ONE

Wolf of the Willow

MILLIONS OF YEARS BEFORE AMERICAN BREWERS opened the taps of the craft beer revolution, a climbing plant of the *Cannabaceae* family evolved in Asia. The hop, characterized by herbaceous bines, vigorous growth, and cylindrical green cones, made its home in river bottomlands and forest margins. It grew best in temperate climates with ample spring rains to inspire rapid growth, dry summers to help stave off pests and disease, and enough of a winter freeze to allow for a period of dormancy. The plant also preferred deep, fertile soils that allowed for an extensive root system to support its ascent up trees or shrubs. If all of these conditions could be met, the perennial hop might subsist for two or three decades, with its bines growing annually each spring and then dying back to the permanent root system in the autumn.[1]

Over the course of millennia, the dioecious plant (one with two distinct sexes) set out roots in the soil and pollen in the wind. The gene pool widened as the hop successfully spread to temperate regions not just in Asia, but all over the Northern Hemisphere at approximately latitudes thirty to fifty-five degrees. Eventually, three distinct species populated the planet. Two of those, *Humulus scandens* (until recently called *Humulus japonicas)* and *Humulus yunnanensis,* remained isolated in Asia. But the most ubiquitous of the three, *Humulus lupulus L.,* or the common hop, established itself across Eurasia and found a path to North America. Still, the plant's adapting and evolving was far from over. Across all of the regions that the plant colonized—whether present-day England, Germany, Russia, or New Mexico—the hop took on variances based on climates and soil types. Local varieties evolved with different rates of growth, resistances to diseases, and, most noticeably, unique shapes, sizes, and colors of cones.[2]

In many ways, the hop's early story unfolded like countless others during the angiosperm revolution, a period that began over a hundred million years

ago when flowering plants repopulated a world of conifers, moss, and ferns. It was a time when nature embellished the earth with the botanical biodiversity with which we are more familiar today. To survive, all plants confronted an evolutionary path rife with geologic and climactic change, not to mention competition among other species. Taking a moment to consider *Humulus lupulus L.* as part of that grand narrative is worthwhile. Envision how the plant interacted with its environments and how it tested new ones as it traveled the world. How did the common hop entangle itself in unfamiliar places in the face of shifting continents and floods, droughts, and competition from other flora and fauna? Why did it succeed? When did it fail, and why? Scientists and archeologists have mapped out some answers, including the expansion and contraction of populations as the earth warmed and cooled.[3] Fossil records and DNA help in this task, and the plants provide clues about their past via the places they inhabit and in the physical manifestations of their evolution (whether color, size, shape, or fragrance). But most of our understanding of the hop's evolution and movement across land and sea, the trial and error, remains to the imagination.

While the details of the distant past may seem a far-off place to begin this book, knowledge of deep time provides an essential backdrop for understanding what unfolded much later in the far west of North America. Plants have much older stories than do humans. They simply lack an easy way of telling them. The fibers that make up the fabrics we wear and materials from which we build our homes, as well as the foods and drinks we consume, all have long, intricate histories. At the very least, even if we lack clarity of the day-to-day details throughout the millions of years that those plants carried forth, it is worth acknowledging that they all have a long and complex past. Perhaps all plants should be revered simply for the fact that they have persisted and continue to do so as human populations have expanded in the past millennia. Of course, the common hop deserves particular distinction among all of those botanical stories: for it was the plant that evolved and modified to become the chosen ingredient to flavor and preserve beer.

A deep-time overview of the hop is useful for several other reasons. It is important to know that the first brewers to add hops to their vats used varieties that had adapted to their regional environments. Those hops that evolved with different physical characteristics also had different flavors and aromas. The hop's distant past helps us understand how and why agriculturalists developed specific cultivation methods. In simple terms, farmers have long sought to replicate and improve on the growing conditions of wild plants.

Such activities required individuals to study when hop shoots emerged from the soil and latched themselves onto trees and shrubs; it required cultivators to test which soils the hop would grow best in and how to provide the nutrients that the plants needed to achieve an abundance of cones each harvest. Farmers also studied the length of growing seasons and harvest times in accordance with their local environment. This botanical and evolutionary knowledge has been gathered and passed down through generations, and it remains vital to successful hop raising in the twenty-first century. But this is getting ahead of the story.

