The Fungi of Bousson: Creation of a Fungarium

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Dr. Rich Bowden	**Date**	**Wendy Kedzierski**	**Date**

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Abstract

Fungi are an essential kingdom of life: a crucial part of forest ecosystems, having symbiotic relationships with 60% of all trees in the world and over 80% of all plants; are part of the food web, and they decompose old biomass to be used for new growth. Unfortunately, they are understudied, in part due to mycophobia, as they are associated with disease and death. Therefore, there has been a historical aversion to and neglect of them in western science. In fact, it is estimated that only .3% of total species have descriptions. As a result, there is little information available on fungi, and not much is understood about their diversity, ecosystem roles, and conservation needs. This leaves fungi vulnerable.

This project aims to create a starting point for future mycological research at Allegheny College through the collection, documentation, and preservation of the fungi of Bousson from October-November 2022. The creation of a fungarium, a collection of dried fungi, allows for a wealth of potential future research into topics such as phenology, population genetics, range shifts, ecology, phylogeny conservation biology, and more. This project further works to encourage the public to find fascination with fungi through the creation of an ArcGIS StoryMap. The story map displays photographs of each fungus accompanied by a fun fact, linked to the location in Bousson in which it was discovered.

Introduction

Fungi are a fantastic kingdom of life, coming in countless shapes, colors, sizes, and textures. The amount of fungal species is estimated to be as high as 5.1 million (Moore, 2022). However, currently, there are only 15,000 described fungal species (Hyde, 2022). This is a large gap in fungal knowledge, and it does not account for undiscovered species. There is little we know about how fungi behave, as they are so understudied. While humans know their roles in nature as a kingdom, such as mutualists, parasites, and decomposers, the role of individual species of fungi is widely unknown (Wu et al., 2019). Another part of this undiscovered knowledge is which factors affect fungal diversity. Little is known about the driving factors behind fungal fruiting phenology; in simpler terms, when, where, and why different species of fungi fruit. Each species of fungi is unique and serves an important function within the ecosystem; therefore, documenting their diversity is vital to understand their roles within the ecosystem.

Fungi have symbiotic relationships within their ecosystems. Several species of insect have coevolved with fungi, farming them and using them as a primary food source (Farrell et al., 2001; Hulcr & Stelinski, 2017; Mueller et. al., 2001). They are an important part of the food web, as a multitude of animals consume them. In fact, some subterranean mushrooms rely entirely on animals that consume them for spore distribution (Fogel & Trappe, 1978). Conversely, some animals rely on the consumption of mycelium of certain fungi to build the microbiome in their gut. Without these fungi, some herbivores could not digest the plants they consume (Fantastic Fungi, 2023).

Fungi have symbiotic relationships with plants as well. Over 80 percent of terrestrial plant species have a symbiotic relationship with mycorrhizal fungi (Lee et al., 2013). Fungi that have symbiotic relationships with plants are called mycorrhizal fungi (Rimington et. al, 2020). Ectomycorrhizal fungi is a more specific category relating to those which have symbiotic relationships with trees. These fungi protect the roots, protect against decomposition, fix nutrients, and can even transfer nutrients from tree to tree (Steidinger et al., 2019). Saprotrophic mushrooms decompose rotting material. They are essential to recycle nutrients that would otherwise pile up in forests and make them usable for new life (Van der Wal et. al, 2013). There are also parasitic mushrooms that gain nutrients from other organisms, harming them in the process. One example is Chestnut Blight. Since there are different fungal lifestyles (parasitic,

symbiotic, and so on), it is reasonable to assume that they would fruit at different times (Sato, Morimoto, & Hattori, 2012). Not many studies have looked into this, so it remains unknown. Furthermore, there are countless lifestyles for mushrooms. Even though more than 85% of vascular plants have beneficial relationships with fungi, surprisingly, these types of fungi only account for 10% of all identified fungal species (Lewis, 2016).

Perhaps because of their ephemeral, hidden nature, and how little is known about their behavior, fungi have garnered a mysterious reputation. They have been both revered and feared throughout history for their perplexing nature. “Mushroom Stones” are small carvings of anthropomorphic and zoomorphic mushrooms found in South America. They date back from around 1000-500 B.C. It is believed that some of these stones were used for sacred ceremonies to grind hallucinogenic mushrooms, and many historians believe that these statues have an association with indigenous gods (de Borhegyi, 1961). In addition to being revered in South America, mushrooms have a favorable reputation in the East. In Asia, they have significance in several indigenous religions as well. Furthermore, many traditional dishes and medicines are made using mushrooms (Dogonniuck, 2019). In fact, mushrooms can have amazing health benefits if one understands which ones to ingest. This is understood in much of Asia and is the reason why the medicinal reishi mushroom has the nickname “the mushroom of immortality” (Loyd et al., 2018).

However, in the west, feelings towards fungi are very different. Mushrooms are not associated with religion or medicine. Instead, they are associated with death and disease (North Spore, 2019). In folklore, they are linked to witches and fairies. While an association with fairies may sound pleasant, it is believed that these fairies would harm humans if given the chance. Stepping in a ring of mushrooms was said to give these fairies power over the unfortunate victim. Fear of these “fairy rings” can be found across multiple cultures and is present in modern society (Volume & Dugan, 2008). In effect, it is not uncommon for people in the West to ask if they can touch mushrooms without getting harmed, even though one cannot get poisoned from touching mushrooms. Because people are misinformed and unsure, they can become afraid and avoid fungi altogether, resulting in a fear called mycophobia. Because mycophobia is largely based on a lack of understanding, the cure may be to learn more, and not avoid mushrooms. It must be mentioned that much like the kingdom of plants, some fungi are poisonous, some are edible, and some are medicinal. However, the kingdom of plants is not feared like mushrooms.

Plants are better understood than fungi, so perhaps this is a reason why mushrooms are more often feared. It is better to be mycophilic than mycophobic.

Mycophobia does not only negatively affect the human psyche; however, as it has very real consequences for the kingdom of fungi. The avoidance of fungi has left them understudied and under-protected. Fungi face countless biodiversity threats, including logging, pollution, and climate change. However, they are seldom included in conservation plans (Fundis a.). Because they are ephemeral in nature, their biodiversity isn't always apparent. However, their biodiversity is great, even in small areas. A singular pine tree can have ectomycorrhizal relationships with over 40 species of fungi (Fundis, n.d., a.). Despite this, the U.S. Endangered Species Act only protects a mere two species of fungi (Allen & Lendemer, 2015). Even well-known and revered mushrooms, such as White Ferula, are becoming endangered. Until 2015, this was the only species of mushroom to be recognized globally as endangered due to human-related causes (Gibbens, 2021). Considering the impacts humans have had on species decline across the globe, it is reasonable to wonder if fungi are neglected in terms of conservation.

Mycologists are years behind other fields in understanding and implementing the conservation needs of fungi, but this does not mean progress isn't being made in mycology (Allen & Lendemer, 2015). Many mycologists use citizen scientists to aid in their collection and documentation of fungi. The first step to understanding fungal conservation needs is understanding their diversity (Allen & Lendemer, 2015). Using citizen scientists to help collect, document and describe fungi is a great way to not only gather a large number of specimens in a small area, but also to engage the public and get them interested in fungi (D'Elia, 2021). Several scientific discoveries have been made by collecting and documenting fruiting bodies. Species ranges have been expanded, and new species have been discovered through this process (D'Elia, 2021). After collection and identification, these fungi are sometimes preserved. It is through this preservation and gathering that a fungarium is created. Fungaria are a collection of dried fungal material. This fungal material is accompanied by written descriptions about the specimen and its habitat, GPS coordinates of where they were found, and pictures of the fungi before drying (Andrew et al., 2018). All of this information creates a rich and valuable resource for future fungal studies. Studies on conservation, fungal diversity, range, ecology, phenology, and more can all be done with just the information housed in a fungarium (Andrew et al., 2018). Furthermore, with the advancement of DNA sequencing, those who have little knowledge of

fungal identification can study fungi through their DNA (Lofgren & Stajich, 2021; Peay, 2014). Even those with a deep understanding of fungal identification can gain further insight into species that are visually identical but genetically different enough to be considered newly diverged or separate species (Reynolds, Jusino, Stajich, & Smith, 2022).

