



WPI

Community-Centered Activity Along The Takase River

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This report represents the work of four WPI undergraduate students submitted to the faculty as evidence of completion of a degree requirement. WPI routinely publishes these reports on its web site without editorial or peer review.

Abstract

As of 2022, the Takase River is undergoing renovation that includes the removal of trees in a marginalized neighborhood of Kyoto. To assess the impact of this construction and provide recommendations for a community project, we observed the wildlife and vegetation of the canal. We also conducted interviews and surveys to gather the opinions and voices of locals. These were then used to develop a cohesive story of the community along the Takase canal. Results indicate future analysis and research of these social-environmental dynamics is required to start development of a community center activity

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Executive Summary

As of 2022, the Takase River in Kyoto is undergoing restoration between Gojo Street and Shichijo Street to beautify the canal and attract tourists to the area. The project involves relaying stones and adding waterproof sheets to reinforce the structure of the canal. However, trees are being tagged for removal as well. Many of these trees are known to grow edible fruit, which may be used by the neighborhood and wildlife. The neighborhood south of Gojo is also historically home to a significant Burakumin population. This marginalized group faced systemic oppression and has been overlooked by the government for centuries. Therefore, it's important to consider the environmental and social impact of the construction while supporting the voice of local opinion.

During our project, we observed the neighborhood in two contexts: environmental and social. The canal was divided into five self-imposed regions for analysis, and the vegetation was counted along the canal for analysis with a spreadsheet. Once regions of further interest were determined, wildlife was observed and recorded throughout the day to provide a comprehensive picture of the biodiversity in the area. We also interviewed and surveyed the local residents to determine their thoughts on the ongoing construction as well as what they'd want to see from the restoration project.

Goals and Objectives:

The main goal of our project was to lay the foundation for a community space along the canal. We also aimed to determine a set of recommendations for future groups to start developing a community space. To achieve the main goal of our project, four objectives were developed to guide the project's methodology, which included both qualitative and quantitative analyses of the canal's neighborhoods. The objectives were as follows:

1. Document and analyze the ecology of the canal
2. Determine the current usage of the canal
3. Interview and survey community members to provide deeper insight into the neighborhood
4. Develop a comprehensive narrative of the neighborhoods along the canal

Data and Analysis:

In our environmental data collection, region 3 (between Gojo and Shichijo Street) is the section of the canal currently undergoing renovation. Based on all regions surveyed, region 3 had the highest biodiversity index at 0.187, which was determined by dividing the number of unique species by total sightings. This is distantly followed by region 5 (Minami Ward) with a

biodiversity index of 0.102. Region 2 (Shijo to Gojo Street) had the lowest score at 0.023. This is in line with observations across the areas, as the northern regions (1 and 2) had already been restored and therefore had a manicured and organized set of vegetation compared to other regions. This could suggest that the current renovation will have a strong negative effect on biodiversity. Regions 5 and 3 also had the greatest numbers of potted plants along the canal, at 100 and 99, respectively. This suggests that people in these regions have an interest in gardening and may also have a need for green space in their neighborhoods.

Wildlife identification was done in regions 3 and 5 due to the residential nature of these areas as well as the more lush nature of region 3. We found that region 3 had far more unique sightings of animals compared to region 5 (18 vs. 5 species identified), indicating that the vegetation in region 3 is home to a variety of animals. We also found that, while region 3 was home to both herbivorous and carnivorous species, region 5 was exclusively home to carnivorous species. This could indicate that the edible plants and increased vegetation are attractive to herbivores, which in turn attracts a greater number of species overall.

Our interviews have shown a variance in opinion on the removal of the trees from region 3. One individual stated that these trees should be trimmed instead of removed to mitigate any damage they may cause, and many others shared his sentiment. However, other respondents were pleased that the trees were being removed, citing safety and beautification as reasons. This polarized opinion could indicate that the trees are much more important to some groups than others. We also found that the community didn't often eat the edible fruit from trees, believing them to be of poor quality or having the potential to make them sick. One other common observation was the disappearance of fireflies from the downstream region following the northern restoration. This confirms our original stipulation that the canal project dramatically reduced biodiversity in the northern canal and also implies that the canal has a continuous ecosystem. The community as a whole did agree on valuing the beauty of the canal, which indicates that the residents care greatly about their community despite differing views on how the neighborhood should be run.

The team also conducted surveys to supplement our interviews. As seen in the interviews, locals were split on the value of the trees, with 50% stating that they want the trees to stay and the remaining responses wanting the trees removed. Despite this polarity, all but one response stated that the canal was either important or neutral in their lives, implying that the community members we reached are heavily connected to their neighborhood. Furthermore, contradicting the interview results, all but one respondent stated that they knew the fruit trees along the canal produced edible fruit, which could indicate that the survey and interview groups may comprise different people. Due to the lack of a conclusive opinion on the trees, as well as the low response rate (only ten responses were collected), more surveys would need to be conducted to verify these findings

Conclusion:

Based on our research, we discovered that the region under construction is historically home to a marginalized community that has experienced environmental and systemic injustice. We theorize that the fruit trees along the canal were planted by these groups to add variety to their diets, and that the community has remained largely untouched until recently. Now, the area has begun to grow economically, with cafes and businesses lining the canal. However, as the fruit trees no longer saw use, they began to overgrow and damage the canal.

In the meantime, the northern portion of the canal began to be renovated in 2010. The natural landscape was being replaced with a curated lineup of ornamental plants. Soon, the government began proposing a maintenance project for the area. In response to the backlash that came from removing trees, the plan was revised without further counsel and imposed upon the neighborhood. Due to this lack of consideration, opinions on the project remain split. Based on this, it is clear that any further development or construction along the canal needs to be more carefully considered to satisfy the needs of the neighborhood. We believe a community project that aims to preserve some of the natural ecosystem of the canal may work with proper planning by future groups.

Limitations:

Before arriving in Japan, our proposed background and methodology was much more specific in scope than the eventual project ended up being. Upon arrival to Japan, it became clear that the development of an urban garden was an overly specific goal, especially given the complexity of the various dynamics along the canal. Therefore, the methodology was greatly altered and much of the initial background became obsolete. Due to the widening scope of our project and our limited time, some proposed methodologies such as soil testing were reconsidered. This means that future work will be necessary to design anything concrete for the neighborhood.

Furthermore, we received limited responses for our survey, which hampered the validity of the data. We believe there are two major factors that led to this. One factor is that the survey deadline wasn't written in specific enough language ("next Friday" as opposed to a numerical date), which likely led to reduced response and urgency. We also distributed our surveys without speaking to community leaders. This may have reduced the credibility of our survey to the community and led to a decreased response rate.

Recommendations:

For future teams, we recommend that the survey methodology is revised to reflect what we have learned. One important change is to consult community leaders before distributing any surveys. This could lend credibility to the surveys and lead to more successful data collection.

We also recommend proofreading and test runs to write more effective surveys with enhanced specificity. This would hopefully help eliminate any confusion the locals may have had with this team's surveys.

We also recommend developing a stronger presence in the community to garner trust and collaboration. This could be accomplished through business cards, a website, or social media platforms. This additional exposure may help increase survey data output as well as generate support for a community project in the future.

Lastly, we recommend that teams conduct background research on multiple types of community-based projects. As the scope of our project widened, our background research was revealed to be too specific to urban farming. Future groups can conduct a wider scope of research to tailor survey questions and get closer to the development of a successful community space.

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1.0 Introduction

The development of urban areas has often come at the cost of nature, whether it is a lake transforming into a reservoir or deforestation. However, urban environments and nature don't need to be mutually exclusive. In Kyoto, Japan, communities that live near canals use the riversides to plant trees, bushes, and various edible plants. Unfortunately, due to the passage of time, canal walls have become weaker and are being replaced all around Kyoto. One of the canals that went through this renovation is called the Takase River. The river has many trees and smaller plants that produce edible produce. Despite this, part of the restoration project involves removing any trees perceived as a threat to canal integrity. The project was halted for a while, but recent reports have shown that "an heir of the late Nintendo's founder will donate about 300 million yen (\$2.48 million) to restore a historical canal in Kyoto" (Murakami, 2022). With the donation of 300 million yen from Nintendo, the city was able to start refurbishing a section of the canal (highlighted in red, Figure 1) in April 2022. The expected work is on 900 meters of the canal, and it is to be completed by 2024.

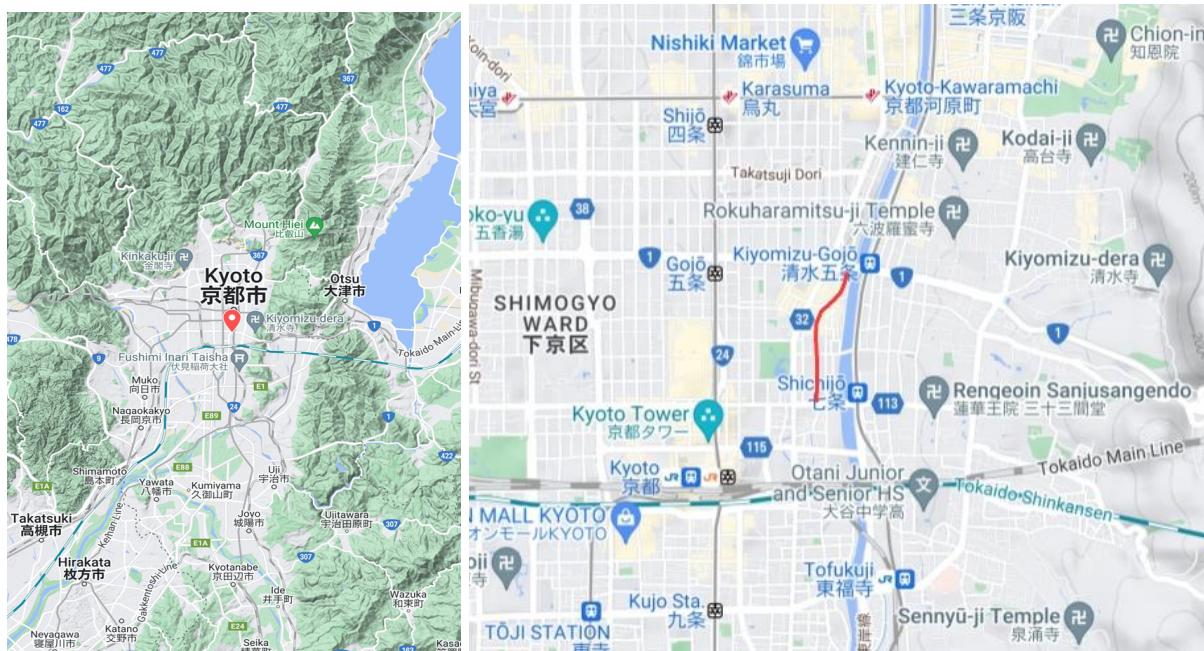


Figure 1. An overview map of Kyoto

The renovation project has brought problems to the community neighboring the Takase Canal. This is because, in order to refurbish the canal, trees would have to be cut down. The trees are causing damage to the canal infrastructure, so the current solution is to remove them. However, this solution isn't without significant costs. (Dover, 2015) explains that "Street trees are recognized as integral components of urban ecosystems which can improve environmental quality by providing significant ecological benefits" (Hirabayashi and Shibata, 2021, p. 1).

Therefore, the project may cause a decrease in the stability of the ecosystem since trees are important for regulating the environment. They purify the air, reduce the overall temperature, and prevent the evaporation of the water in the canal.

The sides of canals have been used by citizens to grow plants and trees for their beauty or the production of food at a very small scale. Now, the canal poses an issue for the community that lives next to the river. Roots of trees are growing large enough to cause damage to the canal walls. The age of the trees increases the probability of illness and rot; therefore, the risk of a falling tree increases (Kyoto city construction Bureau, 2022). Yet, there are people in the community who are pleased by the existence of the trees near the canal. Some of the people have connections with these trees dating back to their youth, and they may even eat fruits produced by the fruit trees. As a consequence, there may not be a solution that pleases everyone.

To propose a use to the canal that would benefit the community, interviews and surveys were conducted to the members of the communities surrounding the Canal. This was done to gather information on the opinion of the community relating to the use of the canal. Additionally, we observed different plant and animal species throughout the regions that the Takase river flows through. This research ultimately allows us to better understand the implications of adjusting the Takase river's landscape.

2.0 Background

Home to just over 1.4 million people, Kyoto is located in the Kansai region of Japan's main island. It attracts an increasing number of tourists every year due to its booming food industry, historical landmarks, and natural landscape. The city's proximity to mountainous terrain has shaped the culture of the area by limiting the import and export of goods. This geography has led to the creation of canals, including the Takase River. This canal flows 6 miles through the heart of Kyoto and was once used to transport goods. However, the community has evolved since and more reliable forms of transportation have been introduced. Now, the canal serves as an area to walk alongside, and the locals have taken pride in maintaining the shrubbery, vegetation, and trees. The abundance of green life along the canal provides a glimpse of nature within the urban landscape. However, the city has made renovations to the canal since 2010, with the existing plant life being replaced with curated ornamental plants such as cherry blossoms. Concrete walls were also constructed to add structure to the canal. These actions have effects on the biodiversity of the region and ignore the connection the locals have to these plants. The completed parts of this renovation have already stripped the lush plant life from the area and replaced it with gravel and concrete. These actions will have unforeseen consequences to the communities living in this area.

