pollination methods began to pop up around the world and the increased amount of alternative pollination methods as well as pollinators combined with policy came to full effect.*

## 2030-2035
Citizen 1a

Since 2030, I have switched my focus to environmental engineering because of the government incentives to be involved with helping solve the problem, being, how to pollinate on a large scale without relying on bees.

As a family, we like to take vacations, and since the onset of CCD, vacationing in certain countries has been warned against, due to less than ideal conditions. North America was not hit too hard, but there are areas like Central America that are dangerous to travel to. We, as a family, try not to plan too far in advance with these things; month to month is safer because if work changes for me, I have to make sure I am around to help. We are close to reaching another milestone with our alternative to bees and if I am needed I cannot say no. It is my duty as a US citizen to help out.

## Archivist 2

Massive nationwide efforts were established to ensure the awareness of reusing food waste on farms. This was very successful in allowing crops to be grown not per the crop rotation cycle. On a local scale, small community organizations began pollinating specific plants on their own in efforts to alleviate pressure on farmers and to help spread awareness. In other areas of the globe, research was being done on alternative pollinators, such as bats, non-bee insects, and other small animals.

## Scientist 2

...As we attempted to attack this gap in nutritional resources from a medical standpoint, we also continued to evaluate it from a bioengineering standpoint; how can we facilitate the pollination of key crops without bees? While artificial pollination was attempted several ways, and by several different organizations, the most wholly environmentally conscious and sustainable solution is to encourage the populations of other pollinating insects, protect their habitats, and use them as pollinators. Our system focuses on the use of insects in their natural climates, pollinating plants and crops that are, as often as possible, native to the environment. This system also protects the environments necessary to maintain the health of other pollinators. Essentially, we reestablish the natural codependence between insects and plants, protect the environment in which occurs in naturally, and do our best to facilitate this relationship while benefiting from the ‘fruits’ of our labor.

***2040**: By 2040 the world is nearly fully recovered. Only through major changes was the world able to succeed. Pollenation technologies like the pollen tower, which spreads pollen over large areas of land, took off regionally. The main reason the CCD crisis was able to be controlled was by diversifying pollination methods and changing the way that we live our everyday lives. The lasting changes gave way to closing the nitrogen cycle further, as well as creating a focus on nature over commercialism with farms giving land for habitat to local animals. Even in the school curriculums and the “Hot Buzz” political pushing, there was a shift towards more sustainable solutions being taught, with an emphasis on awareness of systems outside the house.*

# 2035-2040

## Citizen 1a

This year, 2040, has been, like the previous years, that we, as a global population are recovering. Ever since the colony collapse disorder fully occurred in the early 2020's the world has slowly been driven closer and closer to the brink of complete chaos. Smaller countries were overthrown, larger countries contested with each other, all over food and arable soil. It is almost ironic that, as a species, we have come so far to be thwarted so voraciously by such a primitive need for food.

In Pennsylvania, I have always had many local farmers around that I had never actually talked to. I have taken this for granted, and it was not until recently that I started to discuss with them the effects of CCD on them and theirs. I have developed relationships with these farmers and my family even goes to volunteer almost weekly to help assist in any way to make sure that they are able to pollinate their gardens or feed their animals. For a farmer to buy their feed for their livestock costs them much more than when I was in college, it is almost unaffordable, but with community service programs in place to help them operate, it becomes affordable. Since the CCD crisis, there has been a slow rise in local farming movements, and at the very least the entire population of the country started to take food more seriously and not for granted. No one wasted half a meal, or threw out excess. Even soil became more valuable, so we have been composting and selling soil to local produce farms and with the sheer volume of people doing this, the nitrogen cycle for the soil (replenishing the soil's nutrients) has actually improved all across the country, making soil issues not as large, and the ability to grow crops that are not naturally grown together possible.

## Archivist 1

A combination of these factors contributed to a new way of life for humans. This new way of life was mandatory due to the eradication of all bee species'. A starved bee exposed to poor weather conditions and climate patterns combined with incessant harmful pesticides is a recipe for extinction. Humans have put themselves in this horrible situation and have been forced to find a solution and plan to continue a life without bees. We crafted this chair from selfish decisions and are forced to sit in it for the rest of eternity unless the population of bees regenerates.

## Citizen 2a

Living Day to Day

Roughly twenty years after the collapse of the entire bee population, the world is still in recovery mode. Each and every day gets a little easier, but something feels missing that we used to have pre-2018. Being 42 years old now, I feel as if I have lived two separate lives; one with the bees and one without. I honestly still miss using every ounce of explosive energy I had by running away from them if one of those little buggers landed on my arm. You truly don't know what you got till it's gone. We were spoiled with the natural and free acts of pollination the bees had so generously provided us with.