For most of its existence, *Humulus lupulus L.* carried forth in a world absent of extensive human interaction. That changed in the last fifty thousand years when *Homo sapiens* reached a stasis of behavioral modernity, or took on the physical and mental traits with which we are familiar today. Although evidence is sparse, it is likely that even long before agricultural revolutions around the world and the rise of sedentary civilizations, people discovered various uses for wild hops. Gatherers of the plant used bines for twine and the tender shoots for food. Perhaps, most prominently, they used the cones for medicines, believing in the plant's power to heal a variety of ailments ranging from insomnia to digestive issues.[4] Undoubtedly, someone somewhere tried to eat hop cones right off of the plant. As similarly curious people find today, a taste of raw hops offers a bitter and unpleasant experience. Amid this process of human botanical discovery, the marriage of hops and beer was still far off because beer making arose much later in the course of human civilization. And even then, hops were a relatively late addition to the brewer's trade.

THE MARRIAGE OF HOPS AND BEER

The discovery of all forms of alcohol, including beer, coincided with various agricultural revolutions that unfolded across the world around eight thousand to fifteen thousand years ago, when nomadic hunting and gathering societies transitioned to sedentary farming civilizations. Most archeologists attribute the transition to a warming climate that allowed for the raising of plants and stock animals after the cold Pleistocene epoch transitioned into the warmer Holocene.[5] Others embellish that story by suggesting that alcohol proved the motivating factor in this process, because people around the world discovered the intoxicating delights of fermented grains, fruits, and

honey and wanted to reproduce them with regularity. Whatever the truth of these origins, it is vital to know that brewing and distilling knowledge matured over time in tangent with agricultural expansion.[6]

The world's first beer makers discovered their craft in Mesopotamia quite accidently when they found that baked grain left to the elements might create an inebriating substance. The Sumerians get credit for the culinary innovation, since they were the first to replicate the process on their own terms. Eventually, the ancient brewers added water to the sweet grainy substance and flavored the malty beverage with dates or honey. The beer-making process took time to develop and perfect. But it is clear the Sumerians achieved incredible success. They even preserved a recipe for beer in the Hymn for Ninkasi, named after their goddess of the beverage. As one historian noted, the hymn, captured in writing around six thousand years ago, provided an expansive overview of the brewing process, from the gathering and treatment of grain to the types of vessels used in transferring and storing the delightful liquid.[7] Over time, the knowledge of brewing passed through generations of empires, from the Babylonians to the Egyptians, to the Greeks, and to the Romans. While the Greeks and Romans always preferred wine, they developed a brewing culture and spread it to the rest of Europe, which became the beer-making center of the world.[8] This is not to say that other regions of the globe missed out in establishing independent beer cultures. Around six thousand to eight thousand years ago beer brewing emerged in what is present-day Iran and Latin America. However, those regions would not have the same global influence as Europe on the history of beer.[9]

Throughout the course of thousands of years, the brewing process has remained simple and relatively similar. Brewers boil malted grain (most commonly, barley, wheat, or rye in the modern era) with water and, sometimes, lesser ingredients of one sort or another to add flavor. After cooling off that sweet concoction, called the *wort,* the brewer pitches yeast—a live culture that sets about digesting the sugars of the malted grain to create alcohol. One of the biggest differences between the first brewers and those in the more recent past is a matter of ingredients and flavor, particularly in regards to hops. The plant was not part of the original beer recipes, and its use would not be widespread in brewing until the late Middle Ages.[10]

If beer making proliferated throughout the ancient world, what did brewers use to flavor and preserve their beer if not hops? The answer is extensive. According to one scholar, they used nearly two hundred different flowers, spices, and herbs. Some of the most common ingredients added to the wort

included dandelion and heather, but the list also included peat moss, cumin, willow, and juniper. Like good cooks anywhere, early brewers experimented with available ingredients and adjusted their recipes over time. Fundamental in this quest for the best beer were locally available plants. The earliest brewing pioneers foraged the countryside around their homes to find ingredients. The results contributed a multitude of beer flavors. In part because of the absence of hops, however, these early beers (often called *gruit beers*) tasted much different from the beers we have today.[11]