To better understand the impacts of this construction, the culture, and history of the community, background research has been conducted. This research has been broken down

into several key topics: demographics of the greater Kyoto area, the history of the Shimogyo-ku and the Burakumin, environmental justice in Japan, the history of the Takase River, and the benefits of community projects.

2.1 Demographics

Kyoto had a population of 1,463,723 in 2020, with a split of 52% men and 48% women. 28.2% of its population was people 65 years and older, with 60.7% between ages 15-65. When compared to a county like The Bronx, in New York, where 70% of the population are adults (18+) and only 6% are elderly citizens (world population review, 2022), Kyoto has almost six times as many elderly citizens (City Population, 2022). Considering the concentrated elderly population, the connections these families have with the trees on the canal are likely strong and rooted deeply in their families.

2.2 Social History of Shimogyo-ku and the Burakumin

Historically, Shimogyo-ku has been home to a minority group called the Tokushu Burakumin. They are often referred to as Burakumin which means "special village people" (Shimahara, 1971). This group is found across Japan, with prominent communities in Kyoto. The Burakumin are a group of people who were outcasts and ignored by the majority of Japan during the Tokugawa Period (1603-1867). Even now, they continue to experience discrimination through various social policies such as opposition to intermarriages with members of other social groups, religious discrimination, and residential segregation.



Figure 2. Location of Shimogyo Ward in Kyoto

During the Tokugawa regime, Japan was made up of 4 major caste systems. These were "(1) imperial family (including members of the priesthood); (2) samurai (including the shogun

and feudal lords); (3) peasants, and; (4) the artisan-merchant class" (Brown, 2013). Outcaste groups in Japan formed a fifth caste group called the Senmin (despised citizen) which consisted of people outside of the four major groups. Subgroups of the outcastes were categorized as hinin (non-people) and eta (much filth). The hinin were a group compromised of prostitutes, diviners, and fugitives, whereas the eta were a group who performed tasks involving slaughter and the disposal of the dead. These two groups would form the group known as the Buraku or the Burakumin people. This name was given to them by the other caste groups to identify them as subhuman or as beasts.

Status was not always permanent and could change through intermarriages but as for the Burakumin this was not the case. Edicts of the Edo government would make intermarriages with the Senmin illegal and therefore making the Baraku status solely hereditary. The Senmin had the same type of roles in society such as, "Ryoto (tomb guards), Kanko (government cultivators), Genin (temple and private slaves), Kunuhi (government servants), and Shinuhi (private slaves)" (Shimanhara, 1971). Jobs such as bamboo craft, gardening, peddling, public execution, or others that were considered dirty were also assigned to the Seminin. The caste system controlled the social life and behavior of the Senmin, which inevitably contributed to the historical development of the Burakumin.

Along with being forced to take these jobs, the Senmin were forbidden to move and forced to stay in an residential area called Sanjo: a name that Burakumin ghettos are still called. Along with not being able to change location, the Burakumin were subject to status discrimination. Burakumin were identified by their rectangular clothing issued by the emperor and were required to take off their headgear and footwear before entering the courtyard of a commoner's home which was not required by those of high status. Furthermore, sitting, eating, or any activity that was in the space of the commoner was denied as people were afraid that their presence would pollute them. Pollution and the notion of uncleanliness played a big role in how the Burakumin were seen and even coins used by them were not accepted unless they were washed.

The term pollution heavily revolves around Buddhism and Shintoism, which hold specific attitudes and values. Buddhist teachings emphasize compassion for all beings which prohibited the slaughter of any animal life. Shintoism teachings also state that the flesh of animals is impure and displeasing to the gods. These forms of impurity are deemed as the cause of wounds, death, sickness, and other related activities. The values of both of these religions caused the Burakumin to become untouchable. This encouraged discrimination, since Burakumin tasks such as executioners and slaughterhouse workers involved dirt, blood, and death.

2.3 Environmental Justice and Development in Japan

Environmental justice is a social movement that aims to address the disproportionate environmental hazards faced by marginalized groups caused by resource gathering and production. The term was first brought to the American public's consciousness in response to waste dumping in North Carolina. In 1982, 414 demonstrators were arrested for protesting the development of a toxic waste facility in a predominantly black and lower-income community (Agyeman, 2016). These protests gained national attention, and a movement was born in response. The United Church of Christ Commission for Racial Justice coined the terms "environmental racism" and "environmental justice" while providing recommendations for federal action (*ibid*). Many of these recommendations were later adopted by the federal government in some form. For instance, in 1992, the EPA established the Office of Environmental Equity. This follows the UCC recommendation that the United States create an Office of Hazardous Waste (*ibid*). Not every recommendation was taken into consideration, but the results were clear: this type of grassroots organizing produced a tangible benefit for marginalized communities. Further movements developed in response to this success in the US, particularly in Hispanic and Indigenous communities. However, similar movements have occurred throughout history in other parts of the world. The only thing missing from these historical movements is the specific terminology.

In Japan, citizens were traditionally at the mercy of larger city governments when it came to matters of urban development. Economic development was prioritized over quality of life by the government at large. Little was spent on public services such as libraries and parks in favor of airports, highways, and bridges (Sorensen 2009). This discontent led to the formation of machizukuri, or neighborhood-based community development groups. These groups began to amass power through collaboration and activism. The machizukuri began to advocate for what they wanted to see and preserved the character of their neighborhoods in the process.

This can be observed in a small neighborhood in Tokyo known as Yanaka. Yanaka retained the historical narrow roads of the Edo period after avoiding destruction during wartime. This led to less development of the area, since the neighborhood never needed to be rebuilt in the first place. However, this didn't stop attempts from the city government to develop the area further. The city government was looking to install two high-rise apartment buildings in the neighborhood to economically develop the area. The machizukuri in the area opposed the development, citing damage to the historical landscape (*ibid*). The Yanaka community saw value in where they lived, while the government only saw an underdeveloped neighborhood. A neighborhood constitution was then developed, and plans for the condominium development were revised (*ibid*). The community has even continued to resist development from outside powers following this event, showing how poised the community is to maintain the historical character of their neighborhood (City&Society, 2009). This resistance to pressure from the outside can apply to the Takase restoration as well, since the region of the

canal being restored is historically home to Burakumin. In fact, the Bank of Yanagihara, the only bank in Japan run by Burakumin, is located in Shimogyo-ku (Shigemitsu, 1991). With this demographic in mind, it is important to understand the injustice the Burakumin face thanks to disregard from the government.

In addition to discrimination in employment, the Burakumin were subjected to strong environmental injustice. The group was frequently confined to environmentally undesirable parts of Japan in both rural and urban communities. In rural areas, Burakumin communities were often segregated to areas such as hillsides or riversides. This presented a much greater risk of environmental damage from earthquakes, flooding, and landslides when compared to the less risky geographic location of other Japanese villages. In urban areas such as Kyoto, this manifested itself in the form of unstable housing in population-dense areas. In the 1930s, population density in Kyoto's Buraku neighborhoods was six times higher than in the rest of the city. This was compounded by the fact that 90% of Buraku homes in Kyoto were deemed unfit for habitation in that same time period (Brown, 2012). These crowded and unfit conditions have caused the Burakumin to suffer for decades, with the government not doing so much as lending a hand. In response to this injustice, advocacy groups representing the Burakumin have appeared historically.

Burakumin have attempted to improve the conditions they live in and amplify their voices before. The Suheisha (or Levellers Society) was founded in 1922 and is an example of this. Following World War I, the prices of staple crops such as rice increased astronomically. This disproportionately affected the Burakumin since they sat on the lowest economic rung of society. They also faced a higher rate of police persecution, as they made up 2–3% of the population and 10% of prosecuted individuals (*ibid*). The Suheisha were the first group that strongly rejected the outcast role placed upon the Burakumin and called attention to how they were being oppressed. They called for a swift end to the discrimination against the Burakumin, even occasionally resorting to violence. This was demonstrated with a duel in Nara instigated by a man flashing an offensive symbol at a Buraku couple. This escalated into a conflict between right-wing officers and the Suheisha, leading to further deescalation by local troops. This activism brought attention to the plight of Burakumin (*ibid*). Despite the organization crumbling under fascist rule during World War 2, this organization and the more current Buraku Liberation Movement showcased strong examples of advocacy for these people. Combined with grassroots activism for environmental justice, advocacy will be crucial to the Burakumin taking charge of their communities.

As it stands, the community along the Takase River may be hesitant to speak out against the government. This may be a result of the historically marginalized nature of this neighborhood at large. This community is in need of advocates to amplify their true opinions. Only then will the choice to modify the Takase River be representative of the people who live there.

2.4 Background and History of the Takase Canal

For centuries, the Takase River canal has been an important economic lifeline for the city of Kyoto. In fact, the very reason the canal was constructed was to serve as a method of efficient transportation for goods across Kyoto. The canal was first constructed by a prolific merchant and shipper named Suminokura Ryo in the Edo period of Japanese history (Black, 2022). Through his experience, Ryo gained the trust of Toyotomi Hideyoshi, a retainer to Oda Nobunaga who later became the *Daijō Daijin*, or Chancellor of the Realm. Based on this trust, Hideyoshi granted Ryo a trade license for overseas trade in 1592 (*ibid*). This license was to trade with the Ming Dynasty to bring goods to Kyoto. Following Hideyoshi's death, he also became a trusted advisor to Tokugawa Ieyasu, the first shogun of the Tokugawa lineage, and kept his license for overseas trade (*Ibid*). Using his considerable wealth and trust among powerful people, he collaborated with two other merchant families to construct a series of canals throughout Kyoto to bolster trade. One of these projects ended up being the Takase River, which was completed in 1611 (*ibid*).



Figure 3: Image of the Takase River from 400 years ago

The canal connected Nijo-dori to the Uji river, allowing boats containing valuable goods such as rice and sake to travel uninterrupted to Osaka. Boats built for the canal were known as *Takasebune*, which had flat bottoms and high sides, allowing for easy travel across the shallow canal. This canal, alongside many similar canals, bolstered the economy of Kyoto by aiding the efficient export of goods. The canal was also used to ferry exiles away from the city of Kyoto, which inspired a story bearing the title of the namesake boats, written by Mori Ogai. In this story, a man who was thought to have killed his brother boards a boat on the canal in exile (Micheal, 2020). As the story continues, more is revealed about his story. Based on the art the canal inspired, it is clear that the canal was an important landmark in Kyoto and remains so to this day.

While the canal served a tangible infrastructure function when it was first constructed, the Takase River has become a small waterfront for locals to walk along and appreciate its natural beauty. With the advent of faster travel methods, the canal's original purpose has morphed into something different.. This fate isn't unique to the canal, so this change of function isn't alarming in and of itself. However, this form-over-function approach has led to the canal falling into disrepair under the city's nose. The water quality of the canal has been gradually worsening due to the further urbanization of Japan and the pollutants introduced to the area. This necessitates regulations and projects to improve water quality (Santini, 2019). The structural integrity of the canal has even started to deteriorate, with water leaking and the dyke of the canal becoming damaged. This, as a result, presents a hazard to the neighborhoods bordering the canal (Murakami, 2022). The canal is in obvious need of reconstruction to restore its integrity. In response, some efforts have been made to do just that.

The Kyoto government has recognized the need for canal restoration with the observation of the river, and a project for this purpose is currently ongoing. Stones have been relaid and waterproof sheets have been added to roughly 1.8 km of the canal already. Nintendo heir Fusajiro Yamauchi is providing 530 million yen in funding to the government to complete an additional 900 meters. This work is set to continue in the spring of 2023 (Murakami, 2022). While this project has undoubtedly had good intentions, this refurbishment has had consequences for the trees along the canal. People living along the canal planted fruit trees to supplement their diet after the canal was closed to fluvial transportation in the 20th century. However, various trees along the canal have had to be evacuated from the area due to concerns about damage the growing roots can cause. Furthermore, the canal is being partially restored with concrete. This presents concerns about stripping the local vegetation from the area, as plant life is important to the ecosystem. Removing the greenery from the canal also runs counter to what Japanese citizens often value.

2.5 Benefits and Example of Community-Centered Activity

One type of a community activity that could be integrated with the Takase Canal is an urban garden. Urban community gardens are a great example of community based projects because they bring people to the same physical location and provide a common goal. What separates an urban community garden from a regular garden is that an urban community garden is space limited and emphasizes bringing people together instead of tending to a personal garden. While these differences dramatically change the dynamic of the garden, they come with many benefits, in addition to the ones you may get from a standard garden.

