

# Mycophobic or Mycophilic? Use of Fungi by Ancestral Southwestern Native Americans

Ancestral  
Native Americans  
of the southwest region  
likely used fungi  
as a strategic tool,  
but not how  
we have imagined.

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The southwestern region of North America is a landscape inherently shaped by the uses and existence of Native American groups and has shaped the cultures and traditions of those who have lived here. One of the crucial strategies employed by cultures in the arid and highly variable environments of the Southwest has been an extensive and specialized use of available resources. For example, Native American groups throughout the region have an encyclopedic knowledge of plants from their medicinal properties to growth patterns. Furthermore, this knowledge has been extremely well documented in hundreds of ethnobotanical studies, historical accounts and scientific investigations.

Paradoxically, very little is known about the relationship between southwestern Native American groups and fungi that grow in the region. While this suggests ancestral Native Americans may have represented a “mycophobic” culture, recent evidence shows ancestral Native American groups of the Southwest understood the nuances of local fungi and cleverly used edible fungi to support individual health and help manage resource constraints.

While it is unclear how and to what extent Native American cultures may have used fungi in the Southwest, extant tribal groups generally are not known to incorporate them into traditional practices. While there are library shelves filled with native uses for plants and minerals for food, ritual, clothes, shelter, tools, and medicinal use, there are only a few sparse mentions of information on the Native American uses of fungi in the Southwest region.

For example, there is documentation Navajo tribal members used the spores of puffballs as a lotion when reconstituted (Wyman and Harris, 1941). And that a large variety of tribal groups used the spores as a wound dressing, by using the powdery inside as a poultice to stop bleeding or to treat burns or sores (Wyman and Harris, 1941). There are also reports that puffballs and earthstars were regularly used when severing the umbilical cord after childbirth to stop bleeding and prevent infection (Læssøe and Spooner, 1994). Burk (1983) reported that the Zuni used large quantities of puffballs, both fresh and dried for use during the winter months. However, there is no evidence that this practice was also practiced by other Native American tribes or nearby Puebloan groups, some of which believed puffballs could cause blindness (Burk, 1983).

There is also documentation that certain fungi were often used as a source of pigment or dye. Navajo tribal members have been documented as using *Endothia singularis*, a canker that grows on Gambel oak, as a source for dying (Jones, 1948). Corn smut, or *Ustilago maydis*, was also found to be used by Hopi tribal members as a black body paint (Whiting, 1966) and by Tusayan tribal members as pigment in the creation of pictographs (Fewkes, 1892).

Others have suggested the use of fungi for spiritual or entheogenic purposes. Authors of a 2010 paper sharing the discovery of *Psilocybe hopii* on the San Francisco Peaks in northern Arizona suggest the possibility of traditional or ritual-based Native American uses of the fungi (Guzmán et al., 2010).



Figure 1. *Boletus barrowsii* grows in Ponderosa pine forests in mountainous areas of the southwest. Source: M. Dechter.

While *P. hopii* is thought to have psilocybin and has a severely limited distribution on a mountain identified as sacred to over 13 native southwestern tribes, there doesn't seem to be any evidence or contemporary or historic claims that this fungus had been used by Native American tribes.

While sparse, evidence and documentation for the use of fungi for medicinal and utilitarian purposes seems more common than the use of fungi for food. Compared to other regions, southwestern native American use of fungi appears especially limited. However, early ethnobotanical studies reported that Tewa Puebloan groups in northern New Mexico ate some mushrooms without any ill effects by first boiling and then frying them (Robbins et al., 1916). Another, and likely most well-known example of southwestern tribes collecting fungi for food comes from the Taos Pueblo, who still collect the sand mushroom (*Tricholoma populinum*) among the cottonwoods of high elevation streams in the fall (Arora, 1991).

Given the diversity of edible macrofungi that can be found in the Southwest, it is unlikely that this lack of use is a result of the general lack of mushroom species and seasonal availability compared to other regions of the country. While it is true that the Southwest includes a limited season for collecting fruiting edible mushrooms, it is not much different than the limited seasons for many of the dozens of plants or plant parts collected and used as food or medicine by Native American groups. Furthermore, while the abundance and diversity of available

edible fungi may be limited in the Southwest compared to other parts of the continent, years with average or above average precipitation would still allow for the collection of adequate quantities of mushrooms that could be used for food.

