Fir and Empire

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In 1533, a mid-level official named Gong Hui published the volume *Essays on Timber Rafting in the Western Regions*, based on his experiences overseeing logging at the Ming dynasty’s southwestern frontier. In this remarkable book, Gong describes the substantial ingenuity developed by Ming logging teams to cut and transport huge trees in difficult terrain, including the use of slip roads, “flying bridges,” and massive capstans to tow logs up slopes. He also reveals the substantial perils of the mountainous region, including malaria, widespread starvation, and attacks by tribes and wild animals. But why was a Ming official cutting trees in such a distant and dangerous frontier in the first place? As this chapter explores, the southwestern frontier was one of the only places where Ming officials oversaw logging at all. Elsewhere, private plantations and timber markets were far more effective sources of wood. But the deep gorges of the southwest were among the only places in the empire with trees large enough for imperial construction.

If shipbuilding was a major impetus leading European empires to expand their grasp on forest resources, in China the greatest pressures on the logging frontier came from monumental architecture. The reasons for this divergence depended largely on both material and cultural difference
between the two contexts. South China’s tree plantations produced more than enough timber to supply the navy. But unlike in Europe, where monumental buildings were often built of stone, China’s imperial architecture was almost singularly dependent on a supply of exceptionally large trees. In the classical form of East Asian building, the entire mass of the upper stories rests on a framework of beams and pillars (liangzhu), an architectural style that literally places great weight on its structural timbers. Because timber frames set the fundamental dimensions of each building, monumental structures required monumental pillars, and monumental pillars required monumental trees. The spread of plantations that supplied timber to the shipyards came at the expense of old-growth woodlands with trees large enough for palace building. Paradoxically, this meant that the same trends that enabled a laissez-faire approach to general-purpose forestry also demanded that the state take a more direct hand in obtaining timber for the imperial palaces. It was the construction of Beijing, and its repeated reconstruction, that led to the last and greatest official logging operations in South China, projects that spelled the final decline of old-growth woodlands in the greater Yangzi River watershed.

Southwest China had long been a source of timber for imperial construction, but the early Ming logging projects in the region were unprecedented, some of the largest forced labor operations in history. Between 1406 and 1421, the Yongle emperor built Beijing into an imperial capital on an exceptional scale. State construction teams conscripted an estimated one million workers from throughout the empire to work on the palaces. This was mirrored by a comparable effort in the gorges of the upper Yangzi River, where officials ordered hundreds of thousands of loggers to cut enormous trees and tow them to the waterways. The state levied thousands of other workers to navigate the log rafts along the difficult route down the Yangzi River and up the Grand Canal to Beijing. This fifteen-year effort represented the apex of the Ming command economy.

Aside from dispatching logging teams from the Han interior, the Ming emperors demanded timber from the native rulers of the southwest. During their conquest of the region, the Yuan had enrolled non-Han tribes into native offices (tusi). Rather than regular taxes, these groups submitted tribute (gong) through their hereditary rulers. The Ming inherited and modified this system, granting nominal bureaucratic rank and regalia to tribal leaders and standardizing the forms of tribute and suzerainty. In the upper Yangzi, the standard tribute included enormous trunks of palace-grade fir
and *nanmu*. This created a rather curious exchange of symbolic materials: the Ming state sent Chinese textiles that native officials wore as proof of their rank, while native officials sent giant timbers that Chinese emperors used to construct their edifices of power.

Through a massive escalation of forced labor and tributary extractions, the Yongle palaces set a standard that future emperors struggled to match. While no record survives to document the full extent of the logging program, 380,000 timbers remained in storage in 1441, twenty years after the completion of the original construction.\(^6\) This astounding figure suggests that millions of trees were logged under Yongle’s command. But later, when temples and palaces needed repair, officials struggled to find timber of adequate size and quality to replace the massive originals; the best and most-accessible woods had already been logged. Just as significantly, later courts simply could not command labor on the scale of the Yongle emperor.

Eventually, the Ming court did revive frontier logging, its hand forced by a series of fires that damaged the most important buildings in the imperial palace. But when sixteenth-century emperors ordered new timber requisitions, their officials struggled to supply their work teams, an enterprise rendered all the more difficult as they were forced to press deeper into the mountains to find worthwhile timber. Native officials faced similar problems and repeatedly went to war over the few remaining areas of old-growth woodland. In the face of growing costs and scarcities, official logging became largely defunct in the late sixteenth century. While the early Qing emperors revived palace logging in the late 1600s and early 1700s, they had even less success. By 1700, even the deep gorges of Sichuan and Guizhou had been cleared of accessible old growth. As Aurelia Campbell shows, the depletion of old-growth woodlands even forced changes in imperial architecture, with buildings made more ornate to make up for losses in the scale and natural beauty of the structural timbers.\(^7\) These imperial logging operations marked the twilight of natural woodlands along the Yangzi River. While humans could increase the supply of smaller commodity timber, they could do nothing to speed the growth of the massive trees demanded for palace frameworks.