Urban community gardens establish a sense of belonging and provide economic, health, and environmental benefits. Communities are an important source of connection and create a sense of belonging. With this urban community garden, locals are able to work collectively to manage a garden for the shared benefit of all people. In the midst of this collective effort, a

community is established, allowing people to get involved with projects all while trying to better the environment that they live in. These connections pave the way for the creation of a cohesive community.

Along with the creation of a community, urban gardens have economic benefits in ways that would not be expected. Having a local garden allows fresh vegetables, grains, and fruits to be sold to members of the community as well as business owners, leading to a prosperous local economy. In addition, having a local food supply gives members of the community and business owners access to produce without a complex network of importers. This means people won't encounter competition for fresh produce and the transportation costs for their goods will be reduced. Ultimately, introducing a sustainable food source in the local area can improve the financial situation of local businesses.

3.0 Methodology

The overarching goal of this project is to develop a community space that can be utilized by the locals along the Takase canal. For such a project to be successful in the long term, it is essential to understand the deep-rooted connections between the canal environment and the people in the area. As a result, we have set our eyes on developing this comprehension and laying the foundation for future work. The objectives leading to this deeper understanding include assessing the land and the species that live there, understanding the current land usage of the canal area, and the communities' visions of how they hope to see the canal in the future. The various procedures for this project will be grouped into the respective subgoals they achieve. The project objectives can be broken down into two domains: ecological and social. As a result, the group split into two.

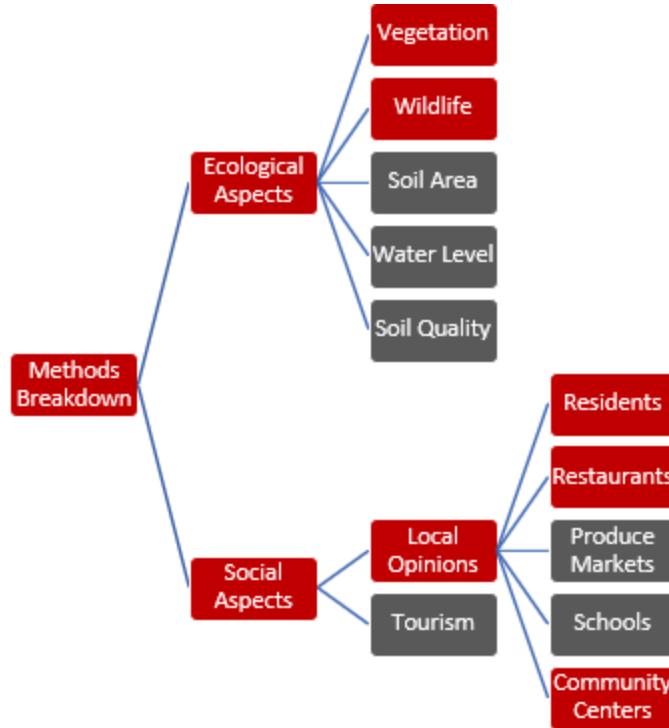


Figure 4: Methods Breakdown and Project Scope

Shown above is a breakdown of the methods of both the ecological and social aspects subgroups. Gray boxes indicate that the research topic was descoped by the team while in Japan but was originally planned while still in the States. The Ecological Aspects team has decided to focus their data collection and research on the vegetation and wildlife along the Takase canal. Testing soil quality along the canal was removed from the scope of the project due to challenges with obtaining soil testing kits in Japan and a lack of time to thoroughly understand the holistic role soil quality plays in an ecosystem. The Social Aspects team dedicated their research to understanding the opinions of the Takase locals on the development of a community-centered activity. They narrowed their attention to the nearby residents, community centers, and restaurants. These people would engage themselves in the community activity and be responsible for sustaining the success of this activity throughout the years.

The proposed research represents the conceptual stages of the implementation of an organized community activity in the Takase River region. Therefore, the project aims to directly impact the neighborhood that resides near the Takase River. In this small subset of Kyoto, there are many parties that have a stake in this project and are directly affected by the decisions we make. If the conceptual research documented here is used by the community, they will hopefully see the benefits of a community activity for as long as the community chooses to support it. Depending on the receptiveness of the community, this may span several years. The team hopes to present multiple options to the community to allow for compromise in how the

community activity can be organized. This is by design, since the success of the activity is determined by the community rather than the project team.

The current viability of the area to support a community activity needs to be assessed to develop an efficient plan. These assessments include field research on the land use to determine whether the land is suitable for a community centered activity. In addition, we conducted interviews and surveys to determine what the residents of the neighborhood surrounding the Takase River think is the best course of action. In the end, the team had a thorough understanding of their region's social dynamics, geology, and viewpoints on the future of the Takase canal.

3.1 Region Breakdown

The Takase River runs through three out of the eleven wards in Kyoto: Nakagyo-ku, Shimogyo-ku, and Minami-ku. These adjacent wards have different types of communities despite their close proximity to each other. To aid in effective data collection, the river was broken down into five contiguous regions. Region 1 is the river's northernmost section, while region 5 is the river's southernmost section, where it merges with the Kamo river. These regions were divided based on the three wards, as well as the two major streets in the Shimogyo ward: Gojo and Shichijo. Each region is around 800 meters long beside the Takase River.



Figure 5: Region Breakdown of the Takase River

3.2 Goal #1: Learning About the Land

Since the current canal restoration proposes the removal of trees and vegetation, the ecology of the region is subject to significant change. To determine the state of the current ecosystem, analysis needs to be conducted to paint a picture of what may be lost in construction. Therefore, the land was visually examined to determine the existing conditions of the area. The techniques used for this were divided into two main subcategories: identification of vegetation and wildlife in the area. We used the data and results in these two categories to determine any effects our decisions may have on the ecosystem.

3.2.1 Vegetation Identification

Collecting data on the species along the Takase River is crucial to understand the region's ecological dynamics. The canal is known for its stunning displays of cherry blossoms in the spring, which were planted in northern parts of the canal beginning in 2010 as part of the beautification effort. In addition, many other plant species inhabit the same area. To document them, a variety of techniques can and will be used.

To identify the vegetation along the canal, we utilized two digital software tools. The first software we used is PictureThis, a smartphone application that utilizes an image to identify the species. The software provides several plant species along with a database of pictures to help the user narrow down the exact plant species. It also provides information about the plant's required sunlight, soil requirements, water requirements, the plant's health, and more. To fill any gaps in this software's capability, a browser program called Pl@ntNet Identity was also used to analyze photos taken by a camera. The website utilizes contributions to citizen science, where scientific research is facilitated by ordinary people. In this case, people identify images to inform artificial intelligence. These tools combined helped to paint an accurate representation of the vegetation currently residing near the canal.

The team organized the vegetation identification effort by splitting each region into trees and smaller shrubs. Each region took 1 day to identify all vegetation forms and had 2 members focused on either trees or shrubs. Both members walked the canal with a small notepad and primarily the PictureThis application on their mobile device. As we identified plant species, they were recorded on the notepad along with tallies of number instances each species was sighted.

3.2.2 Vegetation Data

A spreadsheet was used to integrate the data of both trees and shrubs from all 5 regions of the Takase river. This matrix includes the name of all the species identified on the river along with whether it's a tree or shrub, whether it produces an edible product, and the number of sighting instances in each region. Below in Table 1, is the format of how the data was compiled.

| Vegetation Name | S/T | Prod. | Region 1 | | Region 2 | | Region 3 | | Region 4 | | Region 5 | |
|--------------------|-----|-------|----------|---|----------|---|----------|---|----------|---|----------|---|
| | | | Sightin | % |
| Abutilion | S | | | | | | | | | | | |
| Algerian Ivy | S | | | | | | | | | | | |
| Arakasi | T | | | | | | | | | | | |
| Asian Pear | T | | | | | | | | | | | |
| Beauty Bush | S | | | | | | | | | | | |
| Beggarticks | S | | | | | | | | | | | |
| Bigleaf Maple | T | | | | | | | | | | | |
| Bigleaf Periwinkle | S | | | | | | | | | | | |
| Bitter Orange | T | | | | | | | | | | | |
| Black Gum | T | | | | | | | | | | | |
| Black Nightshade | S | | | | | | | | | | | |

Table 1: Vegetation Matrix

3.2.3 Wildlife Identification

In addition to the diverse plant life along the Takase River, many species of animals call the canal home. Unfortunately, the impending removal of trees and plant life along the canal may lead to animals losing their habitats and being forced to relocate. To determine the cost of the current revitalization measures, we aimed to determine which species call the canal home. We also examined another region for the sake of comparison.

Wildlife analysis was completed on-site, with regions labeled the same way they were for plant identification. For each region, observations occurred four separate hours each day: 6am, 10am, 2pm, and 6pm. This range of times was chosen to include sunrise and sunset, as well as diversify findings. During these hours, the observer walked the length of the canal carefully, noting the surroundings. When we located an animal species, we took an image for future identification. Some places for the observer to check included roads, treetops, bushes, and the water in the canal. Once the hour was complete, the images were analyzed using software such as Seek by iNaturalist. This was repeated in each region over the course of two days, with region 3 and region 5 taking the highest priority. We then tallied the resulting data for analysis.

3.2.4 Wildlife Data

Once wildlife data was collected, it was cataloged by region in an excel file. The formatting for this file mimics that of the vegetation data. The name of each species carried a tally from each region and information on the species' wildlife type and diet.

| Wildlife Name | Type | Diet | Region 3 | | | | Region 5 | | | | |
|-------------------------|------|------|----------|------|-----|-----|----------|-----|------|-----|-----|
| | | | 6am | 10am | 2pm | 6pm | Total | 6am | 10am | 2pm | 6pm |
| Ant | | | | | | | | | | | |
| Asian Brown Flycatcher | | | | | | | | | | | |
| Autumn Darter | | | | | | | | | | | |
| Blue Ash Aphid | | | | | | | | | | | |
| Brown-eared Bulbul | | | | | | | | | | | |
| Cloudless Sulphur | | | | | | | | | | | |
| Common Green Bottle Fly | | | | | | | | | | | |
| Crow | | | | | | | | | | | |
| Domestic Cat | | | | | | | | | | | |
| Dragonfly | | | | | | | | | | | |
| Grey Wagtail | | | | | | | | | | | |
| Hornet | | | | | | | | | | | |
| Japanese Leaf Warbler | | | | | | | | | | | |
| Japanese Wagtail | | | | | | | | | | | |
| Mosquito | | | | | | | | | | | |
| Rock Dove | | | | | | | | | | | |

Table 2: Wildlife Matrix

3.3 Goal #2: Locate Ideal Spaces for Community Projects

An important aspect of designing an organized community project is determining how the land is currently being utilized by the locals. This was assessed through the use of observations along the canal each day. These procedures helped augment our understanding of the area. It also provided clues as to what the community would have an interest in.

3.3.1 Observations of Land Use

Land use data is important to understand how locals use this area and therefore determine what are considered appropriate uses by the local community. To gather this data, we conducted daily observations from 6am to 5pm for one week. Working for 11 hours straight was not feasible, so we split each day into one 3 hour shift and two 4 hour shifts. The key pieces of data that we recorded were any interaction we saw that involved a person and the river or its surrounding area. The purpose of the collected data was so we could understand how people interact with the Takase river on a daily basis. This data is crucial because it showed us what we had to work with, giving us an understanding of the current situation. The basis of the project was to design a community project based on the Takase river. Our understanding of the collected data allowed us to create project ideas that could incorporate what some people are already doing with the river.

3.4 Goal #3: Assess the Community's Opinions

While a community project has many benefits, it is important not to assume everyone will accept it. There are many reasons one may not want a project near their home or business and this needs to be addressed. To ensure the project succeeds, it was imperative that the opinions of the people were taken into account and we created a community activity that benefited them.

3.4.1 Interview Local Individuals

Gaining general opinions about the river is useful, but given how many people it needed to reach, there were some questions that were not fit for a short survey. To answer more in-depth questions, interviews were conducted with willing volunteers in the area. The reason for having an interview was to provide more time for the interviewee so they could give more detailed answers. The interviews also allowed for the use of more open-ended questions, which gave the team a deeper understanding of the opinions of locals. The survey was able to determine what people's stances were on certain topics, but the interviews determined why people chose those stances.

Interview participants were asked to answer some questions about the Takase River. These questions varied based on how the conversation progressed, but a general list of questions can be found in Appendix A. Many interviewees did not speak English, so a translator was necessary to accurately interpret their responses. To aid the interview process, students from Kyoto Seika University volunteered to help translate and conduct the interviews.

3.4.2 Surveying the Locals

Since this project will impact all people in its vicinity, getting an accurate measure of the general opinion was necessary to ensure most people were happy with any proposed recommendations. Sending out surveys to as many people as possible was believed to be the most efficient way to obtain the necessary data. The surveys we used can be found in Appendix B.