I collected, described, photographed, and preserved every visible fruiting body to document fungal biodiversity at the Bousson Research Forest. The collection was done with a knife, either digging up the fruiting body if it was found in the ground or cutting it off its growing substrate. Bousson is owned by Allegheny College and is located in Northwestern, PA, and is currently used as a study area for student and faculty teaching and research. Because the college owns it, it is not susceptible to commercial logging. This gives the potential to conduct long-term studies in the area. Furthermore, its use as a research forest means that there are a number of research projects conducted on the plants and animals of Bousson. Because of the wealth of past data collected and the potential for future research, it was a valuable place to document fungal diversity.

Fungi are crucial for the environment. They break down old biomass to be reused and can translocate nutrients to nutrient-poor areas (Van der Wal et. al, 2013). Sixty percent of all trees on earth have symbiotic relationships with fungi, making them crucial for forest ecosystems. They protect roots from disease and damage and prevent erosion. Furthermore, they boost carbon storage in the soil, making them buffers for climate change (Stanford University, 2020). Fungi are essential for the function of a forest ecosystem, so it is important to understand better the fungi that grow at Bousson.

The storage for these specimens is low cost, as they must simply be dried and stored in plastic bags with silica gel. These bags are housed in bins for further protection. The low cost and maintenance of their storage, combined with the high potential for future research, make a fungarium a vital resource for Allegheny College. The data stored in a fungarium can be used in a multitude of ways. Preservation of physical specimens allows for DNA-based information to be studied, such as population genetics and phylogeography (Andrew et al. , 2018). This DNA can be stored for decades, if not centuries, as these fungaria can hold this data for well over a hundred years to learn more about diversity and distribution as collected fungi's growth area is documented (Redchenko, Vondrák, & Konšnar, 2012). They can be used to study phenology, comparing records of specimen collection dates to weather patterns of the time (Andrew et al.,

2018). They can be used to reclassify and discover new species. Studies have been done to reclassify species that were grouped for morphological similarity, however completely different genetically (Forin et al., 2020). Fungarium can also be used to study range shifts, ecology, phylogeny conservation biology, and more. Potential future study on this fungarium is varied and diverse in scope.

Methods

Site Description

The collection site for this project was Bousson Research Forest. This forest is located in northeastern Pennsylvania, 15 km southeast of Allegheny College, which purchased the land in 1935. Originally, the Bousson family owned this land and built a mansion on the property. They farmed the land. During this time, trees may have been cut down for construction. The Dickson's Mill Cheese Factory was also located on this land and perhaps let their cows graze heavily on site. A carp fishery was held in Lake Siple, and a sugar maple plantation was growing around the Bousson mansion. After Allegheny acquired the land, it was mostly used for outdoor recreation by the Outing Club and Phi Beta Phi. From 1937 to 1945, the fraternity planted over 10,000 pine saplings on site (*A Characterization of Bousson Forest,* 1996*)*. Today approximately 115 hectares of forest are used for teaching and research (Lajtha et al., n.d.). Bousson is mainly comprised of mixed hardwood trees such as sugar maple, black cherry, beech, and hemlock. However, closer to the wetlands in the west, beech trees are more predominant. Oaks, sugar maples, and beech surround a section of Norway spruce trees in the west. Hemlocks also litter the western side, with a larger amount in the north. In the east, there is a higher concentration of black cherry trees. Furthermore, on the eastern edge of the property, there is a red and scott pine plantation. On average, Meadville, PA, gets 42 inches of rain and 75 inches of snow per year (Sperling, n.d.). The average temperature of October is about 50 °F, and the average precipitation is 3.54 inches. November averages 40 °F and 3.98 inches (*U.S. climate data, n.d.*). Being in a temperate zone, temperatures shift dramatically from summer to winter; this sometimes results in the ground freezing and thawing throughout the year. Due to the gradual slopes of Bousson, it is believed not much erosion occurs to the soil. The soil formed on material containing sandstone, siltstone, and shale after being weathered by glacial till. The surface layer is about 2 inches of dark brown silt loam covered by 3 inches of leaf litter and other organic material. The percent

water content of the upper layer of soil was measured to be about 50%, and the average pH was 4 (*A Characterization of Bousson Forest,* 1996).

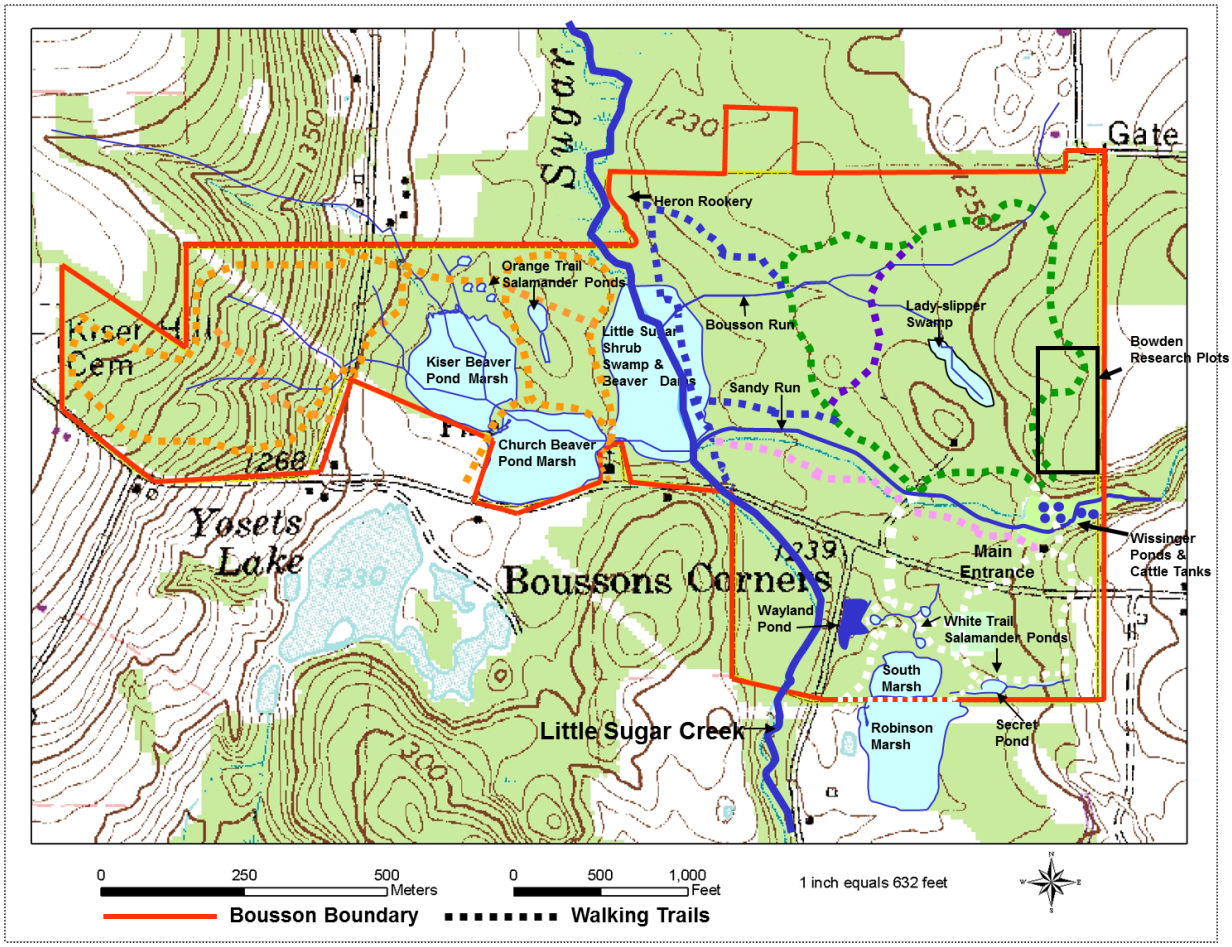

Figure 1: Map Of Bousson

Collection Process

I divided a map of Bousson into general habitat types: Scott and red pine plantations, swamp/riparian zone, hemlock, temperate forest, and Norway spruce. These were broad categories to ensure that I collected from various habitats as I targeted different areas on each visit. I took this map through Bousson, walking from each section to the next. I wandered through the forest, not following trails but just walking until I saw a fungus. Other projects have taken similar approaches, such as the Bridle Trails Diversity survey, stating that they did not want to limit themselves by using plot transect (D'Elia, 2021). I wanted to expand my study beyond certain plots of land or near trails—sampling unconstrained in the forest, I could collect

the widest variety of fungi possible. Slime molds were also collected, as they are often studied in tandem with fungi due to their similar appearances. I needed to ensure that my data collection was not only thorough but comparable to different fungal studies, as this would give more insight into fungal diversity patterns as a whole (Tóth & Barta, 2010). Looking at other fungal diversity surveys, I saw several similarities and differences between collection methods. However, the differences were minor compared to the number of similarities I found.