The pine-fir forests of the southwestern mountains are some of the most productive habitat for edible mushroom species when there is adequate precipitation. It would seem that in years with an average or above average monsoon season many mushrooms such as boletes (*Boletus* spp.), oysters (*Pleurotus populinus* and *Pleurotus pulmonarius*), and lobster mushrooms (*Hypomyces lactifluorum*) could be used as a food source that would be available in the summer months.

These easily identified species and others could be collected during hunting, plant collection, or other activities. Mushrooms are now known to be high in protein content, contain all the essential amino acids, and are a rich source in nutrients including niacin, vitamin D, vitamin C, vitamin E, beta carotene, and a number of phytochemicals (Smith and Sullivan, 2004; Chye et al., 2008; Sadler, 2003). While not in abundance every year, edible mushrooms could have been a useful protein substitute in times where meat could be hard to find and also could be easily dried and stored for use in lean times or the winter months.

A prevailing theory for what appears to be a general lack of mushroom utilization by ancestral southwestern Native American tribal groups could be that mushrooms may have



Figure 2. Photo of corn infected with *Ustilago maydis*.  
Source: M. Hahn.

been viewed negatively either by the Native American groups themselves or by the Europeans that largely documented prehistoric habits and traditions during initial contacts with southwestern Native American groups. While the overwhelming majority of macrofungi species are thought to be beneficial and only a small percentage are known to be poisonous, many cultures have been described as mycophobic because their use of fungi is shunned, and the fungi kingdom is often a source of irrational fears (Arora, 1986). In other cultures, mushrooms are thought to be a privileged food source or ascribed high values for shamanistic or religious purposes (Mapes et al., 2002).

One reason for the apparent lack of edible or other useful fungi in ancestral and extant southwestern Native American cultures may be because these groups share a mycophobic culture. The variability of fruitings and edibility, unapparent growth and life cycle, and/or decompositional nature of mushrooms may have been a source of fear to keep tribal groups from using mushrooms for food or other purposes.

Another possibility is that Native American groups did harvest and use wild local fungi prior to European settlement, but this practice was generally not recorded in early accounts as a result of a persistent and comprehensive dislike and mistrust of mushrooms and other fungi by early European visitors. This theory of cultural bias has been suggested by others (Arora, 1991; Richards, 1997); but seems unlikely given the paucity of contemporary mushroom-related traditional knowledge in the Southwest compared to other areas in the West (Richards,

1997; Anderson and Lake, 2013). In addition, not all early studies can be found culpable of the general disinterest in fungi of those recording Native American traditional knowledge. For example, there are early ethnobotanical surveys that do record the traditional use of some mushroom species along with those of other plants and natural materials (Wyman and Harris, 1941; Robbins et al., 1916).

This is also seen in early ethnobotanical studies identifying the use of corn smut, *Ustilago maydis*, or huitlacoche both as part of historic Native American diets, traditional uses, and for limited medicinal use. In 1926, Frank Boas recorded a story from the Cochiti Pueblo in New Mexico that urged women grinding corn not to discard ears affected with corn smut so the corn would grow fat (Dahl, 2009). As recent as the 1980s, corn smut has also been documented for use both as a food delicacy and for traditional games by Hopi tribal members (Kavena, 1980; Dahl, 2009). In addition to these, there has been scarce but affirmative evidence of eating corn smut among the Navajo, Western Apache, Pima, and Zuni tribes (Dahl, 2009).

This documentation of the use of corn smut by historic and contemporary southwestern tribal groups does suggest its presence in lives of historic and possibly prehistoric tribal groups in the region. Recent evidence, however, suggests that corn smut was not just an occasionally used resource, but a crucial tool of both prehistoric and historic populations. Recent studies of fossilized human feces from different prehistoric time periods ranging from 400 B.C. to 1300 A.D. tell of numerous tribal groups throughout the Southwest

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**Figure 3. Corn cobs from a prehistoric cliff dwelling in central Arizona. Source: M. Dechter.**

heavily utilizing corn smut to a greater extent than previously understood. Electronic microscopy of Native American coprolites at prehistoric Native American sites from 400 B.C. to 400 A.D. and additional studies from 1000 to 1300 A.D. at well-preserved caves in both Arizona and Utah have shown corn smut was a major component of the diet of southwestern Native Americans for hundreds of years (Battillo, 2018; Hertz, 2022).