Sending out the surveys required a lot of planning but it was done thoroughly. The main issues presented were the method of delivery and the language barrier. To deliver the survey, we made a physical version and a digital version accessible via a QR code and on our website. Both versions were important to include as it ensured that people of all levels of accessibility could voice their opinion. To administer the physical copies and the QR codes, we went door to door along the river and placed a physical copy into each building's mailbox. On each copy was the QR code and details on when we would be back to collect the survey's. On the specified dates, the surveys were collected and compiled with the online survey results.

Getting past the language barrier was not a big issue as we were able to find a reputable translation service to ensure our surveys were appropriate for Japanese culture.

3.4.3 Collaboration with Kyoto Seika University

To be able to communicate with the locals and deepen our understanding, we had to collaborate with students and faculty based in Kyoto. With support from our local sponsor, who is a faculty at Kyoto Seika University, we were able to collaborate with students from university and met on many occasions to work on the project. During our first meeting with them, we traveled to Kyoto Seika University and presented our project to a group of students and faculty

members. At the end of our presentation, we asked if anyone was interested in helping us and we received a few positive responses. From there, we found that Tuesday and Friday at 10:30am worked best for both parties and decided to conduct interviews then. On those days, two groups were formed with at least one translator and one interviewer in each group to efficiently interview people along the river. We chose to limit our interviews and surveys to regions 3 and 5 for the same reasons we limited the wildlife survey to these areas.

3.5 Goal #4: Develop A Narrative and Recommendations for the Neighborhood

The tangible outcome of this project was a large collection of data that could prove useful for any future project that involves the Takase river. This data was broken down into two major categories, ecological and social.

The ecological data collection took lots of time to plan and collect so should any projects in the future need the data, they can refer to our website and infographic. The goal of the infographic was to be able to make people aware of what is really going on with the plant along the river and hopefully spark some interest for a project in the future.

The social data consisted of the notes from our interviews and the results from our surveys. This should provide any future projects with a solid understanding of the neighborhood's general opinion when it comes to the Takase River. A project involving the river will inevitably involve the people around the river as well so it is imperative that a project takes this into account. The social data collected by this project will allow future projects to begin with a more defined goal since the local opinion will be readily available. These products can also be used to better inform the community of information and data that isn't readily available online.

4.0 Findings and Analysis

Observations, interviews, and surveys were completed in accordance to our two categories: ecological and social. We used these observations to provide greater insight into the community and inform any recommendations we have for future project groups and community leaders. These findings are separated into ecological and social aspects, with each of these categories informing the analysis of the other.

4.1 Ecological Aspects

The following observations are based on the vegetation and wildlife that call the Takase River home. There was a strong, continuous change in both vegetation and wildlife observation between regions. This is in line with the different landscapes across them despite the regions being contiguous. Note that these findings are grouped based on the regions shown in section 3.1, and that these regions may not reflect the neighborhoods themselves accurately. These boundaries were self-imposed to simplify data-collection on our end.

4.1.1 Vegetation

Vegetation data was collected from all five regions of the canal, and many stark differences were observed between these regions. One of the most striking differences between contiguous regions was between regions 2 and 3. Region 2 had more counts of vegetation than region 3, but despite this, region 3 had a much greater count of unique sightings. This is especially true for trees, with 14 unique sightings found in region 2 compared to 51 in region 3. This difference in biodiversity can also be seen using the biodiversity index. This was calculated using the biodiversity index. We obtained this by dividing the number of unique species in a region by the total number of plant sightings. As expected, region 3 had a far greater score, with a biodiversity index of 0.186 compared to 0.022 in region 2. We also chose to analyze the dominant species in each region using pie charts (Appendix C). In region 2, an overwhelming number of shrub and tree counts were attributed to Southern Indian Azaleas and Japanese Cherry Trees respectively. By contrast, region 3 doesn't have a particularly dominant species in either category.

| Data Overview | Sightings | | | # Unique Species | Biodiversity Index | # Potted Plants | Shrub Sightings | | | Tree Sightings | | # Shrubs/Trees w/ edible Produce | % Shrubs/Trees w/ edible Produce |
|---------------|-----------------|---------------|-----------------|------------------|--------------------|-----------------|-----------------|----------------|-----------------|----------------|-----------------|----------------------------------|----------------------------------|
| | # Unique Shrubs | # Unique Tree | Shrub Sightings | | | | Shrub Sightings | Tree Sightings | Shrub Sightings | Tree Sightings | Shrub Sightings | | |
| Region 1 | 546 | 35 | 0.064 | 0 | | | 27 | 8 | 422 | 124 | 14 | 40 | |
| Region 2 | 1235 | 27 | 0.022 | 0 | | | 14 | 14 | 1025 | 213 | 16 | 59.25926 | |
| Region 3 | 494 | 92 | 0.186 | 99 | | | 42 | 51 | 350 | 148 | 51 | 55.43478 | |
| Region 4 | 458 | 40 | 0.087 | 5 | | | 26 | 14 | 422 | 36 | 19 | 47.5 | |
| Region 5 | 236 | 24 | 0.102 | 100 | | | 15 | 10 | 206 | 30 | 12 | 50 | |

Table 3: Vegetation Data Metrics

Based on what can be observed about these areas by walking, these results are hardly surprising. Region 2 is north of region 3, and has therefore previously gone through restoration. This led to a much more manicured appearance of the canal along with much less biodiversity. Indeed, the northern portion of region 3, where the canal has already seen restoration, is much more barren compared to the more lush landscape of southern region 3. Based on these observations, it can be observed that the restoration will likely dramatically reduce the biodiversity of region 3 as it stands.

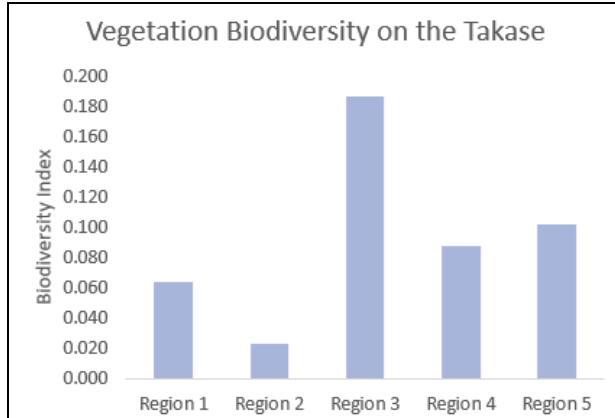


Figure 6: Biodiversity Metric

As for plants determined to be edible, region 3 had by far the greatest number with 51 shrubs and trees producing edible plants. This comprises about 55% of the unique plant sightings in this region. This region is the one currently seeing revitalization while also being a region with a known Burakumin population. This could suggest that these plants provided some sustenance to the people living in this region at some point, since no other region comes close to the number of edible plant sightings. It is, however, close to the average percentage of edible plant species in each region, which would be 50.4% of all plants.

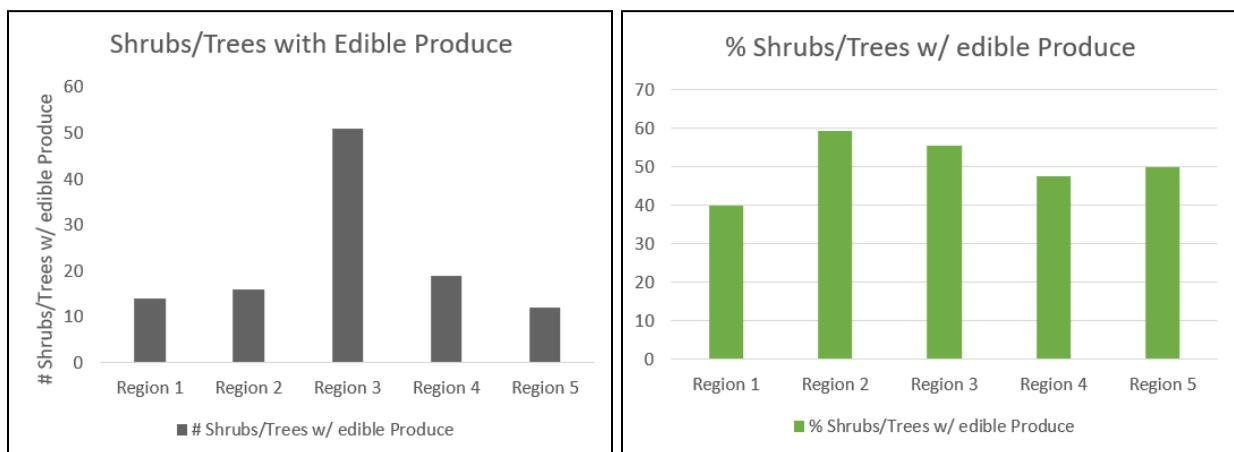


Figure 7: Edible Produce Metric

In contrast to regions 2 and 3, regions 4 and 5 had fewer counts of plants, with both having more unique plants than region 2. This makes sense, since these two regions were observed to be more industrial in nature, with very little soil area to grow plants. The biodiversity also makes sense since this part of the canal hasn't faced renovation yet. The dominant shrub still appears to be Green Foxtail though.

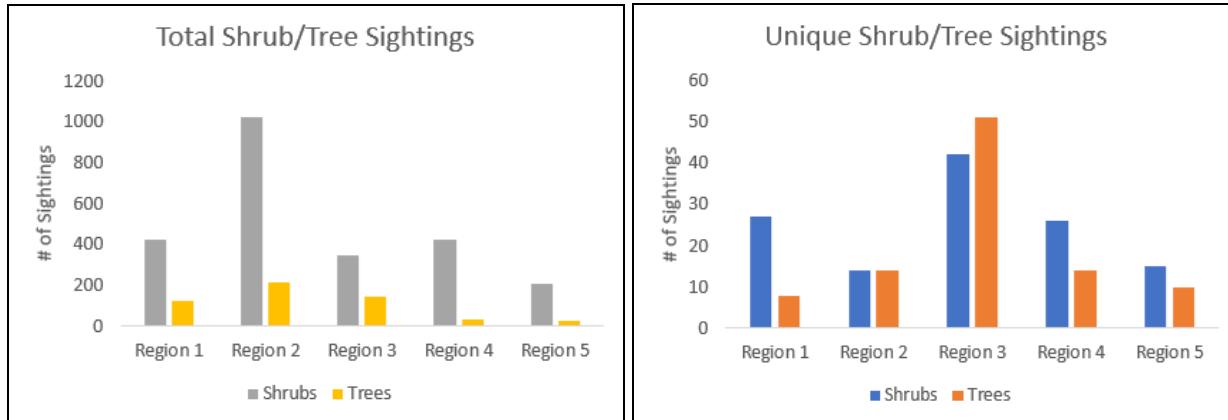


Figure 8: Total and Unique Plant Sightings

Despite the lower count of plants, region 5 was home to a couple of interesting observations. The most important observation is that there were many potted plants in this region of the canal. In fact, nearly half of all plant sightings in this region were potted plants (100 potted plants to 204 total sightings). This could indicate that this community is more keen on gardening than other parts of the canal. It should also be noted that potted plants were nearly as common in region 3 (99 potted plants spotted), though the greater number of vegetation sightings makes this figure less significant. These two regions do have a greater marginalized population than the northern sections of the canal, though. This could suggest a dependence on personal plants in these sections, but there is no definitive proof of this.

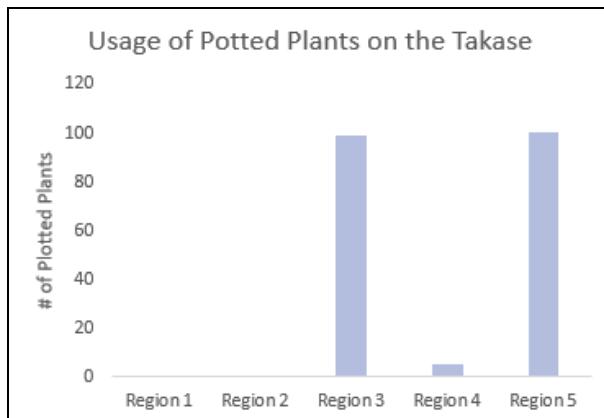


Figure 9: Count of Potted Plants

Region 5 was also home to the one statistical outlier found in the data set. This is in the form of an unidentified weed found inside the canal. This unknown plant had an estimated 100,800 sightings in this small section of the canal. Since this plant was unidentified and the numbers were so overwhelming they could affect the clarity of the remaining data, this unknown weed was left out of the graphs and analysis.

4.1.2 Wildlife

Wildlife observations were made in regions 3 and 5 of the canal, since these areas had the most significant statistical data points during the vegetation observation. These two sections ended up having significantly different levels of fauna diversity. Region 3 had a much greater variety in observed species, with 18 unique observations compared to 5 in region 5. There were also 9 unique bird sightings in region 3, when there were none in region 5. This can likely be explained partially by the much greater number and variety of trees for birds to roost. The water level of the canal in region 3 was also noticeably deeper, which could have been attractive to birds. These two features are directly threatened by the current canal renovation, since trees are to be removed and water is currently being held in the north. This could be another unforeseen consequence of the current restoration plan. By contrast, four of the five unique sightings in region 5 were insects, which could be feeding on the shrubbery in the area.