The collection of fungi began in October 2022 and ended in November 2022. Fungi of Bousson were collected; their macroscopic features were described; their GPS coordinates were marked, their habitat was described; their collection date was written; the field and lab photography was taken of each specimen; and the fruiting bodies were dried, preserved, and stored. I marked specimen GPS coordinates on GIS using the Field Maps app. Some locations were marked using a Juniper Geode GPS antenna. However, as the project went on, I switched to the internal GPS on my phone as it made it easier to make more trips to the field. The GPS device used for each location was stored in GIS.

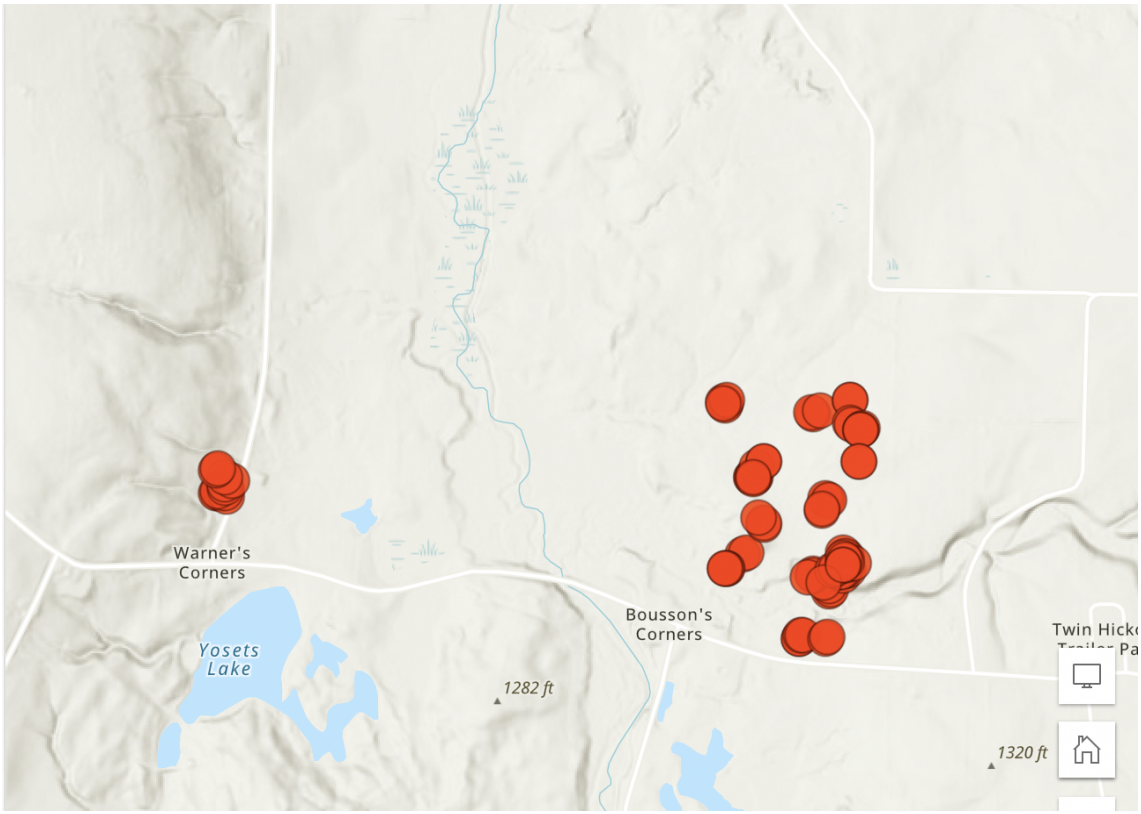

Figure 2: Locations of Collected Fungal Specimens

The photos document the fungi in their natural habitat from multiple angles, showing the cap, stem, and spore surface. Specimens were then collected and placed in paper bags. If they were growing in the soil, the fruiting bodies were dug up entirely to see if subsurface features, such as a volva, were present. This also ensured that fungi grew from the earth instead of a buried piece of wood. A soil core sampling tool was used on the soil on either side of where the fungus was found. The soil core sampling tool was pushed five centimeters deep, and the soil was placed in a plastic bag labeled with the corresponding specimen's identification number. If the specimen was found on wood, a pocket knife was used to cut the fungus off along with some of the wood. Specimens were cleaned in the field and placed in a paper bag labeled with the corresponding identification number. Habitat descriptions were written in the field. Samples were then taken back to the lab. Soil samples were placed in the freezer, and fungal samples were placed in the fridge for up to two days if they were not to be processed right away to avoid DNA degradation (Natural History Museum, 2022).

Lab photos were taken of each fungus on white or black backgrounds depending on if the fungus was light or dark-colored. Lab photos were taken to show each fungus's spore surface, cap, and stalk. All photos were uploaded to a flash drive kept with the fungarium. As these photos were taken, I wrote the macroscopic features of each fungus on the same datasheet used to describe their habitats. Fungi were placed back into their collection bags and dried at 29 degrees C for 24 hours. After drying, samples were placed into a plastic bag labeled with their identification number. Each specimen was housed with ten grams of color-changing silica gel. Larger specimens were cut into smaller pieces to ensure no internal rotting and smaller specimens were placed in a separate bag within the ziplock full of silica. This ensures that smaller specimens would not come in contact with the silica gel directly (Acharya, Pradhan, & Dutta, 2015). After this, they were organized by number and placed into airtight plastic containers for long-term storage.

Results

89 fungal specimens were collected and preserved. A total of 66 species were found. The most common fungi found were mushrooms, the second most common type being shelf fungi. Cup, jelly, puffball, parasitic, coral, and crust fungus also grew in Bousson. Slime mold was frequently found as well; Wolf's Milk (*Lycogala epidendrum*) was one of the more common

species found, with three specimens collected for this project. The most common species found were Violet-toothed Polypore (*Trichaptum biforme*), Turkey Tail (*Trametes versicolor*), Yellow Fairy Cups (*Bisporella citrina*), Eyelash Cups (*Scutellinia scutellata*), Orange Parchment (*Stereum complicatum*), and Wolf's Milk (*Lycogala epidendrum*).

Most fungi were found growing on wood. The areas most dense in fungi contained large piles of branches, where chunks of trees fell and gathered. These piles were lined with multiple and many fungal species. This is not an exhaustive list of all fungal species living in Bousson, as many may have been overlooked. Furthermore, the number of fungi fruiting is lower during the colder months. Many fungi do not fruit in the fall and winter months, but are likely to live in Bousson's soil and wood. For example, Amanita mushrooms are often found in this region but fruit during the warmer months of the year. Not all fungi could be identified to species, as many fungal species are very similar to each other. For example, many cannot be identified to species without microscopic analysis, which this study did not conduct. The following pages showcase the different species of fungi found during this project in the order in which they were found.

Species



Blackedged Shield (Pluteus atromarginatus)

When this specimen ages, its pale gills grow dark on the margin, giving this fungus its name. Its cap flattens out with age and is covered with small fibers. They have a symbiotic relationship with pine trees. However, simply because a fungus has a relationship with a particular type of tree does not imply that it only grows on this type of tree. Although edible, this fungus is rare enough that collecting and eating this species is not recommended (First Nature, n.d., a).



Honey Fungus (*Armillaria mellea*)

An edible fungus that grows in large clusters throughout the forest. One Armillaria species (*Armillaria ostoyae*) is the largest known organism in the world, spanning 2,385 acres (Wagner, 2021). While other species have thin mycelium, these fungi have thick, black, root-like rhizomorphs. This species is parasitic, killing trees as they rot them, and has been seen to have a relationship with hardwood trees (Kuo, 2017, n.d., a).





Trametes sp. (possibly Hairy Bracket [*Trametes hirsuta] or Trametes pubescens*)

This genus consists of wood decayers and can be found in all climates and continents. Some species have been studied for their medicinal properties, such as in the treatment of cancer (Olou, Krah, Piepenbring, Yorou, & Langer, 2020). The specimen on the left is more likely to be *Trametes pubescens* due to its radial brown lines, which develop on *Trametes pubescens* as it ages (First Nature, n.d, l). The specimen on the right is more likely Hairy Bracket (*Trametes hirsuta*) as it had no strong zones of color, thicker hair, and a brown cap margin (First Nature, n.d, k).