According to the best available records, the Roman naturalist Pliny the Elder first documented the common hop just after the time of Jesus Christ. In *Naturalis Historia,* he noted that the ancient Europeans called the plant *lupus salictarius,* most commonly translated as the "wolf of the willow"—perhaps because its climbing bines suffocated willow trees with their rapid growth throughout the spring and summer, or perhaps because of the gnarling twisting of the vines. Even during Pliny's lifetime, when beer was common in parts of Europe, there is no documentation of hops being used in the brewing process. Instead, gatherers of wild hops continued to find uses in the bines for twine, in the shoots for food, and in the cones for medicines, as had likely been done by various civilizations for thousands of years across the Northern Hemisphere.[12]

There are debates on the exact origins, but it is generally accepted that Western Europeans first added hops to their beer in the eighth and ninth centuries. At that time, the hop provided a remarkable addition to the medieval brewer's trade. The gastronomical alchemists came to rely on the bitter alpha acids of hops (known today primarily as *humulone*, *cohumulone*, and *adhumulone*) that helped balance the sweetness of malted grains and on the essential oils that infused pleasant aromas. The soft resins of *Humulus lupulus L.,* found in the cone's inner yellow lupulin glands, also exhibited strong antibacterial activity and thereby acted as a preservative for beer. (See figure 2.) Of course, it is only in the past century that scientists have been able to explain the chemical makeup of the plant. And even now, there is still much to learn. A thousand years ago, brewers gained the knowledge by testing hops in their beers.[13]

The first generations of beer makers who used hops did not cultivate the plant. Instead, they gathered it from the wild, just as had their ancestors. Brewers in Bavaria, likely the first to use hops, found the ingredient rather easily. Wild hops grew (and still grow) abundantly in German river valleys and on the edge of forests. Brewers likely added the whole cones to their vat

FIGURE 2. Cross-section of an experimental hop variety (with lupulin glands exposed). Photo by Stephen Ausmus. Courtesy U.S. Department of Agriculture.

upon collection in the late summer and early fall. Over time, beer makers also began to dry the cones and store them for uses throughout the year. These adaptations informed future practices and provided standards.[14]

One prominent English hop expert suggested that the A.D. 736 records of a "Wendish prisoner in the Hallertau district of Germany" offer the "earliest written evidence of hop cultivation."[15] Little is known of this account, and it is uncertain why the individual began his work. Nevertheless, sources indicate that shortly after that date, Bavarian monks began planting hops. Perhaps the plant added some charm to their gardens in the summertime, with running bines climbing high and the hop cones hanging throughout. More likely, these early cultivators harvested hop cones for medicinal purposes and brewing. Hop growing spread as the plant became revered for these reasons.[16]

By the end of the ninth century, hop growing for use in beer making expanded from Bavaria to Bohemia (in the present-day Czech Republic),

Slovenia, France, and other temperate regions of continental Europe. In the early spring, growers planted rootstock in small, evenly spaced hills.[17] After shoots emerged, growers trained the bines to climb clockwise on timber posts, since the plant's botanical makeup determined that the shoots would fall off if trained otherwise. Come summer the plants matured, and by early fall hop cones adorned the plant. Families then handpicked the cones after the posts and their attached bines had been laid to the ground. Success in the process, as in any other agricultural activity, depended on trial and error. Hop growers searched for and discovered better ways to encourage growth and productivity, whether those were improvements in training bines or methods of fertilization. Intercontinental travelers helped the agriculturalists by spreading both knowledge and plant material in efforts to improve cultivation. That cascading process continued over generations and would significantly improve hop farming.[18]

The most important activity in early hop agriculture pertained to the selection of hops for planting. Early horticulturalists found that the hop did not breed true from its seed, but rather from its rhizomes, or underground stems that send shoots above the soil. This is not an uncommon agricultural phenomenon; many fruit trees behave similarly. Local geography, or *terroir*—the term used in viticulture to describe the environmental features in which specific grapes grow and which impart unique tastes—proved essential. Although the common hop could be found across Europe, individual regions had unique plants that had adapted to distinctive climates, elevations, and soils. Such variations are called *landraces.* Beer makers and agriculturalists selected the hardiest and most productive of these, as well as those that offered the best qualities in flavoring and preserving beer. Along with the use of local grains and yeasts, the hop selection contributed to regionally specific beers. The first German hops under cultivation included the Hallertauer and Spalter, and the first in Bohemia was the Saazer—all named from the region in which they grew (i.e., Hallertau, Spalt, and Saaz, respectively). These hops have been long considered the world's finest, particularly because of their pleasant, aromatic attributes. For that reason they have been deemed "noble hops." All of the noble aroma varieties are as revered in the early twentieth-first century as they were in the era of the Crusades.[19]