In the past twenty or so years, the United States has made numerous attempts to create an end all solution to the pollination crisis. Most were band aid fixes that proved unsustainable and required a new solution. Countries all over the world looked to each other for help. Some regions coordinated together while others became enemies. This very complex situation caused many small conflicts to break out. More wealthy and developed countries attempted to provide some form of assistance to the rather undeveloped countries, but could only do so for a period of time

before we needed to focus on our own problems within borders. I don't know too much since all of the information updates I receive are from the media.

As far as day to day living, my habits have changed tremendously over the past couple of decades. Grocery shopping always requires a tactical plan. Before the crisis, I would go to the store and pick up whatever I wanted, whenever I wanted, no matter the time of year. The thought of how or when that box of fruits was picked never once crossed my mind. This caused a sense of entitlement and spoiledness that I no longer have. Currently when I go to the grocery store, fruits are infrequent and the prices of such have absolutely skyrocketed. For this reason, I do not eat many fruits anymore. The only fruits I eat are the ones in my self-made garden in the backyard of my house. I self-pollinate the strawberry and blueberry bushes by hand. It is quite labor intensive, but worth the time and effort.

Instead of sitting back hoping for a permanent change to occur, I have adapted to donating my time to local farms. I have been visiting three farms a week for the past ten years and work with a group of volunteers who help pollinate the gardens and fields. For a small family farmer, it is difficult to keep up with the pollination techniques that are so valuable for generating healthy food. I would hate to see these farmers go out of business. I also get a small portion of the foods every two weeks to bring home to my own family. If there are any positives gained from this epidemic, this crisis has helped bring people together. It is not something one person can fix, which is why I have loved volunteering in the past ten years.

## CONCLUSION

It would be foolish, irresponsible, and incorrect to try and declare that all of our pollination troubles were over in 2040. The bees are gone, destroyed in the folly of our overdependence on them. In their place, people across the world have worked to find a solution to their disappearance, a solution to a sudden collapse of our agricultural chain and love of food convenience. We floundered and fell for a time, but like children learning to walk, we found our footing and stabilized our system. Surprisingly, one of the most lasting solutions came first in the form of hand pollination. Pioneered by eastern countries and farmers desperate to keep their land and further strengthened by the Hand Pollination Movement, hand pollination forced humanity to take a much more active, hands on roll in the reproduction of plant species. In this way, the masses became privy to the complex system that had been altered and hidden by our overdependence on bees. People were made an integral part of the system in an attempt to keep it afloat. While revealing, this also cast humanity in a new, different position of control. Whereas before they controlled the flow and location of bee populations and, subsequently, what had easy access to be pollinated, they now dictated directly what got pollinated where and when.
This was not our only change, as living with the consequences of our mistakes taught us a great deal. Foremost among the lessons we learned was to not "put all of our eggs in one basket." Overdependence on one source of pollination led to the collapse of the system, so scientists and environmentalists worked hard to diversify pollinator species and pollinator dependence. By focusing efforts on creatures such as bats, ants, and butterflies, we built a complex system of measures and countermeasures, pillars of pollinators that supported one another and distributed the job of pollination across the board so no single species was overburdened. Though touched upon already, the fact that too much pressure on bees drove collapse is paramount to remember. Humanity's control of bees created a downward spiral corrected in part by our efforts with other pollinator species. Rather than put an iron grip on one creature, we offered hands to many. Furthermore, efforts to protect and conserve habitats and food for pollinator species helped ensure their prolonged survival and thriving.

Lessons from the previous two solutions helped spur the development of other technological innovations. Though many early technological solutions, like the failed robotic bee project, didn't make it far into the market or into common use, if they made it past testing at all, there were one or two with lasting ability. Prime among these technological solutions were the pollen towers. These structures collected pollen, either on the wind or from hand pollinators, and scattered the pollen across large swaths of field using controlled bursts and the breeze. This, while simple in appearance, represented a collection of research and knowledge garnered through the success and implementation of our previous solutions. Hand pollination and diverse pollinators caused us to reexamine the system as a whole and what made it tick. In doing so, the way we understood and interacted with the nature of the pollination and agricultural system changed dramatically. Challenging what we thought we knew resulted in revised processes that, together, showed us ways to improve the system in less invasive ways. The pollen towers help to support the system as a whole, working as a pillar in the same manner as the diverse pollinator species.

Here, in 2040, we are closer to comfortable. The way that we approach pollination and agriculture has, through force of necessity, changed ultimately for the better. Overuse and over dependence on bees as pollinators caused us to stumble globally, but we collectively stood back up and learned from our mistakes. While we may still be a little ways away from a perfectly

fixed system, we are in a much more stable and sustainable situation now in 2040 than we previously were.

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