Violet-toothed Polypore (*Trichaptum biforme*)

As the name suggests, its spore-producing surface is purple, making it a common purple fungus to see in the woods. The name *biforme* translates to two forms, referring to the fact that it can have pores or teeth. Furthermore, its purple fades as it ages into a tan color, making it a variable mushroom appearance. It is a Saprobic fungus that rarely occurs on conifers; however, when it does, it tends to grow smaller (Emberger, 2008 a).



Eyelash Cup (*Scutellinia scutellata*)

This species is considered one of the world's most widespread fungi. Despite its commonality, it is often overlooked due to its small size. It measures at most 10 mm across, but more often stays in the range of 3 to 5 mm. What makes this fungus unique is its bright orange color and dark brown hairs lining the edge of its cup. It is a saprobic mushroom and is found growing in damp areas on wood (First Nature, n.d., b).



Witch's Butter (*Tremella mesenterica*)

This is an edible, parasitic jelly fungus that parasitizes a crust fungus from the genus *Peniphora*. Other species of look-a-like tremella, such as *Tremella aurantia,* are separated due to the fact that they parasitize a separate species of crust fungus, as well as microscopic differences, such as smaller spores (Kuo, 2018, a).





Crimped Gills (*Plicaturopsis crispa*)

Recently, its range has expanded greatly, but the exact reason for this is unknown. Before 2010 this fungus was rarely found in Britain, but after this year, it has since quickly spread across the nation. It is suspected that this may be due to changes in climate. It is distinct for its false gills, after which it is named. False gills are tougher, ridge-like, and harder to remove than real gills. Other species, such as chanterelles, have false gills as well. This saprobic species is found on the bark of deciduous trees, mainly birch, beech, and hazel trees (Sharp, 2021).



Orange Parchment (*Stereum complicatum*)

It is a saprobic mushroom found on a variety of hardwood trees, but mostly oaks. It can fuse together to create large orange sheets covering the wood. It is a distinctive and common fungus that can be parasitized by jelly fungus species (Kuo, 2008, a).



Turkey Tail (*Trametes versicolor*)

It has *versicolor* in its scientific name due to the large variety of colors its cap can display. The top of this fungus is banded with color and these colors range from blue to orange to brown. Turkey Tail (*Trametes versicolor*) has been used in Chinese medicine for over 2000 years, but in recent years, research has revealed that Turkey Tail (*Trametes versicolor*) can diminish and decrease tumor growth, increase survival rates of cancer, and boost immune system function (Habtemariam, 2020).



Clitocyboid Species

Clitocybe is a loose genus of mushrooms that can often be distantly related; however, they all lack a partial veil, have decurrent gills, and a fibrous stem. They are now referred to as Clitocyboid instead of Clitocybe because many species have been moved out of the Clitocybe genus but resemble its form (Clark, 2017). Later in the project, another Clitocyboid species was found. It is a smaller mushroom with a thinner stem and a different cap shape. This species of mushroom grows on the leaf litter and has white mycelium. One specimen was found in a pine plantation, and another under hardwood trees. There are many small Clitocyboid species very similar to this fungus, making it hard to identify. Furthermore, many Clitocyboid species are hard to identify without microscopic analysis.



Daedaleopsis

While it could not be identified to species, it is believed to be *Daedaleopsis septentrionalis* because it was found growing on a beech tree. Although *Daedaleopsis septentrionalis* prefers beeches, *Daedaleopsis confragosa* has been known to grow on beech trees and other hardwoods. Another reason why it is believed to be *Daedaleopsis septentrionalis* is the fact that its underside grows in a more lamellate fashion, while *Daedaleopsis confragosa* has a more pore-like or maze-like surface (Emberger, 2008, b)



White-toothed Polypore (*Irpex lacteus*)

This species is a particular type of fungus called a resupinate polypore. This means that it has no shape, instead spreading across the underside of decaying wood, as it is saprobic. In rare cases, it can be parasitic. It appears year-round and is widely spread across North America. However, it is scarce in the southwest (Kuo, 2007, a).



Little Nest Polypore (*Poronidulus conchifer*)

When young, this species looks like a cup fungus; however, as it continues growing and builds on itself, it transforms into a shelf shape. It grows on all types of hardwoods but primarily elms. It used to be classified as a Trametes but was later transferred to a genus of its own. This is why it is sometimes still referred to as Trametes conchifer in some field guides (Kuo, 2010, a).



Yellow Fairy Cups (*Bisporella citrina*)

This species is often overlooked due to its small size, growing a maximum of 4 mm, and turning disc-like as they get larger. The only continent on which this fungus is not found is Africa. As the name suggests, this fungus is a yellow cup that grows densely on decaying wood. It is a saprobic fungus that grows on conifers and hardwood stumps, logs, and branches (Kuo, 2021, a).



Eggs of Salmon (*Trichia decipiens*)

This species was the first slime mold found in this project. Slime molds were once classified as fungi due to the similarities in their bodies; however, due to the fact that slime molds do not have chitin in their cell walls and the fact that they digest microscopic organisms instead of absorbing nutrients from the environment, they are now classified differently. Still, slime molds and fungi are often studied in tandem. Eggs of Salmon (*Trichia decipien*s) have two ways in which they move, based on the humidity. When humidity is high, it allows the cells to swim, displaying a form called myxoflagellate. When the humidity is low, this slime mold crawls in a form called myxamoeba. In droughts, this slime mold reduces activity and hardens its surface to be rigid and waterproof. This species mainly feeds on yeast, bacteria, and spores of fungi (Barrionuevo, n.d.).



Deer mushroom (*Pluteus*)

While the exact species is unknown, it is in the same genus as the Black-edged Shield (*Pluteus atromarginatus).* There are many species in this genus. Although edible, they are often not collected due to poor quality, such as grainy texture. Many believe they are called deer mushrooms due to the light brown coloring of their cap; however, it is due to the horn-shaped protrusions on the edge of their gills. These cells are known as pleurocystidia. These mushrooms are found growing on hardwood as they are saprobic (First Nature, n.d., c).



False Chanterelle (*Hygrophoropsis aurantiaca*)

Unlike true Chanterelles, this fungus grows from decaying wood or leaf litter. True Chanterelles grow from the ground; however, False Chanterelle can appear to be terrestrial if it is found in leaf litter. While it is not listed as poisonous, many have reported feeling gastrointestinal distress after consuming this fungus, so it is best to be avoided (Roehl, 2017).



Mycena

Mycena is a small saprobic genus of fungi, although some evidence of parasitism has been reported. They are commonly known as Bonnets. Many species of *Mycena* are hard to identify, only being distinguishable due to their microscopic features. The edibility of most Mycena species is unknown; however, some are toxic and edible. Over 58 species of Mycena fungi are known to be bioluminescent. It is theorized that they glow to attract insects to distribute their spores. They come in various colors, from blue to orange to gray to red; some even secrete latex when cut into (iNaturalist, n.d., a). All Mycena found in this project were of different species.



Dacrymyces sp.

The fungi found in this study were possibly *Dacrymyces stillatus* or *Dacrymyces minor*. They are small yellow blobs, sometimes taking on a disc-like shape. Although they appear like Yellow Fairy Cups (*Bisporella citrina*) they are much more irregular in form (Kuo, 2021, b).



Common Earthball (*Scleroderma citrinum*)

This is a poisonous puffball fungus species. It is distinctive from other puffballs due to its tough, scaled skin and black interior. It is a mycorrhizal fungus, which means it has a symbiotic relationship with plants. In addition, it has some mycelial threads that are thick and root-like. Common Earthballs (*Scleroderma citrinum*) are the only known host of a rare parasitic Bolete called *Pseudoboletus parasiticus* (Woodland Trust, n.d.).



Short-stemmed Russula (*Russula brevipes*)

This species is edible and contains bioactive compounds that have been studied for their anti-inflammatory and anti-tumor properties. However, most people prefer it after it has been parasitized by the fungus *Hypomyces lactifluorum*. This transforms the taste of the fungus and makes it more desirable for foragers. It is also found that it is one of a few *Russula* species to be parasitized by the orchid *Limodorum abortivum*. When studying groups of Short-stemmed Russula from different geographical regions, it was found that they had developed significant genetic variation from one another. (iNaturalist, n.d., b).