Around one thousand years ago, the hop began an accelerated period of territorial expansion, unlike anything in its deep past. People began to transport the plant by rhizome cuttings. Following the successful rise of hop agriculture across Bavaria, Bohemia, and surrounding regions of western and

central Europe, this practice spread to other temperate parts of the Continent. In the thirteenth century, the Hanseatic League played a crucial role in transporting hop agriculture, after the German trading organization adopted hops as the standard preservative in beer. The decision affected not only German beer makers but also those who traded with the German states.[20] While brewers in some regions relied on the importation of what they saw as the ideal German product, many began to cultivate local hops for their own supply. Hop agriculture spread to Scandinavia and Russia, and, by the sixteenth century, English brewers also embraced the hop as an essential ingredient in their brews. By 1700, English growers dedicated approximately twenty thousand acres of land to hop cultivation, largely in Kent, Sussex, Surrey, and Hampshire.[21] At that time the preferred hop variety was the Farnham Pale, later appropriated in Kent and renamed the Canterbury Whitebine. At the century's end, the Golding variety—selected from a field of Canterbury Whitebines—became the standard hop used in English beer.[22] Similar stories explain the nomenclature of hop varieties grown across the world.

In England and across Continental Europe, the expansion of hop growing coincided with the expansion of beer culture. As populations recovered from the trying years of the Black Death in the fourteenth century, the number of brewers who relied upon the hop increased. A general approach to brewing also changed. In the late Middle Ages, a major gendered transformation unfolded: the cottage industry—largely run by rural women, called *alewives*—transitioned into larger-scale urban operations run by men.[23] This significance cannot be overstated, because men dominated the history of professional brewing in the Western world from that point until the very recent past. Amid these developments, beer makers became more professional, joining brewing guilds and adhering to specific codes that included the requirement of using quality ingredients. Beer also established itself as an important part of northern European culture—namely, because the fermented beverage offered a safe alternative to polluted water supplies. Production grew as populations increased, and hop growing also expanded. Farmers began to dedicate more land to the crop, far more than could be used by a household or small community, which had been the previous practice. As a result of increased volume, large hop-trading networks emerged that funneled hops to brewers across Europe. Nuremburg and London arose as two of the largest centers of the hop trade, where formal inspectors judged hops for quality and began to offer local seals of approval. At the same time,

unique beer styles cemented themselves into European cultures, including German lagers and English ales.[24]

The professionalization of brewing and the commercialization of the hop trade created greater competition among growers to cultivate quality products and inspired more-intensified exchanges of agricultural knowledge. Universities and agricultural societies in the central hop-growing regions assisted with research that helped develop more productive cultivation methods. Nothing aided farmers more than the proliferation of print culture from the sixteenth century onward, when hop growers began publishing guides. One of the most famous of these publications was Reynolde Scot's *A Perfite Platform of a Hoppe Garden* (1574), an English treatise that provided detailed advice on the preparation, cultivation, and harvesting of hops. The written discourse outlined the nuances of preparing hills for planting, selecting timber poles, training bines clockwise for upward growth, and combating various pests and diseases. Scot also described the *oast house,* the English term for the building where growers dried their cones. He outlined the construction of the two-storied structure where growers laid hops across the top floor to dry from the heat of a kiln underneath. Finally, Scot emphasized the best ways to dry uniformly for transport.[25] His guide and similar publications played an essential role in improving hop growing for generations. The result of these works could be seen in the physical environment as Europeans planted ever more hop gardens and constructed hop dryers by the thousands. Farmers and businesspeople published similar guides in other regions and languages.