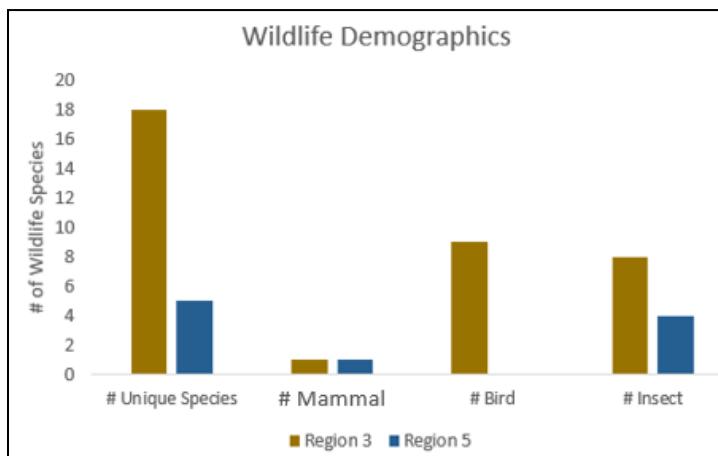


Figure 10: Wildlife Demographics

Interestingly, only one mammal was spotted in both regions, and that was the domestic cat. It couldn't be reliably determined whether these cats were strays, or if they were simply allowed to wander the streets of Kyoto. Regardless, the lack of sightings for any other mammal in the area could indicate some level of invasiveness by these roaming cats, since cats are an introduced predatory species in Japan.

It is important to note that, due to the limited amount of time observing these two sections, this species list isn't comprehensive. Furthermore, species identification may not be completely accurate due to lack of experience. These sightings are mainly to provide insight into the unique habitats found across the canal.

Once the regional species were identified, we also analyzed the diets of the species in the regions. In both regions, multiple species had a diet mainly composed of insects, with most species in region 3 having this diet. This makes sense, since there is a presence of insects in both regions 3 and 5. However, only region 3 contained species that had diets mainly of fruit, nectar, or seeds. This could be explained by the greater presence of vegetation in region 3. The

substantially higher species count in region 3 can also be explained by this finding, since the insects the vegetation attracts may also attract birds and other species that feed on insects. Both regions also contained diets classified under another category. The domestic cat and the mosquito were found in both regions and mainly consume meat and blood respectively. In region 3, the common green bottle fly also scavenges on dead tissue.

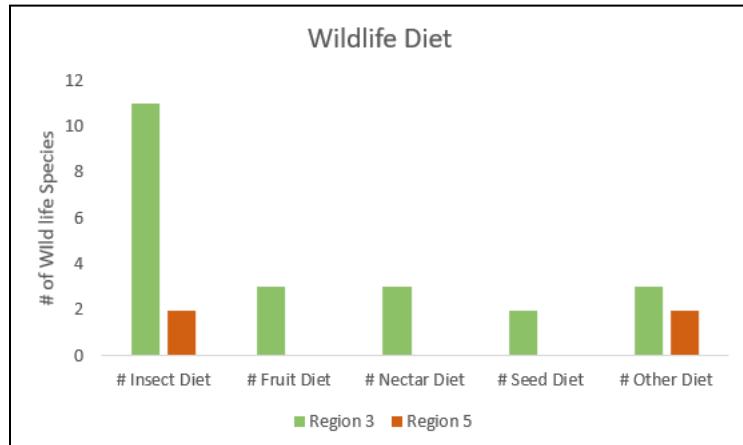


Figure 11: Wildlife Diet

4.2 Land Use Analysis

Throughout the seven days the team had observed the Takase River in region 3 we saw interactions in ways we had not expected. Due to the several pots of plants along the river we had predicted that we would see locals come along and tend to these plants. This was not the case, instead we saw very little of that. The observations mainly consisted of the occasional passerby that would admire the trees and people sweeping leaves off the roads along the river. There was one instance where we observed an organized group preparing soil in a park along the river, but when we asked them what they were going to use it for, we discovered it was for a garden that was not near the river. Ultimately what these observations showed us was that the locals do not interact with the river very much, which meant that the success of an organized activity in the region is questionable at the moment. It is imperative that the project provides something of value to the locals and that further preparations are made, otherwise it is unlikely they will bother with it at all.

4.3 Interview Results

Interviews in Shimogyo-ku, specifically region 3, presented a general distaste for the removal of trees by the city contractors. An elderly man along the river conveyed how important the trees were and that the “trees should be trimmed” rather than being removed entirely. Similarly, the son of the owner of Okano Taiyodo explained that the trees needed to be kept and that the construction and heavy machinery were polluting the river. He also pointed

out that before the renovation of the canal, there had been fireflies in the area. Although most individuals shared this sentiment, a few had contrasting opinions. Some shops in close proximity to the river were relieved to have trees removed. They feared that trees would fall onto their stores and cause harm to their business and safety. A worker at Akari, a ramen and bar shop, was particularly concerned about this.

Furthermore, an interest in the river's aesthetic was prominent among locals. The owner of Murmur Coffee Kyoto shared her excitement about how cleaning the river would continue to attract customers to her coffee shop. This cafe relies on the calming views from the Takase for their business because locals tend to enjoy their drinks while immersed in the scenery. Individuals in region 5 were especially bothered by the current state of the river in their area. At a glance, it is clear that the river is not cared for to the same degree that the northern parts of the river are. Likely, the trash thrown into the river in the northern regions would flow down to region 5 and remain there as a result of the low water flow. Ultimately, region 5 faces the consequences of the northern regions' actions and lacks the city support to clean it up. According to Yoon Chae Kun, who has been living in the Minami ward for 58 years, the river has always been littered with trash. Other interviews in that region indicate that there isn't a consistent cleaning schedule and that it only happens on occasion. One interviewer even threw their trash into the river shortly after talking with us about her disdain for litter.

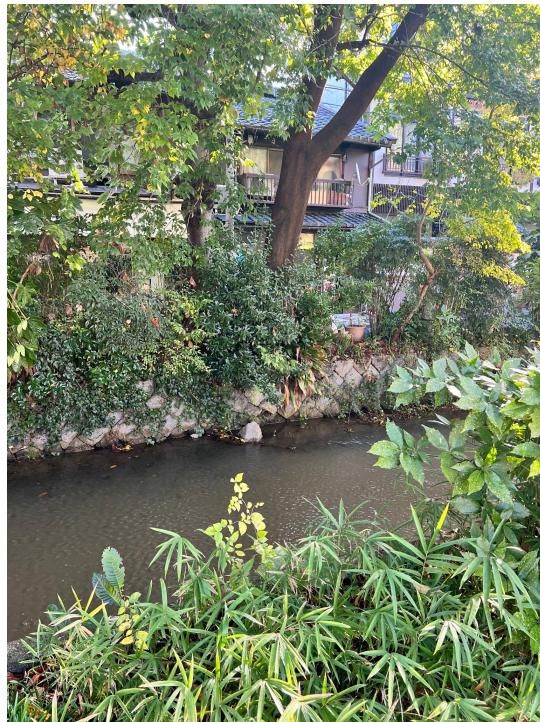


Figure 12: Picture of the Takase River in region 3



Figure 13: Takase River in region 5

A common discussion topic among the interviews was the disappearance of fireflies. Okano Taiyodo, Ume-yu (an onsen), and individuals in region 5 recall seeing fireflies at the river before the canal renovation of the northern regions of the river. The fireflies may have dwelled in the trees and shrubs growing along the canal in the northern portions and traveled along the water. With regions 1 and 2 having significantly lower biodiversity metrics compared to region 3, it could be inferred that the tree removal in those areas displaced the fireflies. This goes to show how ecological changes in one region have significant effects on seemingly distant areas. It also serves as a reminder that the boundaries chosen for this project were self-imposed for our benefit. While the ecology analysis was split into five regions, each of these areas are connected to each other in a continuous ecosystem.

Lastly, interviewees expressed their lack of interest in eating produce from plants along the river. Some people believed that the fruits were inedible, while others even thought that the fruits would make you sick if consumed. Despite public opinion, our vegetation analysis indicated that 50% of plant species found along the river create some form of edible produce. This disconnect between our research and public understanding is common throughout Kyoto. Kyoto University's agriculture department has a large persimmon orchid with over 100 different species. Despite being a public university, students still refuse to pick the persimmons, likely due to a fear of taking something that isn't theirs. This recurring theme throughout Kyoto may even root back their culture's desire for high quality produce. Fruits and vegetables from the streets aren't likely to be as fresh or clean as those found at a market, which may deter people from foraging.

4.4 Survey Results

We delivered surveys to houses and businesses along the Takase River and we received 10 responses. This was lower than we had anticipated, so we were careful not to try to

extrapolate too much from this small data set. Nonetheless, we saw some points where most people agreed, and some points where people had differing opinions.

All but one of the responses said that they go to the river often or always. This is ideal, since it means the people who gave these responses are the ones who will also be affected by any project in the future. This also suggests that the responders are invested in the community and would like to see it succeed, indicating that their responses are valuable.

Every response was either neutral or satisfied with the ongoing construction in the river. Based on this it would seem that people were mostly indifferent to the construction itself and instead had stronger opinions on what the construction was changing about the river. This is supported by a later question which asked people what they thought should happen to the plants and trees along the river. There were three responses saying the plants and trees should stay, three responses saying they should be cut down, and one response saying they should be replaced with rows of Sakura trees. These responses are inline with the interview answers, so similar reasoning may apply. Perhaps some people have an attachment to the trees, while others see them as either ugly or dangerous. Given these divided responses, it is difficult to determine a course of action involving the vegetation that will make most people happy. Therefore, further analysis by future teams is necessary to determine a solid course of action.

Interestingly, 90% of the responses said that they were aware that there was edible produce growing along the river. This was the opposite of what we understood based on the interviews where most people believed that the plants were inedible. This may indicate a difference in demographics between the interview and survey subjects. Based on the frequency of visits by survey participants, these people are likely to be invested in the community. They may have even lived here for multiple generations. On top of knowing of its edibility, many of the responses stated that they had eaten some of the food with pomegranates, oranges, and acorns being some examples. This indicates that the locals see at least some value in the edible plants along the canal. However, since this information contradicts the interview results, nothing conclusive can be determined yet.

One question where many people agreed was the question asking people to rate the beauty of the river. A majority said that the river's beauty was either poor or acceptable, indicating a general dissatisfaction with the current landscape. However, there were a few responses stating it was good or even very good, so this opinion wasn't universal. Considering the limited number of completed surveys, nothing very conclusive can be determined. Since the river is fairly long, it makes sense that there would not be complete agreement on the question. However, it is likely that many areas along the Takase are not appealing to the residents, and that the canal needs more maintenance.

While we were still able to gather the opinions of some of the residents along the Takase river, there are ways we would change how we would go about surveying in the future. The first thing we would have done differently is do some research into surveying. After writing the

survey questions, we quickly discovered it to be very difficult as we struggled to ensure each question would be properly understood in English let alone Japanese. We circumvented this through the use of a hired translator, but more steps could have been taken to ensure thoroughness. Another part of the process we would have altered is the collection process. We had asked people to leave the surveys out by their door so we could pick it up even if they were not around, but this may have been confusing to some of the people given how few we got back. Furthermore, there was some backlash from the community based on how surveys were conducted. For future groups to see greater success, it would be helpful to meet with the community leader before distributing a survey. The whole survey process was not smooth, but it provided us with some usable data and even more valuable experience on how to deliver and collect surveys.

5.0 Recommendations and Conclusion

Based on field research and analysis, the team has attained a greater understanding of the neighborhood and ecosystem of the Takase River. Staying near the canal and speaking to community members has given us insight that academic papers and research alone couldn't. This has provided the team with greater insight into what the community would accept, and whether current developments address the state of the neighborhood. Based on these insights, we were able to develop a narrative for the neighborhoods along the canal.

The people living in the neighborhood undergoing restoration have been surviving in the area for generations. Due to historical oppression from the government, the Burakumin class forged a community here based on a lack of opportunity. Neighbors and families lived in cramped, substandard housing as the area was left behind without any means of economic growth. A bathhouse was constructed to provide a social outlet to the people living there, but they continued to live in squalor. The lack of attention from the government did lead to some resourcefulness though. Along the flowing canal, fruit trees were planted and cultivated to add variety and sustenance to the people living there. These plants ranged from yuzu to pomegranates and likely added variety and nutrition to the local diet. We theorize that these trees were kept in the family line for generations to come, and as they grew, time passed.

Generations later, this area along the canal flourished with diverse plant life. Insects became attracted to the lush variety of plants as birds rested along the water to scout their next meal. New businesses and cafes began to see an economic opportunity in this neighborhood as well, using the landscape as a selling point to customers. People even continued to cultivate their own potted plants and make use of the cramped space and narrow roads of the area to individually garden. Some members of the community even took it upon themselves to clean the area, showing a tendency to care for their neighbors.