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Wolf's Milk slime mold (*Lycogala epidendrum*)

Wolf's Milk (*Lycogala epidendrum*) begins pink but turns brown as it ages. It is usually found on dead logs where its food lives. This slime mold, and many others, display animal-like behavior, its plasmodial form moving towards or away from light and food (Fretwell & Starzomski, 2015).



Yellow Leg Bonnet (*Mycena epipterygia*)

This specimen was found peeking out of a decaying log. Its name refers to its long, wiry, yellow stem. It is saprobic and prefers well-decayed conifer stumps. Its cap can vary in color from greenish to brown to yellowish brown (Kuo, 2010, b).



Black Jelly Roll (*Exidia glandulosa*)

All jelly mushrooms form irregular shapes; however, Black Jelly Roll has brain-like folds, while other jelly fungi, such as Amber Jelly Fungus (*Exidia recisa*) have facets that are flattish in shape. This species prefers to grow on deciduous trees, and is differentiated from fungi such as Warlock's Butter (*Exidia nigricans*) because it is often seen growing on oaks. It is a saprobic species of fungus (First Nature, n.d., d; Kuo, 2007, b).



Amber Jelly Fungus (*Exidia recisa*)

This fungus develops in large sections that are concave in the middle and often attach at a central point, being easily separated if pulled apart. When pulled apart, one may see a small pseudostem where the fungus connects to the decaying wood. Like the previous specimen, it is saprobic and prefers oak trees, but grows on a variety of hardwoods as well, primarily branches. Jelly fungi can dehydrate fully and still regain their shape fairly quickly once rehydrated. It can be used in various dishes as it takes on flavors well (Kuo, 2018, b).



Oyster Mushroom (*Pleurotus*)

Like the previous two specimens mentioned, it is an edible fungus. They can be either parasitic or saprobic, being found as overlapping clusters on both living and dead deciduous trees. They have decurrent gills, meaning they travel down the stem. They are considered a choice edible mushrooms and are coveted by many foragers. The Pleurotus genus comes in many colors, from white to brown to gray and even pink (Emberger, 2008, c).



Trichoderma sulphureum

It is suspected that this fungal disease was growing on Black Jelly Roll (*Exidia nigricans*), as it is a parasite of Exidia species, and the shape of this specimen mimicked that of Black Jelly Roll (*Exidia nigricans*). It is a yellow fungus with a white margin (Emberger, 2008, d).



Smoked Oysterling (*Resupinatus applicatus*)

This species is a small pleurotoid fungi. They have no stipe, only a very small pseudostem. It is saprobic and grows on hardwoods. It often grows in the summer and fall, but it can be found in the winter during a warm spell. It is edible, but very small and rarely eaten (Kuo, 2009).



Coral Fungus

This specimen grew from the soil. Coral Fungi are in a variety of genuses. They can be found growing on a variety of substrates and range from tan, yellow, pink, orange, red, or purple. Despite the differences between them, what links Coral Fungi together is the unique branching pattern in which they grow. They can be difficult to identify, even to the genus level. Some are edible, like the Crown-tipped Coral fungus (*Artomyces pyxidatus*), which is fairly recognizable, and grows on decaying wood, not soil (Fecteau, 2017).



Ink Cap (*Coprinopsis*)

This is a unique fungus, because its cap goes through a process called deliquescence, where the cap completely dissolves into an inky black liquid. They do this as a spore dispersal method, but it makes them hard to study as they are short-lived mushrooms. Coprinopsis are decomposers that grow on various substrates, decomposing wood, dung, grass litter, and forest litter. Although edible, they cannot be consumed after drinking alcohol, as they block an enzyme in the body from breaking down one metabolite of alcohol, acetaldehyde. This causes disulfiram syndrome which results in a variety of symptoms such as vomiting and heart palpitations (Ultimate Mushroom, n.d.; Kuo, 2008, b).



Yellow Spot (*Nectria peziza*)

Yellow Spot (*Nectria peziza*) can grow in large clusters or isolated, ranging from a bright yellow color to orange. It can be found on a variety of surfaces, such as rotting polypores, decaying wood, dung, bark, and cloth. On top of its fruiting body, a small black dot can be seen; this is where the spores are released (NBN Atlas Partnership, n.d.).



False Turkey Tail (*Stereum ostrea*)

This is a brown fungus that is sometimes turned green by algae. It is told apart from its look-a-like Turkey Tail (*Trametes versicolor*), due to the fact that its underside is smooth and poreless. It decomposes wood and is often found on hardwoods, especially oak (Missouri Department of Conservation, n.d., a).



Giraffe Spots (*Peniophora Albobadia*)

Giraffe Spots (*Peniophora Albobadia*) is a brown fungus with a white edge. While many resupinate fungi are difficult to identify without microscopic analysis, Giraffe Spots (*Peniophora Albobadia*) are an exception due to their unique appearance. It is a saprobic fungus found mainly on twigs and branches of hardwood species (Emberger, 2008, e).



Brick Caps (*Hypholoma lateritium*)

This edible mushroom grows in large clusters. Its name yields from the red color of its caps. It is also identifiable due to its submembranous partial veil, which covers the gills until the fungus grows larger. The partial veil is similar to cobweb-like Cortinarius veils, but more membranous. It is a saprobic mushroom that decays hardwood (Kuo, 2014).



Tinder Conk (*Fomes fomentarius*)

As a parasitic or saprobic fungus, it can be found in both standing and fallen hardwoods, but seems to prefer birch and beech trees. As the name suggests, it can be used to start fires, as it burns slowly. In fact, it may have been used for this purpose for a long while, as it was one of two fungal species found carried by the Tyrolean Iceman, a 5000-year-old body discovered frozen in a glacier (First Nature, n.d., e).



Trametes elegans

This species is a highly variable polypore due to its pore surface, which can present pores or a maze-like surface, even on the same fungus. It is a white, hard fungus whose cap is bumpy to its attachment point. This species is saprobic and decays hardwoods (Kuo, 2005).




Psilopezioid

Two Psilopezioid were found in this study, but not of the same species. Psilopezioids are a category of fungi similar to Clitocyboid, in that they resemble each other but are not necessarily in the same genus. Psilopezioid fungi are shallow cups that attach directly to wood. They are brown cup fungi that are notoriously difficult to identify without microscopic analysis. When looking at the microscopic features of Psilopezioid, it's the spores used to separate species from one another. Both of these specimens grew on decaying, moist wood in a solitary group (Kuo, 2004).



Late Fall Oyster (*Sarcomyxa serotina*)

This is a unique and easily identifiable oyster mushroom due to the olive coloration of its cap and small nub-like stipe. Late Fall Oyster refers to the time of year it fruits, as it almost always fruits after the first frost. It is saprobic and grows solitarily or in groups on both conifer and deciduous trees. While edible, it has a tougher texture than other oyster mushrooms (Emberger, 2008, f).



Pholiota sp.

Pholiota are unique mushrooms, as they can be covered in thick scales all over their cap and stipe, referred to as a squamose texture. They can also be slimy, but this particular specimen was covered in these scales. They are saprobic mushrooms that grow on wood. (Kuo, 2007, c)



Artist's Fungus (*Ganoderma applanatum*)

This fungus is named after the staining properties of its underside. When damaged, the normally white underside turns brown; this staining can last for years. Many people take advantage of this characteristic and etch beautiful designs into the underside of this fungus. It can persist and grow for many years, adding new layers of tubes to its pore surface each year (Kuo, 2018, c).



Reishi (*Ganoderma sp.*)

This species of *Ganoderma* has a lacquered cap. It is believed to be a reishi mushroom, a name used to describe several species. This type of mushroom is well known for its medicinal effects. It has been used in east Asia to promote good health and prevent cancer. In fact, the name Reishi translates to 10,000-year mushroom, referring to increased longevity of life. It is a tough and woody mushroom, but can be ground into powder or steeped as tea for its effects (Missouri Department of Conservation, n.d., b).



White Green-algae Coral (*Multiclavula mucida*)

This saprobic fungus is always found growing on barkless, wet, decomposing logs covered in green algae. It is a coral fungus that is lichenized. However, it is not a true lichen due to the lack of thallus structures (Hodges, 2022). Their tips are sometimes forked, but this is not a defining characteristic (Emberger, 2008, g).



Oak Curtain Crust Fungus (*Hymenochaete rubiginosa*)

This fungus can appear in a bracket or crust forum. However, it is classified as a crust fungus. It grows on hardwoods as a saprobic fungus. As the name suggests, they are mostly found on oaks, mainly oaks that have lost their bark (First Nature, n.d., f).