The benefits of new agricultural knowledge and increased productivity in hop growing across Europe came with its share of problems; chief among them was the strain on labor resources for the harvest. Once able to rely on family members and neighbors, hop growers came to depend on hiring seasonal help toward the end of the summer and early autumn. As hop growing became more commercialized, most European growers solved the problem by hiring a temporary pool of lower-class laborers. The workers camped for the duration of the harvest and engaged in the monotonous daily task of pulling cones from the bine. Because the work was unskilled, entire families participated, with men, women, and children of all ages earning wages according to the weight of their hauls. The harvest labor situation remained an integral aspect of hop agriculture across the world, up to the present day in some areas, always connecting the hands of agricultural workers to the brewer's gold.[26]

So what does the history of hop growing and beer making in Eurasia have to do with a relatively small agricultural valley in western Oregon?

Hops and beer have substantial origin stories across time and place. For millions of years, *Humulus lupulus L.* evolved and traveled around the world via wind and bees and the forces of nature. Then, very recently in the plant's own past, humans found a use for hops in beer making. This inspired the development of specialized agriculture. Production of knowledge and technologies centered on hops and brewing spread, and the hop plant spread physically, too, into gardens and fields across temperate Europe. In other words, hops and humans have been participants in a grand experiment of agriculture and beer that had traveled from Europe across the world in the previous thousand years, and in nature and the earth millions of years prior. The characters and events introduced are part of the Pacific Coast hop industry's global heritage, playing essential roles in the flavors and aromas that emanate in the craft beer revolution. The next section brings this story closer to home.

THE EUROPEAN BEER AND HOP DIASPORA

The hop's territorial migration accelerated once again between the sixteenth and nineteenth centuries, when Europeans introduced their brewing culture across the globe. German, British, Dutch, French, and Scandinavian immigrants hauled brewing kettles and beer recipes with them to settlements in Africa, Asia, Australia, and the Americas. Hopped beer offered colonists a significant source of calories and a reminder of home. More important, the beverage continued to be safer to drink than water from contaminated sources in colonial settlements. It should then not come as a surprise that European colonists in many areas of the world constructed breweries as some of the first buildings within forts or town sites. Along with the planting of grains, fruit orchards, and other European crops—not to mention the importation of cattle, sheep, and other nonnative animals—the process became part of the Europeanization of the globe.[27] But how did colonial brewers obtain the spice of their brew in regions distant from commercial hop production? This was a question that the Dutch would face in South Africa by the 1650s and German colonists in China during the late nineteenth century. It was the English during this period, however, who left the biggest imprint. Today's popular India pale ale (IPA) traces its roots to over two hundred

years ago, when it earned its name because of the large quantities of hops that English brewers used to preserve beer for long oceanic voyages to colonial India.[28]

The greatest expansion of British hop growing during that period occurred in North America. Records of the Massachusetts Bay Company indicate that along with hopped beer, hop plants arrived with Puritan immigrants as early as the 1620s.[29] From then on, brewing beer caught on across the colonies. Access to water and baker's yeast never proved cause for concern. Although the initial malts arrived from England because of inadequate supplies of barley in North America, that situation did not last long.[30] By the 1640s, English and Dutch settlers planted barley and other familiar grains. They also imported and planted more European hops in small plots. Some ambitious beer makers sought out American subspecies of wild hops. But those plants never won over imported domestic varieties.[31]

While it might seem strange that colonial brewers did not embrace local wild hops, they had good reason. The recipes upon which they learned their craft called for specific hops with specific profiles from their homelands. From the beginning, European beer makers complained that American hops gave off flavors and aromas that were too strong and that, in turn, altered their end product. Brewers faced the choice of importing familiar hop varieties from Europe or trying to grow European hop varieties themselves. Eventually the latter option became preferable given the expenses of importation and because colonists discovered favorable growing conditions. Not only did the temperate regions of eastern North America have climates similar to those in Europe, but they also benefited from virgin soils that had not been under intensive long-term cultivation. To their luck, colonists discovered that growing conditions in North America could produce more hops per acre than many of the hop-growing regions in Europe.[32]

Throughout the colonial era, hop raising mostly occurred at the household level, with families growing small plots for their use and possibly that of their neighbors. The most universally grown hop was probably the Farnham Pale, commonly grown in England. Over time, hop farmers turned toward a hybrid hop, called Cluster, born accidently of an English hop and a wild North American variety. The hop appeared perfect for colonial growers because it produced flavors familiar to English stock but had the benefit of genes better suited to the North American agricultural landscape. Different varieties of the Cluster that matured earlier or later in the season also developed, and the hop variety became the preeminent feature of the English ales,

stouts, and porters that Americans brewed and consumed well into the nineteenth century. While strong in flavor and alcohol content, suitable beer could now be made with ease in most American colonies.[33]