However, as the economics of the area changed, the trees continued to grow. Trees continued to produce fruit with few people picking them due to a lack of ownership or need,

with the leaves and trees obstructing and damaging nearby buildings. The local fireflies also began disappearing, coinciding with the restoration of the canal upstream. The fireflies were driven away as trees got removed and replaced with ornamental plants that attracted tourism, and soon this project continued downstream.

Soon, trees began being tagged as the government planned to remove them for beautification and canal renovation purposes. When outcry manifested, experts revised the plans to remove fewer trees, but the construction began with no further argument. As construction continued, people were divided about whether the trees should stay or be removed. Some residents believed the trees to be a safety hazard or otherwise unsightly. Others found familial significance in them. The community agreed on keeping the area clean and beautifying the canal, and it became clear that this neighborhood is important to them. While many didn't have specific ideas for the restoration, they wanted the canal to be a nice place to live while the character of the neighborhood was preserved. To honor the community, there needs to be a plan where every voice is considered.

With this in mind, it's important for urban developers to more carefully consider the community they chose to operate in. Many of the plants in the area have significance to the people living there, and these should be preserved. This is especially true since previous restoration efforts affected downstream neighborhoods and consequently reduced biodiversity in the ecosystem. To preserve the landscape while contributing to natural beauty, a community garden or other activity may be beneficial to the area. The team has already done research on the benefits of an urban community garden (details can be found in Appendices D-J), and this is just one activity that can benefit the community and ecosystem.

However, such a project would need to be implemented with care. Even the current edible plants are often overlooked. We believe this is due to a perceived lack of ownership in the community. Therefore, more research would need to be done by future project teams before this type of development can continue. One way these teams can take more steps to establish a community project in the area is to conduct more varied research on beneficial types of community activities to allow for a more defined conclusion on what the neighborhood would prefer. If the community garden idea stays, it would also be a good idea to conduct soil and water testing on the area. This procedure was considered for this project team, but was scrapped due to a shift in priorities. Our proposed procedure can be found in Appendix K. Most importantly, more information needs to be collected on the community at large. While this project team did a substantial amount of observation, some improvements can be made to the methodology for future teams.

The least successful data collection method for the team was the survey. We believe this is due to a lack of specificity in the questions as well as the lack of authorization by community leaders. This likely reduced the credibility of the survey in the eyes of the community. To help future teams conduct more successful surveys, some recommendations need to be articulated.

One recommendation for these teams would be to prioritize specificity in survey questions and deadlines. The surveys this team utilized told respondents to fill it out by “next Friday,” which led to ambiguity and some responses being late.

One other important consideration is that being personable is key to getting good data in this neighborhood. People are more willing to answer questions from people they are familiar with. Therefore, it would be helpful for future teams to establish a more formal presence. This could be done through the use of frequent social interaction, website, dedicated social media page, and/or business cards. These tools can spread awareness and familiarity, which can in turn provide important connections and support. It would also be important to speak with community leaders for guidance before surveys are distributed. These individuals are trusted within the community, and their advice and support can lend credibility to the surveys. This should be helpful to avoid community outcry and obtain more successful responses. Hopefully what this team has learned will be of good use to future projects so the neighborhoods along the canal can be given a voice on how their community should be improved.

We also think some of our side projects would be of great use to any future effort. Over the course of our project, we developed an infographic and websites. These would be useful tools for outreach as the project continues to expand with future groups, since they allow for the information contained in this report to become more accessible.

Our infographic (found in Appendix L) has been designed to make the data our team collected more accessible to the community as well as future teams. After all, the community doesn't have our spreadsheet at all times to reference. The infographic was designed to provide a visual for our ecological data in an easy-to-digest format for both the community and any future groups that may need to reference our data.

Our project website was created using google sites to catalog some of our project objectives and contacts. While it didn't see much use during this project, we think the blueprint for the website will be of great use to future groups looking to expand their presence in the community. The contacts listed on the website may also be used to contact members of this team about the project during these undertakings.

| |
|---|
| <p>Link to Project Website: https://sites.google.com/view/takase-community-project/home</p> |
|---|

Overall, we believe that this community deserves proper investment. This neighborhood has been overlooked by the government and higher authorities for centuries, and this trend unfortunately seems to continue based on current construction plans. We hope that teams of researchers and activists can continue where we left off to develop a project that can work for the community. We think outreach and an open mind will be the two most important tools for

those looking to continue this project. This would allow for successful project implementation and, hopefully, a space that is well-liked and utilized by the community. We would also like to further emphasize the importance of listening to the community for any project that may be undertaken. These people have been denied a voice for so long, so it's important that their opinions are amplified. After all, the true objective of any project in this region is to improve the lives of community members and give them a sense of advocacy and ownership.

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Appendix

Appendix A: Interview Questions

1. What is your name? (Unless anonymity is requested)
2. Where do you live? (Can be general or optional if interviewee want anonymity)
3. Have you heard about/seen the renovations to the Takase River?
 - a. (If yes) What do you think about the changes?
4. Do you know about the edible plants along the river?
 - a. Yes or no
 - i. Have you eaten anything grown along the river?
 1. (If no) Have you considered it?
 - ii. What do you think about the food grown along the river?
 5. How does the scenery along the Takase River make you feel?
 - a. Has it changed since you've been here?
 - b. How do you think it could be improved?
 6. Is there an area along the river that is your favorite?
 7. As a child did you ever play along the river?
 8. Do you have any pets?
 - a. If so, is the Takase canal a route you enjoy to walk?
 9. Have you seen anyone else interacting with the plants along the river?
 - a. (If yes) In what way?
 10. Would you consider helping a community garden along the river?
 11. Is gardening a part of your life?
 - a. Why is it important ?
 - b. What do you like to grow?
 - c. How does it make you feel, would you recommend it?

Appendix B: Survey Questions

高瀬川アンケート Takase River Questionnaire

こんにちは！私たちは、アメリカの大学、ウスター・ポリテクニック・インスティテュートの学生で、高瀬川に関するプロジェクトのために来日しています。私たちの目的は、高瀬川沿いのコミュニティガーデンの設計を提案することです。そのために、川沿いに住む人たちの共通の興味や関心を知りたいと考えています。これらの回答は、私たちの次の方向性を決定するのに役立ちます。近いうちに皆さんとお話しして、高瀬川沿いのコミュニティへの関わりを理解したいと思います。アンケートは10分程度で終わりますので、もし答えにくい質問があれば、空欄で結構です。また、自由記述欄は、日本語でも英語でも結構です。

Hi! We are students from Worcester Polytechnic Institute, a university from the United States, who've come to Japan to work on a project involving the Takase River. Our objective is to propose a design for a community garden along the Takase River. In order to do this we want to know the common interests and concerns of those who live along the river. These responses will help us determine our next direction. We hope to soon talk to you all and get to understand your involvement in the community along the Takase River. The survey should only take about 10 minutes and if there are any questions you feel uncomfortable answering, feel free to leave them blank. For any free response questions, entering in Japanese or English is fine.

スマホでこちらのQRコードを読み取って回答していただくこともできます。お知り合いでこのアンケートに参加したい方がおられましたら、送っていただけるとありがとうございます。

You can also take this survey on your phone by scanning this QR code and if there is anyone you know that would like to take the survey as well, feel free to send it to them.



この回答用紙を金曜日と土曜日の午前11時頃に回収に伺います（オンラインで回答された方を除く）。ドアの下に置いておいていただいて結構です。アンケートへのご回答ありがとうございました。

ご質問がありましたら下記までご連絡ください。

Jennifer Teeter (京都精華大学の教員): jteeter@kyoto-seika.ac.jp
Benoit Jacquet: benoit.jacquet1@gmail.com
私たち Our Team: gr-kyotoa22_forestgarden@wpi.edu

1) 住んでいる場所(通り名や大まかな地域でも可)。Where do you live (Can just be a street name or general area)?

2) 高瀬川にはどれくらいの頻度で行きますか。How often do you go to the Takase River?

決して Never 稀に Rarely 時々 Sometimes よくあること Often 常に Always

3) 高瀬川で行われている工事について、どの程度満足していますか。How satisfied are you with the ongoing construction in the Takase River?

非常に不満 Very dissatisfied ニュートラル Neutral 非常に満足 Very satisfied

不満足 Dissatisfied 満足 Satisfied

4) 高瀬川沿いの草木の果実の中には食べられるものがあることを知っていますか。Are you aware that some of the plants/trees along the Takase River produce edible fruit?

はい Yes いいえ No

5) 高瀬川沿いの草木から果実を取ったり食べたりしたことがありますか。ある場合、何の果実ですか。Have you harvested/eaten any fruit from the plants/trees along the Takase River? If so, what fruits?

6) 高瀬川の美しさをどのように評価しますか。How would you rate the beauty of the Takase River?

非常に貧弱 Very poor 貧弱 Poor 好い加減な Acceptable 良い Good 非常に良い Very good

7) 高瀬川沿いの草木はどうすべきだと思いますか。What do you think should happen to the plants and trees along Takase River:

取り除くべき They should be removed 残すべき They should stay 特に意見はない No opinion

8) 日常生活で高瀬川をどのように利用していますか。How do you use the Takase River in your daily life?

9) 高瀬川をどのように利用してほしいですか。In what ways would you like the Takase River to be used?

10) 高瀬川にまつわる思い出はありますか。Do you have any notable memories about the Takase River?

はい Yes いいえ No

11) 質問10で「はい」と回答された方は、もしよろしければその思い出について教えてください。If you answered yes to question 10 and are comfortable answering, What are those memories?

12) あなたの人生において高瀬川はどの程度重要ですか。How important is the Takase River in your life?

非常に重要でない Very unimportant ニュートラル Neutral 非常に重要 Very Important

重要でない Unimportant

重要 Important

Appendix C: Vegetation Species Sightings

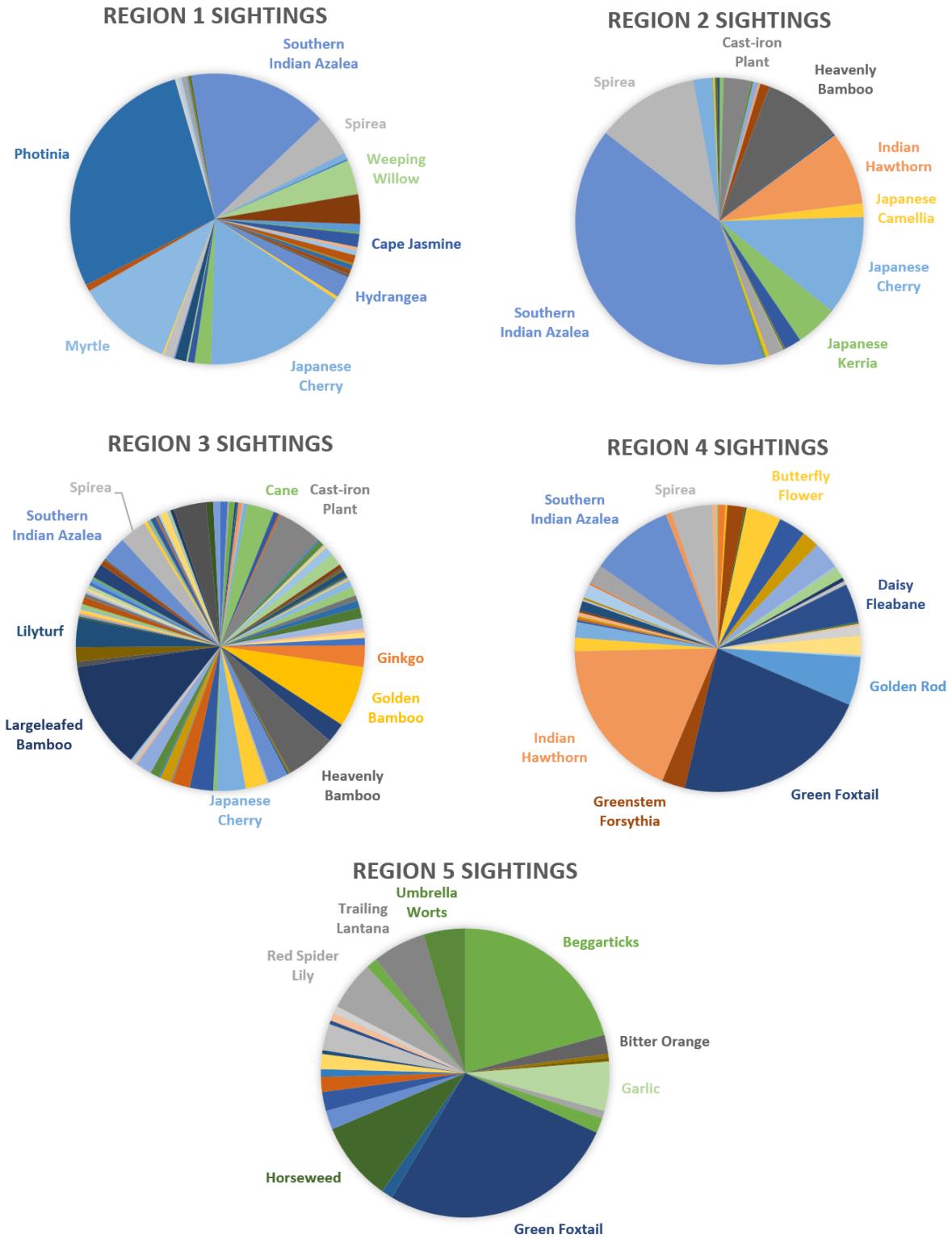


Figure 14: Breakdown of Vegetation Sightings

Appendix D: Possible Outcomes for the Future

Alternative Trees and Plants

One potential outcome is that the general public likes the garden and wants to keep it alive where it is currently located. In this case, one option is to find alternative trees and plants to grow along the river. The idea behind alternative agriculture is that plants impact the ground differently, so a new set of plants could potentially coexist with any canal renovations. These alternative plants would be found via a survey of the land and research about the ecology around Kyoto. The combination of those two pieces of data should be sufficient to find plants that will be able to thrive in the new environment.