Mossy Maze Polypore (*Cerrena unicolor*)

Mossy Maze Polypore (*Cerrena unicolor*) is named after the algae that often covers its cap and whitish gray pores. The pores start maze-like, and turn more toothlike as the species ages. Mossy Maze Polypore (*Cerrena unicolor*) has a very interesting relationship between the Horntail wasp (*Tremex columba*) and the Ichneumonid wasp (*Megarhyssa spp.*). The Horntail wasp gets spores from this polypore stuck in its ovipositor as it bores into wood. These spores get laid with the eggs, and quickly turn into mycelium, which serves as a food source for the Horntail. However, this fungus also releases a pheromone, which attracts Ichneumonid wasps that feed on the larva of the Horntail. It is saprobic and feeds on hardwood trees, avoiding confiners for the most part (Kuo, 2007, d).



Oyster Mushroom *(*possibly *Pleurotus nematode*)

This is a relatively large fungus that has a unique skill. It can kill bacteria and nematodes to supplement nitrogen when nutrients are low (Lee et al., 2020). This mushroom grows on hardwood primarily, but can be found on conifers. Although this specimen is suspected to be this species, physical characteristics are not always enough to distinguish this oyster mushroom from similar species. Sometimes DNA analysis and mating tests are needed to see if they are one exact species of oyster mushroom (Kuo, 2017, b). It differs from the previous oyster mushroom found in this study due to its size, cross-connected gills, hair on the stipe, and the fact that the gills do not go entirely down the stipe.



Ganoderma sp.

This specimen is a different species than other Ganoderma found in this study. These fungi are parasitic and saprobic polypores that have unique double-walled spores. They are particular about the substrate in which they grow. Although they grow on both deciduous and conifer trees, species will rarely grow on both, and will sometimes even limit themselves to one species of tree. This particular specimen did not have a lacquered cap, which is one identification feature to distinguish between species in this genus (Kuo, 2019).



Ascocoryne Cylichnium

This specimen is a small cup fungus that grows on moist, well-decayed wood. To the naked eye, it can be almost impossible to distinguish from other similar species, such as *Ascocoryne sarcoides*. Therefore, identification is uncertain. It is a saprobic fungus that grows on hardwoods and conifers in fall and winter (Kuo, 2013, c).



Split Gill (*Schizophyllum commune*)

This fungus attaches directly to wood without a stype. It is found across every continent except Antarctica. While many species without genetic flow diverge, the Split Gill (*Schizophyllum commune*) has been studied and confirmed to be the same species across all continents. This is why *commune* is in its scientific name. Although it can take a bracket form, it is most often seen as circular attached fans, with the gills radiating from the center. In prolonged dry conditions, this fungus can close its spore-producing surface until rehydrated by rain. It can dehydrate and rehydrate several times, allowing it to persist for long periods. It is saprobic and prefers to grow on dead or decaying branches rather than logs (First Nature, n.d., g).



Trembling Crust (*Merulius tremellosus*)

This fungus is saprobic and grows on dead hardwood, occasionally appearing on conifers. It is a crust fungus that spreads over wood, creating small extensions that fold over and give this fungus the appearance of deep pockets. What distinguishes this species from others is its translucent spore-producing surface, ranging from orange to pink and its irregular shape (Kuo, 2008, c).



Deadly Galerina (*Galerina marginata*)

As the name suggests, it is a poisonous species that can cause vomiting, liver damage, and death. It appears on dead conifer logs and stumps, but is sometimes found on broadleaves. It has edible lookalikes, such as the sheathed wood tuft (*Kuehneromyces mutabilis*) (First Nature, n.d., h). It is best to avoid eating fungi with poisonous look-alikes for safety. No fungus should be eaten unless its identification is certain. Even then, one can be allergic to edible mushrooms, so a small amount of any wild fungus should be tried before consuming large quantities.



Red Cushion Hypoxylon (*Hypoxylon fragiforme)*

This specimen appears as clusters of balls on dead wood, mainly beech. They change colors throughout their life cycle, starting gray, salmon, brick red at maturity, and finally brownish-black. Its surface is bumpy in texture. These bumps are the openings from which spores are released, and contain ascospore-forming structures. *Hypoxylon howeianum* is a similar-looking species that typically grow on trees other than beech, but both can occur on beech trees (Emberger, 2008, h).



Dead Man's Finger (*Xylaria polymorpha*)

This fungus mostly grows on fallen beech and sycamore trees, but on other hardwoods as well. They are saprobic and consume polysaccharides, which bind wood together. It gets its name from its resemblance to blackened fingers curling up around logs, but can be variable in shape, as the name *polymorpha* suggests. They are capable of both sexual and asexual reproduction. Much like Red Cushion Hypoxylon (*Hypoxylon fragiforme*) it is covered in bumps, which are spore-producing structures (First Nature, n.d., i).



Northern Cinnabar Polypore (*Trametes cinnabarina*)

This saprobic mushroom is mainly found growing on oaks, but can appear on other deciduous trees. Sometimes, it will stain wood red as it grows. Its striking orange color makes it stand out in the forest, and distinctive enough to identify easily. While it is not edible, it does show some medical promise. It has antibacterial properties and has shown antitumor effects in mice (Collins, n.d.).



Bitter Oyster (*Panellus stipticus)*

This species is small, brown, with a short stem, and saprobic. It is said to taste bitter and spicy, sometimes causing vomiting. It is widespread throughout the world. In some parts of North America, this mushroom has been known to bioluminesce, producing a greenish light in the dark (First Nature, n.d., j).



Birch Polypore (*Piptoporus betulinus*)

This saprobic fungus grows exclusively on dead birch trees. Along with Tinder Conk (*Fomes fomentariu*s), this fungus was found with the Tyrolean Iceman, showing its use dates back over 5000 years. It is an immune-boosting fungus with many other health benefits, such as anti-inflammation and easing stomach discomfort (Group, 2020). This was the largest fungus found during this project, measuring 29.5 centimeters across.



Unknown Species

Fungal Data

Data collected for all these fungi were organized in a spreadsheet, with specimen identification number, date collected, nearby tree species, substrate the mushroom grew in, fungus type, genus/species, common name, and a link to detailed descriptions about each fungus containing more information such as physical and habitat descriptions. Specimens can be studied from the fungarium, and all photos taken can be accessed from a flash drive kept with the fungarium. This project aims to be helpful not only to future researchers but those with an appreciation for fungi.

Story Map

The overwhelming amount of data and sterile format of the information sheets and spreadsheet may feel inaccessible to the general public. Sifting through pages and pages of fungal identification features and scientific names can be boring, or feel like work. Because of this, people may be discouraged from exploring this collection. I want to encourage those new to the world of fungi to easily navigate the collection, as mycophobia can be combated with information sharing. Hopefully, showcasing the amazing variety of fungi that can grow locally

will empower people to look for, and admire the fungi that grow around them. People often assume you have to look long and hard to find interesting fungi, but this is not true. Fungi were collected indiscriminately, so one can be assured that this is not a curated list of the most incredible, rarest mushrooms. Instead, it serves as a painting of what can be found in a relatively small area over a time in which fungal diversity is lower than most of the year, accompanied by pictures and fun facts.

An ArcGIS story map was used to display this information. This easy-to-navigate page contains information about the project, its purpose, a link to the spreadsheet, a link to the research paper, and an interactive map. The amount of data collected on each fungus may feel overwhelming to one unfamiliar with mycology. ArcGIS story maps can compact this information in a user-friendly way. Evidence suggests that a story map format may help enhance spatial thinking and, therefore, would be helpful to communicate where and what fungi were found in Bousson. The interactive nature of story maps makes them particularly engaging to audiences. In one study, 84% of participants rated their experience learning from a story map as excellent. Furthermore, comments on the experience were primarily positive (Cope et. al., 2018). GPS points on the map can be clicked to take one to information, facts, and pictures of each fungus. Pictures of each fungus can also be scrolled through and clicked to zoom into the point of Bousson in which it was found. The accessibility of ArcGIS StoryMaps is also practical, as the story map can be opened on a computer, tablet, or phone without the need to download software (Cope et. al., 2018). Being able to visualize what these fungi look like, familiarize oneself with interesting facts about them, and gain a real understanding of the diversity that can be found in just one forest may hopefully spark interest in the kingdom.