Ancestral Native American groups of the Southwest largely depended on agriculture for food. Previous studies have found that both early ancestral groups in the Southwest and later Pueblo peoples depended on corn for an estimated 60–80% of their caloric intake (Battillo, 2018; Bellorado, 2011). Without beans, and without a regular supply of meat to complement the low-quality protein in corn, early prehistoric groups depended on other sources of protein and amino acids including lysine, niacin, and tryptophan (Matson, 2016). New technologies such as boiling corn with limestone or wood ash resulted in the alkalization of corn to increase the digestibility of niacin and tryptophan, which largely prevented disease such as pellagra (Katz, 1974). However, the alkalization process is a tradeoff, by making available key amino acids, but decreasing nutrition of the corn and still lacking adequate levels of lysine or other key vitamins including A, B12, iron, and folate (Katz, 1974).

The finding of corn smut as a major food component suggests that it was widely eaten and may have been used strategically to augment the nutrient availability of their staple food. Huitlacoche amplifies the protein content of corn with estimates ranging from about 3–10% for traditional maize, and up to 19% for corn infected with corn smut (Valverde et al., 1995; Valverde et al., 2015). Furthermore, the growth of corn smut results in the production of significant amounts of lysine, an amino acid important for growth, bone development and immune system health. Combined with the other amino acids available in fresh corn, it provides the nine essential amino acids not synthesized by mammals and essential for dietary health (Battillo, 2018; Hertz, 2022).

Evidence of corn smut in the diets of early prehistoric cultures during the Basketmaker II phase (400 B.C. to 400

A.D.) were used to supplement protein and lysine, which were key limiting nutrients. The importance of these compounds is especially acute given these early populations lacked bean horticulture and ate little meat—other key sources of these nutrients (Battillo, 2018). Over a thousand years later, evidence from dietary analysis shows corn smut still heavily in use in the Southwest (Hertz, 2022). This time beans and meat, from turkey husbandry, were of greater availability for addressing dietary needs (Hertz, 2022), however corn smut likely continued to serve a valuable role in augmenting nutritional needs in coordination with the intensification of other agricultural techniques, needed to maintain and support a period of social aggregation with increasing community size and environmental change (Rautman, 2000).

Despite a scarcity of evidence of Southwestern Native American use of fungi in ethnobotanical studies, historic observations, and contemporary traditions, it is clear that corn smut was not only regularly eaten by a broad distribution of southwestern native American groups, but also may have been a key tool to address dietary needs and societal challenges. Ancestral Native Americans in the Southwest were neither mycophobic nor mycophilic. Rather than shunning or glorifying fungi, these prehistoric groups illustrated a nuanced understanding of fungi they regularly were in contact with and strategically used corn smut as a crucial tool to survive and thrive in the variable and ever-changing environments of the Southwest.

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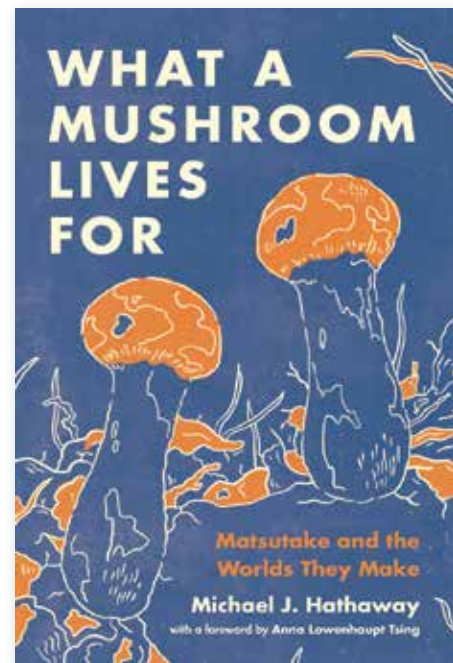
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