Find New Areas to Grow In

Another possible outcome is that the public likes the current community plants, but the river is no longer a viable place for plants to grow. The solution to this problem would be locating new nearby areas for an urban community garden to grow based on the geographic surveys. The key factors to look for in new pieces of land are the soil quality, water quality, and space. The geographic survey will provide all of that data and should provide suggestions for other available land.

Redesign the Current Landscape

In the case that the river is no longer viable or will not be in the future due to canal restoration, the best course of action is to redesign the landscape along the river. If the riverside is unusable in its current state, it may be possible to improve the area by creating a vertical garden plan. There is not a lot of space along the river and the space is only shrinking due to the canal renovations, so the solution to that is to utilize the vertical space. If trees or shrubs are being cut down due to a lack of space, growing plants on top of each other is ideal. Many edible plants can grow up along trees so as long as there is enough space for at least a small tree, many plants could be grown. This solution will utilize many of the agroforestry techniques outlined in the background research, such as aquaponics or aeroponics, to increase the efficiency so that the garden will have a high yield in a small space. These techniques will increase the maintenance required so it is important that we consider how many people are willing to help based on our surveys and interviews.

Appendix E: How Urban Community Gardening is Done

To create an urban community garden, first the soil must be prepared to accommodate the new plants. Large dead trees and unwanted plants must be removed, and if there's grass on the soil, the best way to eliminate it is to place cardboard on top of the grass. The cardboard will prevent the grass from growing through the soil and obtaining sunlight. After the cardboard and soil have been placed, the soil is ready for use. The ecosystem of bacteria and small creatures will benefit from the decaying grass and decomposing cardboard for better root development. Before the soil is fully prepared, it is important to take time to research plants that grow well alongside one another and are compatible with the weather. This can be done by incorporating local vegetation or plants that are not native to the zone that might be accommodated by more or less water, sun, humidity, and other factors. All plants should be able to grow while harming their neighbors as little as possible. For example, the ivy vine that can be found in oak trees grows without critically injuring the tree. The ivy damages the bark of the oak tree, and it might even overtake it. The ivy can also weaken branches due to its weight, and it can prevent light from penetrating to the lower layers of a garden.

In addition, plants inside the Urban Community Garden space are encouraged to belong to the same region where it is to be created. Plants can also be sourced from forging locations as long as their growing conditions are met and other plants can grow. Because of this, an urban community garden must be appropriately managed and well-planned to obtain a productive harvest.

Along with all the previous planning, it is crucial to set up an irrigation system. The most efficient system of irrigation is the drip system (NETAFIM, 2022). The drip system consists of placing flexible and cheap tubing along the area of interest while passing above the area where the plant roots are. Holes are made after placing the tubing so water can slowly flow and drip on top of the plants. This provides the plant with the needed water over time, and it is as easy as turning a valve into the open position.

Finally, after preparing the soil and choosing the plants, placing the vegetation into the soil is next. Tall trees should be planted above smaller forms of vegetation, such as shrubs and vegetables. After everything is planted, the plants must be watered as soon as possible to not affect their growth.

Appendix F: Japanese gardens

Gardening has been a part of Kyoto's cultural expression ever since the creation of the Saihoji moss garden in 1339, which became the greatest Zen temple of the time. However, the Saihoji moss garden is not the only example of a great garden in Kyoto. Shugaku Imperial Villa Garden was created in the 17th century to represent a scene of nature with its upper tea gardens and a larger forest with the lower fields. The history of these gardens represents the importance of nature to the citizens of Kyoto.

A Japanese garden is created to bring harmony into the lives of those who visit it. To immerse viewers in nature, the garden is created by arranging natural elements in small spaces, depicting a scaled-down representation of larger scenes.

Meditation and harmony became important aspects of Japanese culture after they were introduced by Buddhist monks in 538 AD, when they were sent as scholars to Japan in the Asuka Period (538 AD-710 AD) and Nara Period (710 AD-794 AD) (Takkhis, 2022). These monks also introduced Zen gardens as a way to practice meditation and cultivate the soul. As a result of the exchange between the Buddhists and the Japanese, three types of gardens were developed in Japanese culture.

Karesansui, also known as zen gardens or rock gardens, are associated with the practice of Zen Buddhism and are often found in large temples administered by a Zen abbot (administrator of a monastery). These gardens are characterized by the raked sand that symbolizes the flow of water and rocks that represent islands in the water. But the illusion tends to be easily lost when viewed from different angles. So to maintain the illusion of flowing water, these gardens are designed with a viewing platform to meditate on or to visit and enjoy the scenery.



Figure 15: Daitoku-ji Temple

“Tsukiyama,” meaning “constructed hills,” is another type of garden characterized by artificial hills and ponds. These gardens simulate a hill's natural scenery on flat land. The objective of this design is to observe the scenery from different viewpoints on the hills while strolling along the path. To further improve the experience, the garden is decorated with small

and well-trimmed trees, shrubs, and other plants that enhance the scenery of the majestic mountains and lakes.



Figure 16: Tsukiyama garden with Kaizando Hall

In contrast to a Tsukiyama, a Chaniwa is a garden designed to guide guests into a tea house. Since its only purpose is to be a path to the tea house, this garden style tends to look more like a trail. In order to improve the ceremonial aspect of walking to the tea house, the path contains stone lanterns and stone water basins where the guests must purify themselves before reaching the ceremony.



Figure 17: Kashintei Tea House

The culture of Japan is well known for its symbolism and traditions. In order to create a successful community garden, it is important to understand the parts that form the Takase Canal and what they mean in terms of Japan's view on gardens. Given the importance of the concepts involved in a garden, the canal is characterized by the water stream that represents the continuous and unstoppable passage of time that will continuously bring change to the community. This is a relevant aspect of understanding the community garden since the people living nearby see the canal as a source of change in their lives. Another important aspect of Japanese gardens that is present in the canal are bridges that represent a change of territory and the continuation of one's journey from their own perspective of the world. Although the canal was not originally built to represent these concepts, it is critical to make them part of the

scenery to be created given that the community will directly or indirectly interact with the garden in their daily lives.

Appendix G: Pros of Urban Community Gardening

Urban community gardens are a great example of community based projects because they bring people to the same physical location and provide a common goal to go along with it. On top of this, they produce food for the community to consume and enjoy. What separates an urban community garden from a regular garden is that an urban community garden is more limited in space and there is an emphasis on bringing people together instead of tending to a personal garden. While these differences dramatically change the dynamic of the garden, they come with many benefits, in addition to the ones you may get from a standard garden.

Gardening is highly beneficial because it impacts the well-being of those taking part in both highly apparent and unapparent ways. One of the most visible effects is the production of produce. Beyond that, urban community gardens establish a sense of community and provide economic, health, and environmental benefits. Communities are an important source of connection and create a sense of belonging.

Communities are an important source of connection and create a sense of belonging. With this urban community garden, gardeners are able to work collectively to manage a garden for the shared benefit of all people. In the midst of this collective effort, a community is established, allowing people to get involved with projects all while trying to better the environment that they live in. These connections pave the way for the creation of a cohesive community. A fundamental aspect of a “community garden is the shared endeavor, often from the very conception of the project to the management and maintenance of the garden” (Lovell, R. 2014).

Although other members may have different goals/visions in the end they all collectively work together. Besides the collective effort created, communities give the opportunity to create a network for people to share supplies, ideas, and collaborate. Having established the relationship that urban community gardening has with the aspect of creating a community, we can also see how the impact of a community establishes a medium for learning experiences. These experiences make individuals far more aware of ethical and environmental issues that interfere with their daily lives and help make their area far more sustainable.

Along with the creation of a community, urban gardens have economic benefits in ways that would not be expected. Having a local garden allows fresh vegetables, grains, and fruits to be sold to members of the community as well as business owners, leading to a prosperous local economy. In addition, having a local food supply gives members of the community and business owners access to produce without a complex network of importers. This means people won’t encounter competition for fresh produce and the transportation costs for their goods will be reduced. Ultimately, introducing a sustainable food source in the local area can improve the financial situation of local businesses.

The attraction of a local garden on top of gaining fresh produce, increases the traffic of tourists in the area. The influx of tourism in the city of Kyoto invites business transactions and creates the opportunity for employment in the community. Alongside being attractive, the “presence of gardens raised property values” (Golden. S, 2013). Subsequently greater tax revenue is created for the local government. This can then be used to improve the neighborhood or be contributed to construction and urban development.

As stated previously, an urban community garden revolves around fresh produce and interaction with the community. Poor mental health is “projected to be one of the most

extensive population health issues...such as loneliness and poor social contact" (Lovell, R. 2014). Gardening has been proven to improve the nutritional value of food, which leads to an improved diet. As long as there is a consistent involvement in gardening people will achieve sufficient levels of physical activity, which helps lay the path to a healthy lifestyle. Furthermore, "preliminary studies have reported benefits of horticultural therapy and garden settings in reduction of pain...lessening stress and therefore promoting mental health (Detweiler, M. 2012)."

Gardening on its own provides an alternative way to take care of one's health as it is therapeutic and relays a sense of achievement through an activity that holds value. Through the community social ties are created and strengthened allowing opportunities for bonds with others to be created. Altogether, urban community gardens improve social interaction, neighborhood reputation, education, youth development, and employment opportunities.

Appendix H: Urban Farming Examples

Urban community gardening is not a new concept, but as cities develop and expand, it becomes increasingly prevalent throughout the world. Urban development often takes away from green areas, leaving little to no room for plants. This is where the urban community gardens come into play. One such example of an urban community garden took place in Stockholm, Sweden (Schaffer, 2016). In Stockholm County, there are 4 urban community gardens, and each one is in a different type of location.

“Kräpladammen” is located in a public area between low-income and high-income communities (Schaffer, 2016). This urban community garden consists of at least 50 trees, all of which produce food, and smaller edible plants such as flowers, herbs, or perennial vegetables are scattered around the garden. There are over 100 different species of plants growing in the garden. The garden was constructed in 2010 by volunteers and, as of 2016, it was not only still operational, but the required maintenance was dropping.

“Braxenparken” is located in a low-income, suburban area with many people of different cultures (Schaffer, 2016). It was once a regular park but was converted to an urban community garden without diminishing its status as a park. It is maintained by volunteers, and surrounding schools are able to integrate it into their education systems. This gives the garden a good reason to be maintained.

“Bagisodlarnas Skogsträdgård” is also located in a suburban area (Schaffer, 2016). It was created in 2014 by the local residents, who continue to maintain it. Local authorities showed interest in the project as they had previously asked the citizens for a community project. Given this request, the local authorities financially supported the project and study groups on agroforestry.

“Campus Stockholm University” is aptly located near Stockholm University and is even integrated into a summer course at the university (Schaffer, 2016). It was made over the summers of 2012 through 2015 by students and teachers. A maintenance team was created for the garden, and throughout the years, there has still been a lot of value gained from the garden. Many groups besides the university are finding uses for it via study visits and media exposure. The project grew big enough that a restaurant showed interest in partnering with it, though it fell through due to the restaurant not having time to harvest the garden.

These four successful urban community gardens in Stockholm all show the positive impacts an urban community garden can have on a community beyond providing free food. Schaffer (2016) states that “these gardens have so far been used by local residents, children, green activists, students and the public for various purposes” showing just how versatile the gardens are for the communities. One of the obvious purposes is free food, but another purpose is education. Whether it is a hands-on experience for children or the subject of ecological studies for university students, urban community gardens have a lot of educational value. One recurring theme throughout each of the gardens was that there was maintenance involved. While this could pose an issue at the beginning of a project, it is clear that over time the required maintenance drops.