Link to StoryMap:
https://storymaps.arcgis.com/stories/63ea263da11b4b1780275b3ddd8b8406



Figure 3: Opening Page of Story Map

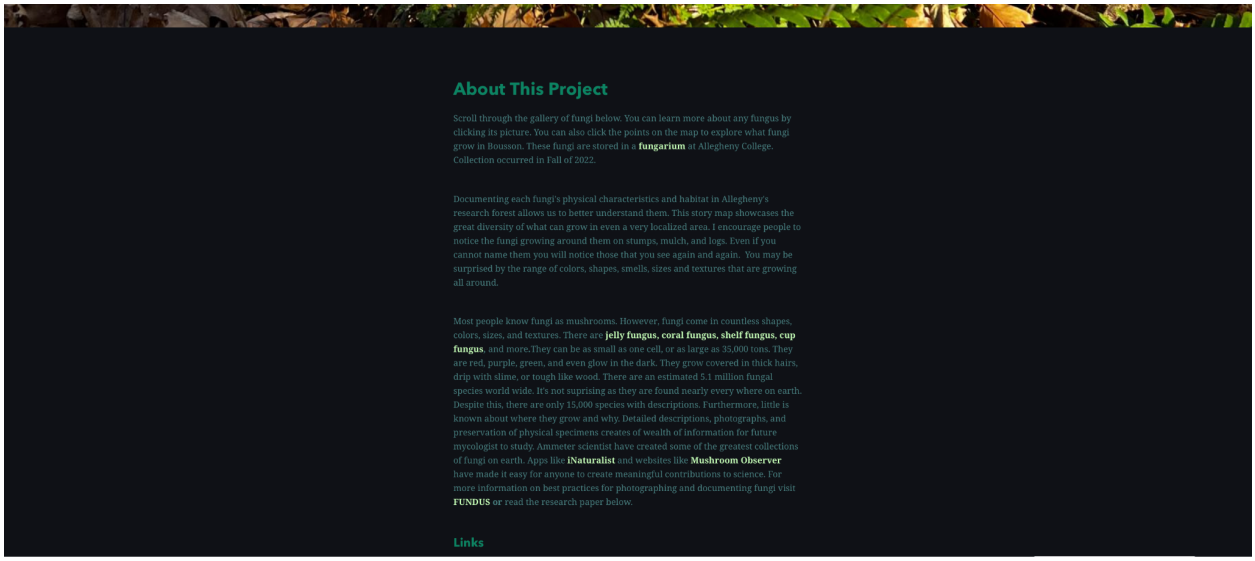

Figure 4: Information Page

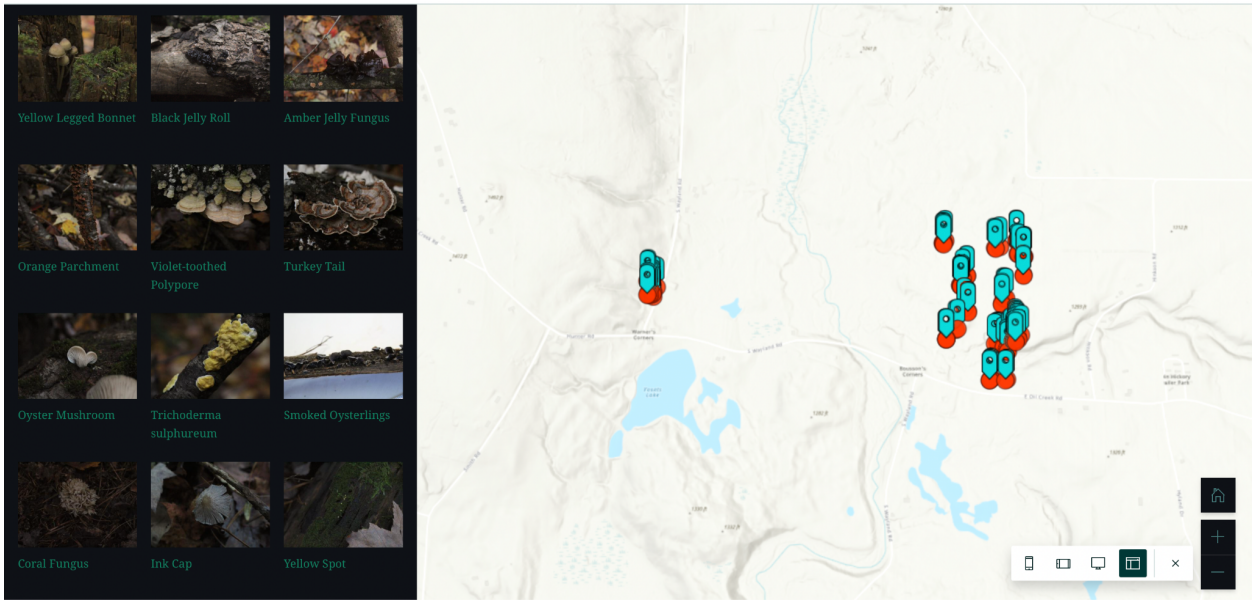

Figure 5: Image of Story Map



Figure 6: Example of an Information Page

Discussion

There is a growing fascination with mycology in recent years. Mushroom-shaped merchandise lines the shelves in stores like Joann Fabrics and Walmart. Google trends show that searches for “mushroom” have steadily risen since 2004. Common edible mushrooms such as chicken of the woods and oyster mushrooms have also seen a rise in searches over the past years.

Making information about common species found in the winter more available to the public will encourage those interested in mycology and an appreciation for fungi, but overwhelmed with the complexities of mushroom identification, to start looking in their area. People can choose to engage on a surface level, simply enjoying the pictures of what I found, or they can delve deeper and read the info sheets, displaying characteristics used in identifying fungi, such as cap shape, texture, size, and color. Those interested in foraging can learn of the amount of edible fungi found in the late fall and winter. Of course, warnings concerning being 100% sure of the identification, using multiple guides in identification, and best foraging practices are displayed on the site.

I hope my collection can uplift those interested in mushrooms but intimidated by mycology to enjoy the fungi they see. Even if they cannot identify what they have found, I hope people can enjoy the fungi in the same way they would simply appreciate a wildflower for its beauty. With more interest comes more citizen scientists, interested researchers, and more funding for fungal projects. Furthermore, I know that if future researchers wanted to look through my data, they could study a wide variety of topics in mycology with what I have collected. Whether it be DNA analysis, ecology, biology, phenology, or physiology, I have created a jumping-off point for future mycologists of Allegheny. One potential study that would be extremely valuable would be an in-depth study into the habitat types of Bousson. If a GIS map was made with this information, the map containing the GPS according to each specimen could be overlaid. This would give us great insight into the factors that affect the fungal diversity of Bousson. In the end, any additional research would be valuable as so little information is known about fungi and especially the fungi of Bousson.

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Appendix A

Specimens and their Species

Link to Spreadsheet:
https://docs.google.com/spreadsheets/d/e/2PACX-1vTuh3NZ801gvMryE0kHDniRlTtLgFDadgw-jjKg1wr-9vpWeSGvpmEvocDhJT9p7HPgqSJCaXF81_yC/pubhtml

Specimen ID	Scientific Name	Common Name
1	*Pluteus atromarginatus*	Blackedged Shield
2	*Armillaria mellea*	Honey Fungus
3	*Trametes*	
4	*Trichaptum biforme*	Violet-toothed Polypore

5	*Scutellinia scutellata*	Eyelash Cup
6	*Tremella mesenterica*	Witch's Butter
7	*Plicaturopsis crispa*	Crimped Gills
8	*Stereum complicatum*	Orange Parchment
9	*Trametes versicolor*	Turkey Tail
10	Clitocyboid sp. 1	
11	*Daedaleopsis*	
12	*Irpex lacteus*	White-toothed Polypore
13	*Poronidulus conchifer*	Little Nest Polypore
14	*Bisporella citrina*	Yellow Fairy Cups
15	*Trichia decipiens*	Eggs of Salmon
16	*Pluteus*	Deer Mushroom
17	*Hygrophoropsis aurantiaca*	False Chanterelle
18	*Mycena sp.* 1	
19	*Dacrymyces sp.*	
20	*Scleroderma citrinum*	Common Earthball
21	*Russula brevipes*	Short-stemmed Russula
22	*Lycogala epidendrum*	Wolf's Milk
23	Unknown	
24	Clitocyboid sp. 2	
25	*Mycena epipterygia*	Yellow-legged Bonnet
26	*Exidia glandulosa*	Black Jelly Roll
27	*Exidia recisa*	Amber Jelly Fungus
28	*Stereum complicatum*	Orange Parchment
29	*Trichaptum biforme*	Violet-toothed Polypore
30	*Trametes versicolor*	Turkey Tail
31	*Pleurotus*	Oyster Mushroom
32	*Trichoderma sulphureum*	
33	*Resupinatus applicatus*	Smoked Oysterling
34	Unknown Genus	Coral Fungus