By the early 1800s, New England and New York farmers had established the first commercial hop operations in the United States.[34] Initially, growers selected native hops. As one New England farmer noted, they could be found in abundance "growing spontaneously on the banks and intervals of our large rivers."[35] Eventually the commercial farmers recognized the need to supply brewers with hops that they preferred. Along with the Cluster hops, these agricultural pioneers grew mostly English varieties, which made sense given climactic similarities and the fact that American growers found a significant portion of their buyers in the British marketplace. Yet, competition was fierce. Brewers in England and elsewhere often decried the American product as inferior. This occurred in part because of the amount of stems and leaves that producers accidently packed in with each shipment of hop cones and that serve no purpose in brewing, and in part because North American farmers had not yet mastered cultivation techniques. Both of these realities probably justified the reputation of early American hops as a substandard product. Throughout the nineteenth and early twentieth centuries, European buyers more commonly complained about taste and fragrance, claiming that American hops were "coarse," "pungent," or otherwise unpleasant and not suitable for quality beer. An 1857 report from the British House of Commons, for example, noted that American hops were "grown too rank; they are very powerful in their flavour, and very bitter; they are naturally grown of a certain quality, which cannot be changed by reason of the soil and climate being the only cause of it."[36] Official and unofficial reports of all types shared similar language well into the twentieth century.[37] Still, when prices were right or European supplies ran low, American hops served the global marketplace as an acceptable backup.

Equally prohibitive for the development of commercial hop agriculture in the United States was that fact that hop farmers did not yet have the advantage of a vibrant domestic beer market. Although New York and Philadelphia had emerged as centers of brewing during the colonial era and early republic, consumers of alcohol favored readily available corn whiskey, hard apple cider (courtesy of the likes of Johnny Appleseed), and rum made in New York and New England from imported Caribbean sugar. During this period, production of hops for the domestic beer market remained modest.[38]

But the hop industry would rapidly expand during the nineteenth century, a period when the United States transitioned into a beer-drinking

nation. Two important factors contributed to this growth. First, the 1840s and 1850s witnessed a substantial influx of German and Irish immigrants, who brought distinct beer cultures and beer-making techniques. The German brewers, importantly, brought with them a different kind of beer: lager, which won American favor for its lightness and drinkability compared with heavier ales in the English style.[39] Second, an expansive temperance movement arose by midcentury that sought to reduce the volume of alcohol consumed by Americans. As one historian notes, "During the first third of the nineteenth century the typical American drank more distilled liquor than at any other time in our history."[40] Leaders of the temperance movement, who tended to be women and Christian, equated alcohol with detriment to family and society; they fought against the stigma that the United States was a nation of drunkards. The arrival of the German lager during this time period was, perhaps, serendipitous. The temperance movement embraced lager as an alternative to more-potent kinds of booze. Immigration and temperance, it can be said, turned American alcohol consumers into lager-beer drinkers.[41]

It was under these circumstances that the Midwest, with its large German populations, became a center of American brewing. German-American brewers, including Adolphus Busch, Frederick Miller, and Frederick Pabst, successfully set up shop in Milwaukee (Miller and Pabst) and Saint Louis (Busch) just before the Civil War. Not surprisingly, states in the Midwest began commercial hop production thereafter in the hopes of catering to these emerging beer empires.[42] Many of the large German-American brewers initially shunned American hops in favor of continuing imports from Europe. But gradually they conceded that the purchase of local hops proved both cost effective and qualitatively competitive on the world market.[43] This would be an uphill battle not only because of favored European hop varieties, but also due to the perceived low quality of hops produced by American farmers, who were new to the business.

By the outbreak of the Civil War in 1861, the rise of the German-American lager altered the beer scene in the United States for brewers and consumers, and opened new opportunities for the country's farmers to grow hops. Across the country, the sparsely populated Pacific Northwest also felt the repercussions. There, south of the Columbia River in a valley drained by the Willamette River, stood the future "Hop Center of the World."