In Alberta, Canada in the city of Edmonton, a man named Ron Berezan decided to build his own urban community garden (Berezan, 2010). For his garden, Berezan had 5 types of plant groups that each served a specific purpose for the longevity of the garden. There were plants

that helped build up the soil for other plants to use, plants that accumulate nutrients below the surface, plants that attract pollinating insects, plants that give off an insect repelling aroma, and plants that provide protection to other plants after they have matured. The structure of the garden used these 5 groups as a base so all around the garden would be trees, and then surrounding each tree would be other plants that filled in the other 5 required groups. The urban community garden was built in 2008 and was still operational in 2010. Berezan's story shows that there is a formula for the success of an urban community garden. This formula involves the deliberate usage of plants to aid the growth of other plants and when followed properly, maintenance is reduced to basically nothing.

Appendix I: Agroforestry Practices and Technology based Farming

The practices of agroforestry combine the benefits of “growing trees and shrubs together with crops and/or livestock” (USDA, n.d.). These techniques take much more space than what is available near the Takase Canal but some of their attributes are still applicable. For example, a practice called alley cropping involves laying out rows of trees and plants in an alternating pattern. This modular organization allows for adjacent plants/trees to directly benefit from each other in a symbiotic relationship. For instance, foxgloves are known for their ability to prevent diseases and strengthen immunity among their neighbors, while marigolds attract hoverflies, which feed on unwanted pests. Planting foxgloves and marigolds resembles a plant-plant positive relationship. This sort of bond between tree and plant creates a strong community of vegetation. Furthermore, being able to plant a variety of species of trees and vegetables allows a garden to be versatile. This allows the garden to appeal to a wider audience.

Some urban gardens take an unorthodox approach to bringing green life to urban environments. The SWALE Barge, for example, is a floating produce garden that is open to public enjoyment and travels between the harbors of NYC. In a place like NYC, where space is limited and expensive, non-traditional gardening spaces are very attractive. Swale’s mission is to promote local food growth in NYC public areas. “Since 2016, Swale has hosted 205,000 visitors, over 800 guided tours, 75 school field trips, 50 free public programs, and 38 Summer Youth Employees!” (SWALE, 2020). Taking advantage of the river area to implement a similar floating garden in the Takase canal is very much a possibility. As seen in the GIS (Geographic Information System), Google Maps, there isn’t much workable area next to the canal, so finding off-land alternatives will open up options for this urban community garden. The use of floating platforms to hold vegetation is an efficient use of city space, especially for the Takase canal.





Figure 18: Google Maps view of Takase River

Another method of high density gardening is aeroponics and hydroponics. Hydroponics is a gardening method that doesn't involve the usage of soil and aeroponics suspends plants in the air while providing moisture via mist. At Chicago's O'Hare International Airport, there is an aeroponics showcase that includes 26 towers of plants and is claimed to be as yield efficient as standard gardening methods when under substantial lighting and proper ventilation. This method of gardening strives in its ability to provide plants high oxygen levels because of the highly aerated mists. Furthermore, it also has little to no water waste because water is always recycled back into the system so none is evaporated or disposed of. "There, the plant roots are sprayed with a fine mist of water and a mineral nutrient solution for 15 minutes every 30 minutes."(Admin, 2013). Although community engagement isn't a strong point for Aeroponics, it makes up for its technological advancement. It combines the best features of a garden and urban environment.

Another method of agriculture is called aquaponics, where the growth of plants and small fish is coupled together. Wastewater produced by the fish is recycled and used as fertilizer for plants to grow vertically. "Aquaponics represents the relationship between water, aquatic life, bacteria, nutrient dynamics, and plants which grow together in waterways all over the world" (White, 2021). Using technology to emulate natural world relationships reflects the ideology behind urban farming, highlighting aspects of the city is just as important as the green life.

There are 2 main approaches to designing an urban community garden in our urban environment. The first is the more traditional hands-on and community based garden that follows some principles of agroforestry. The second is the more technologically advanced approach that is slightly automated but requires a non-zero amount of care from the community such as aquaponics and aeroponics. Each approach caters to audiences with different opinions but both embody important values for Kyoto communities. Without careful analysis of the community's priorities and values, it is impossible to determine which methods would work best. Due to this, all options will remain open to continuous evaluation and research as the project continues.

Appendix J: Significance of farming and cuisine

Japan is well known for their cultural emphasis on food and for good reason. Cuisine in Japanese culture is more than just a filling meal but rather a method where people "... can socialize, build stronger bonds, cooperate, work in teams and help society to develop." (Cedillo, 2017). There are around 21,000 7-Eleven convenience stores, 150 cat cafes, 10,000 ramen restaurants, and 30,000 sushi restaurants in the small island of Japan. They are also known for having the 2nd highest number of Michelin star restaurants, falling short of France. It is safe to say that Japan takes their food seriously and is an important aspect of their lifestyle. Their close proximity to Korea and China allows for an easy exchange of ideals and knowledge. Cuisine also happens to be significant in Korea's and China's culture. Also, Buddhism and Shinto is widely practiced in Japan so their values of naturalism and purity is reflected in the type of food they eat. Much of their cuisine shines a light on local produce that is held to the highest standard of freshness and quality. Lastly, the Japanese have a mindful attitude towards food that is generally uncommon in other nations like America. Smaller but higher quality and tastier meals encourage people to be less indulgent in their eating styles.

In addition to cuisine, the Japanese also highly value their vegetation. Trees, for example, represent age and resilience while also embodying a personality of their own. Being surrounded by green life is a way of "communing with nature" and "has both physical and a mental upside"(Box, 2022). Japanese gardens are also known for bringing serenity and peace to the chaotic lifestyle of a modern day society. The western image of Japanese gardening emphasizes their connection to religion and abstract symbolism but in reality it really comes back to the simplicity of nature. Bringing aspects of nature into one's life is highly desired. In many Japanese households there are a selection of potted plants inside and outside despite the small living spaces in an urban environment. Even when there aren't many opportunities to grow plants in a city, the locals of Kyoto always find a way

Appendix K: Geographic Data Collection Procedures

Soil Type Test:

Materials: Mason quart jars, permanent markers, water, soil sample

Procedure: Topsoil will be collected from five spots along the canal and will be added to mason jars. The jar will then be filled with water, with the soil agitated in the water. The jar will then be left on a flat surface. As levels of different soil types emerge (sandy, then silt, then clay), the level will be marked using permanent markers. The composition will be determined by comparing the depth of each level.

Timeline: 1 test at 5 different spots each week for three weeks

Soil Nutrition Test:

Materials: Soil test kit, soil samples

Procedure: Perform soil test as directed on the package. Record a numerical value from 0-4 corresponding to the value displayed on the test kit.

Timeline: 1 sample at 5 test sites per week for three weeks.

Land Use Survey:

Materials: Paper, pencil, Google MyMaps, QGIS3 (time permitting)

Procedure: A surveyor will walk directly alongside the canal, recording any businesses, residential neighborhoods, undeveloped natural spaces, educational institutions, and spiritual sites. The hand-sketched map will then be digitized using Google MyMaps software, applying a color code to different types of land use. Following the collection of species data, the QGIS 3 software may also be used to create a more sophisticated map.

Timeline: 5 hand-drawn maps (one from each team member) over the course of one to two weeks, converted into one consistent digital map.

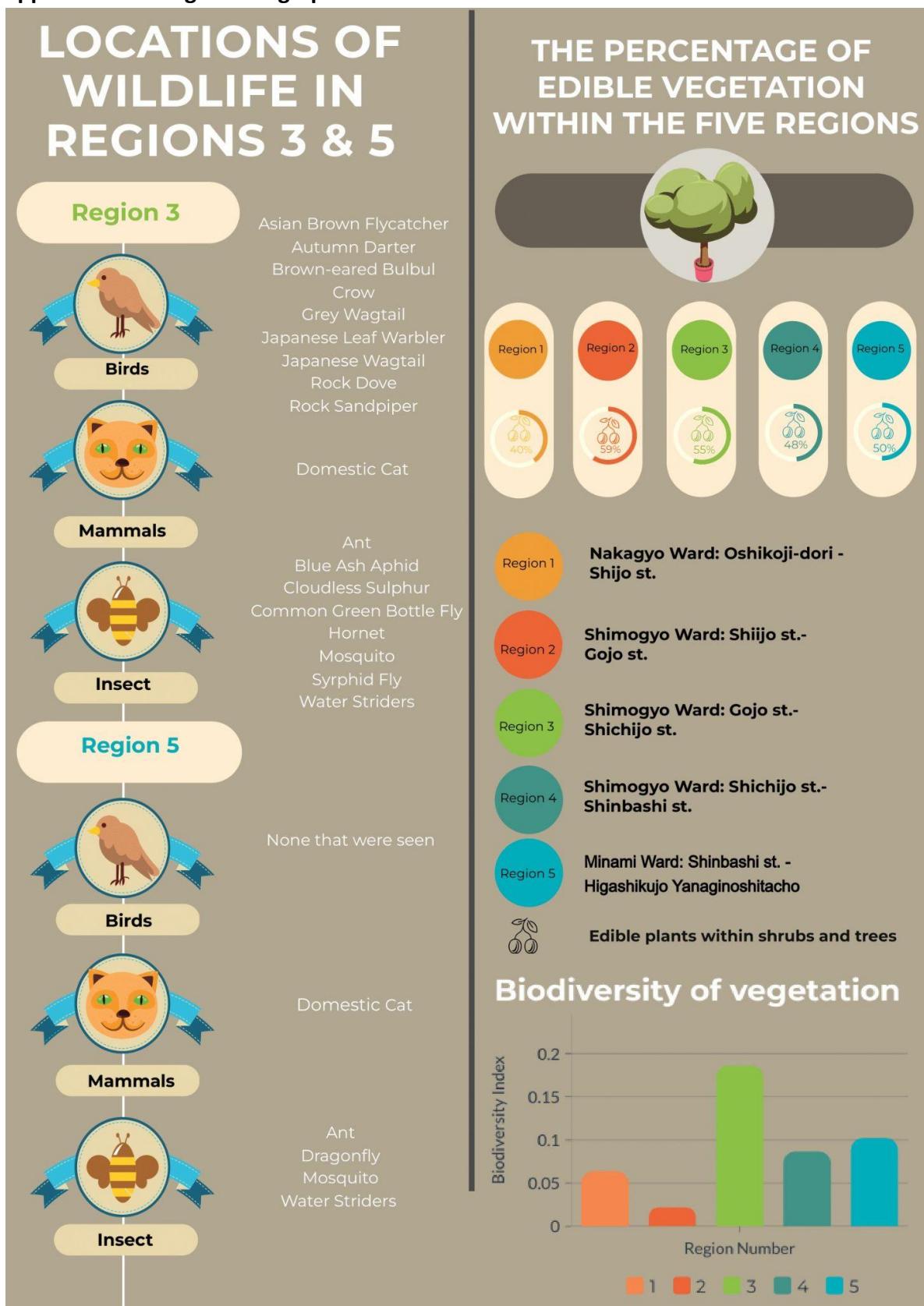
Species Identification:

Materials: Camera, PI@ntNet, Picture This App, Field Guide, Pencil, Paper

Procedure: Plant species currently growing along the river will be identified utilizing the field guide and Seek app on the field, with images being taken during the observation. Each team member will take charge of one area of the canal, mapping the species using pen and paper, as well as identifying any unknown species using browser software PI@ntNet. This map will then be digitized, possibly by incorporation with the land use map.

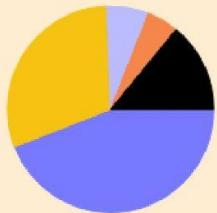
Timeline: Each team member surveys an equal portion of the area along the canal, documenting and updating species over the course of three weeks.

Appendix L: Ecological Infographic



Edible plants found along the Takase Canal

Region 1
Nakagyo Ward



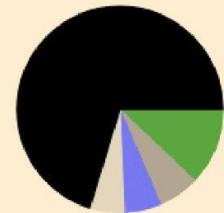
- Japanese Cherry 44%
- Myrtle 30%
- Hydrangea 7%
- Japanese Camellia 5%
- Other 14%

Region 2
Shimogyo Ward



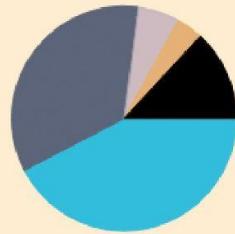
- Japanese Cherry 37%
- Indian Hawthorn 27%
- Japanese Kerria 17%
- Sweet Cherry 7%
- Other 13%

Region 3
Shimogyo Ward



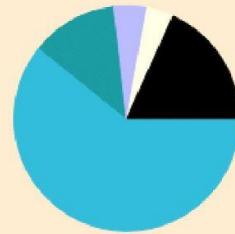
- Golden Bamboo 12%
- Woodsorrels 6%
- Japanese Cherry 6%
- Cane 5%
- Other 70%

Region 4
Shimogyo Ward



- Green Foxtail 42%
- Indian Hawrthon 35%
- Chinaberry tree 6%
- Chameleon plant 4%
- Other 13%

Region 5
Minami Ward



- Green Foxtail 61%
- Garlic 12%
- Hydrangea 5%
- Japanese Persimmon 4%
- Other 18%