35	*Coprinopsis*	Inky Cap
36	*Nectria peziza*	
37	*Tremella mesenterica*	Witch's Butter
38	*Trichaptum biforme*	Violet-toothed Polypore
39	Clitocyboid sp. 2	
40	*Stereum ostrea*	False Turkey Tail
41	*Lycogala epidendrum*	Wolf's Milk
42	*Peniophora Albobadia*	Giraffe Spots
43	*Trichaptum biforme*	Violet-toothed Polypore
44	*Dacrymyces sp.*	
45	*Hygrophoropsis aurantiaca*	False Chanterelle
46	*Stereum complicatum*	Orange Parchment
47	*Hypholoma lateritium*	Brick Cap
48	*Fomes fomentarius*	Tinder Conk
49	*Trametes elegans*	White Maze Polypore
50	Psilopezioid	
51	*Sarcomyxa serotina*	Late Fall Oyster
52	*Mycena sp.* 2	
53	*Fomes fomentarius*	Tinder Conk
54	*Mycena sp.* 3	
55	Unknown	
56	*Pholiota*	
57	*Ganoderma applanatum*	Artist's Conk
58	*Trametes versicolor*	Turkey Tail
59	*Ganoderma*	Reishi Mushroom
60	*Peniophora Albobadia*	Giraffe Spots
61	*Multiclavula mucida*	White Green-algae Coral
62	*Hymenochaete rubiginosa*	Oak Curtain Crust Fungus
63	*Scutellinia scutellata*	Eyelash Cup
64	*Cerrena unicolor*	Mossy Maze Polypore

65	*Pleurotus ostreatus*	Oyster Mushroom
66	*Ganoderma*	
67	*Sarcomyxa serotina*	Late Fall Oyster
68	*Ascocoryne Cylichnium*	
69	*Trametes versicolor*	Turkey Tail
70	*Stereum ostrea*	False Turkey Tail
71	*Schizophyllum commune*	Split Gill
72	*Merulius tremellosus*	Trembling Crust
73	*Sarcomyxa serotina*	Late Fall Oyster
74	*Galerina marginata*	Deadly Galerina
75	*Scutellinia scutellata*	Eyelash Cup
76	*Hypoxylon fragiforme*	Red Cushion Hypoxylon
77	Psilopezioid	
78	*Ascocoryne Cylichnium*	
79	*Hypholoma lateritium*	Brick Cap
80	*Lycogala epidendrum*	Wolf's Milk
81	*Bisporella citrina*	Yellow Fairy Cups
82	*Trametes elegans*	
83	*Xylaria polymorpha*	Dead Man's Finger
84	*Trametes cinnabarina*	Northern Cinnabar Polypore
85	*Trametes sp. (Possibly Trametes hirsuta)*	Hairy Bracket*
86	*Panellus stipticus*	Bitter Oyster
87	*Irpex lacteus*	White-toothed Polypore
88	*Bisporella citrina*	Yellow Fairy Cups
89	*Piptoporus betulinus*	Birch Polypore

Appendix B

Fungal Descriptions Document

Collection Date:
Collection Time:

Collector: Dan Gonzalez
Habitat
Nearby Tree Species:

Description of Understory/Canopy:

- ☐ Wood
- ☐ Soil
- ☐ Leaf

Additional Notes:

Fruiting Body

- ☐ Large Cluster
- ☐ Small Cluster
- ☐ Solitary
- ☐ Spread Apart, but Multiple Found

Type

- ☐ Mushroom
- ☐ Shelf Fungi
- ☐ Cup Fungi
- ☐ Phallic
- ☐ Jelly
- ☐ Coral
- ☐ Puffball

Size:
Before Drying:
After Drying:
Llamale Color

Llamale

- ☐ Gills
- ☐ Pores
- ☐ Teeth
- ☐ False Gills
- ☐ N/a

Pore/Teeth Size

- ☐ Large
- ☐ Medium
- ☐ Small
- ☐ N/a

Description:

Gill Attachment

- ☐ Free
- ☐ Adnexed
- ☐ Emarginate
- ☐ Sinuate
- ☐ Adnate
- ☐ Decurrent
- ☐ Subdecurrent
- ☐ Suceeding
- ☐ N/a

Gill Spacing

- ☐ Distant
- ☐ Subdistant
- ☐ Close
- ☐ Crowded

- ☐ With Lamellulae (Short & long gills)
- ☐ Ramificate (Branching)
- ☐ Anatosing (Cross connected)
- ☐ Furcate (Forked)

- ☐ Thick
- ☐ Thin
- ☐ N/a

Gill Margin

- ☐ Smooth
- ☐ Dentate (Even-sized Indents)
- ☐ Fimbriate (Same as Dentate, but shallower)
- ☐ Undulate (Wavy)
- ☐ Serrated (Unevenly Sized Indents)
- ☐ Crenate (Same as serrated but shallower)
- ☐ N/a

Cap Color

Before Drying:

After Drying:

Cap Shape

- ☐ Connate (Joined by Growth)
- ☐ Depressed

- ☐ Hemispheric
- ☐ Convex
- ☐ Plano-convex
- ☐ Plane
- ☐ Conical
- ☐ With low umbo
- ☐ With sharp umbo
- ☐ Campanulate
- ☐ Indibuliform (Funnel shape)
- ☐ Membranous
- ☐ Cylindrical
- ☐ Umbilicate
- ☐ Gibbeux
- ☐ N/a

Cap Texture

- ☐ Fibrillose (Fine silky hairs)
- ☐ Floccose (Small Cottony Scale)
- ☐ Canescent (Soft fluffy Down)
- ☐ Fine Fuzz
- ☐ Pubescent (Soft short hairs)
- ☐ Tormentose (Finely matted Hairs)
- ☐ Stringose (Coarse Bristly hairs)
- ☐ Velutinous (Velvety)
- ☐ Minutely Velutinous
- ☐ Barbate (Bearded)
- ☐ Suede
- ☐ Squamose (Thick long hairs)

- ☐ Sqamulose (Small soft scales)
- ☐ Squarrose (Erect or recurved scales)
- ☐ Felty Scales
- ☐ Appressed Scales
- ☐ Concentric scales
- ☐ Warts
- ☐ Spinose (Spiny)
- ☐ Areolate

- ☐ Rivulose
- ☐ Gelatinous

- ☐ Glutinous (Slimy & Stretchy)
- ☐ Viscid
- ☐ Ceraceous (Waxy)
- ☐ Lacunose (Pitted)
- ☐ Granulose
- ☐ Pruinose (Floury)
- ☐ Transluscent-striate
- ☐ Glandular (Small spots)
- ☐ N/a

Additional Description:

Cap Margin

- ☐ Plain
- ☐ Inrolled
- ☐ Rounded
- ☐ Revolute
- ☐ Upturned

- ☐ Smooth Entire
- ☐ Appendiculate
- ☐ Undulate (Wavy)
- ☐ Crenate (Scalloped)
- ☐ Eroded
- ☐ Striate
- ☐ Plicate
- ☐ Rimmose Fungi Margins
- ☐ Zonate (Concentrically Zoned)
- ☐ N/a

Stalk Color

- ☐ N/a

Before Drying:
After Drying:

Stalk

- ☐ Equal
- ☐ Clavate
- ☐ Bulbous
- ☐ Abruptly bulbous
- ☐ Tapered down
- ☐ Rooted
- ☐ Hollow

- ☐ N/a

Stalk Texture

- ☐ Smooth
- ☐ Scaly
- ☐ Fibrillose
- ☐ Reticulate
- ☐ N/a

Additional Description:

Universal Veil

- ☐ Remnants on Cap
- ☐ Egg
- ☐ N/a

Volva

- ☐ Membranous (Sac-like)
- ☐ Scaly
- ☐ Friable
- ☐ N/a

Partial Veil

- ☐ Descending
- ☐ Ascending
- ☐ Double Ring
- ☐ Moveable
- ☐ Booted
- ☐ Cortinarius Ring
- ☐ N/a

Mycelium Color

Spore Print

Any oozing, bruising, or other?

Additional Descriptors

Species