**TIMBER, TRIBUTE, AND FORCED LABOR**

For centuries, Chinese capitals in the north and east had imported giant timbers from the southwest. The Han government had a specialized timber
office (*muguan*) in Sichuan. The Tang cut a canal specifically to ship timber and bamboo from the southwest. The Song was no exception to this pattern: northern Sichuan was heavily logged during the eleventh-century wood crisis. Later that century, the dynasty accepted timber as tribute from southwestern tribes. Throughout this millennium, southwestern logging policies reinforced an ethnic and ecological barrier between Han merchants in the lowlands and non-Han loggers in the mountains. In fifth- and sixth-century South China, tales circulated of exchanges between Han merchants and “timber visitors” (*muke*), mysterious humanoids who could “cut fir from the high mountains” and would “trade it with men, exchanging timber for knives and axes.” Over time, this relationship was gradually formalized. For example, in 1196, the Southern Song court prohibited ethnic Chinese (Hanren) from entering the mountains in southeastern Sichuan to cut timber themselves, instructing them to “wait for the ‘barbarians’ [*man*] to bring planks and timber to the main river course to trade.” While the ethno-ecological logging frontier shifted over time, the basic pattern of exchange was astonishingly persistent. Ming sources suggest that until the 1400s, “[Han] axes could not enter” the rich forests along the tributaries of the upper Yangzi.

In the first decades of the Ming, logging continued to follow the dynamics of earlier periods. On several occasions, the court sent officials to oversee non-Han tribes in harvesting this timber for imperial construction in Nanjing. According to a stone inscription from northeastern Yunnan, in 1375 an official from Yibin County led 180 indigenous laborers to cut 140 trunks of fragrant *nanmu* for palace construction. This timber probably went to the major expansion of the inner court that started in 1378. The court designated another site in northeastern Yunnan as a state forest (*guanlin*) and had its best trees branded with the mark “imperial timber” (*huangmu*) to reserve them for court use. Yet Zhu Yuanzhang soon curtailed the construction projects as part of his broader drive toward self-sufficiency. In 1379, he even closed the primary timber yard in Nanjing, apparently intending to end construction entirely. In 1390, Zhu Chun, Zhu Yuanzhang’s eleventh son, took control of the frontier markets in Sichuan and reduced tributary requirements to a nominal amount. Following the opening of the Longjiang customs station at Nanjing in 1393, the court specified that all future building projects should rely exclusively on tariff timber and the building offices should not conduct any unnecessary logging. Yet despite nominal attempts to restrict it, tribal logging continued. In 1387, Minde, the
native prefect of Mahu, sent a shipment of fragrant nanmu timber to Nanjing.\textsuperscript{21} Zhu Chun also used logs from Sichuan to build his own estates at Chengdu.\textsuperscript{22} Despite Zhu Yuanzhang’s attempts to reduce the footprint of the state, the early Ming regime continued the trend to demand timber tribute from the southwestern gorges.

After a succession struggle following Zhu Yuanzhang’s death in 1398, power transferred to the Yongle emperor, who moved the court to his estate at Beijing in 1403 and conducted a series of massive building projects to expand the city into an imperial capital on a new scale.\textsuperscript{23} While Beijing had served as the Yuan capital Dadu, large portions had fallen to ruin in the late fourteenth century. Between 1403 and 1420, Yongle had Beijing’s walls and palaces rebuilt and expanded.\textsuperscript{24} For his monumental buildings, Yongle turned to the same forests as his father, his brother, and even earlier rulers: the great fir and nanmu trees of the upper Yangzi River gorges. In 1406, in preparation for the first wave of building projects, he sent high officials from the Board of Works to find the largest and most beautiful tree specimens in Sichuan, Jiangxi, Huguang, Zhejiang, and Shanxi.\textsuperscript{25} While the court would ultimately take timber from all of these places, supernatural influences revealed Sichuan as the prime site for imperial logging. Song Li reported that one night during his visit, several large trees fell into the river and floated downstream of their own accord. The emperor considered this a sign from the spirits and named this site Sacred Tree Mountain (Shenmu Shan).\textsuperscript{26} Whether as a continuation of historical precedent or through divine intervention, this region became the focus of the most intensive timber extraction under Yongle. In the course of building Beijing, Song Li visited Sichuan four more times. The court also sent inspecting censor Gu Zuo to provide high-level oversight, while the eunuch official Xie An spent twenty years on-site.\textsuperscript{27}

Even with giant trees located, the labor for these logging projects remained a significant issue, with officials left with a devil’s choice between dispatching Han laborers at great expense or using local non-Han populations at the risk of revolt. Stone stelae scattered through the region provide snippets of information on the scale of the effort. An inscription at Yibin County in southern Sichuan documents an effort from early 1406:

\begin{quote}
Eight hundred workers came to this place
Of steep mountain streams and treacherous roads.
Officials carefully applied their minds and we applied our strength,
[Our quota of] four hundred poles of timber was quickly fulfilled.\textsuperscript{28}
\end{quote}
The wording of this poem suggests that these laborers may have traveled to the site from the Chinese interior. In other instances, it is clear that the workers were drawn from non-Han populations. Another inscription from 1406 records that a nearby logging project was supervised by a native official, who led 110 of his subjects to tow logs to the rivers. Another stela from northeastern Sichuan also documents logging orders received in the fall of 1406. In this case a village head was dispatched to oversee the cutting and transport of ten rafts of timber (approximately eighty poles), apparently through the use of village labor. These inscriptions mark a scattered record of the massive mobilization brought on by the palace construction, which probably entailed thousands of similar logging projects throughout the west and southwest.

Logging in the upper Yangzi gorges was only the beginning of the work of transporting the logs to the capital. Even after work teams floated individual timbers out of the mountain streams and bound them into rafts, these logs still had to travel hundreds of miles to Beijing. To guide log rafts to the capital, counties along the river system designated special “imperial timber transport households” (huangmu jie hu)—rafting specialists charged with floating timber in place of other corvée. Once they reached the capital, workers piled the logs at the specially designated Sacred Timber Depot (Shenmu Chang), part of the larger transshipment complex established at Tongzhou in 1407. A bus station in Tongzhou is still named Imperial Timber Depot (Huangmu Chang), carrying a record of this legacy.

Within a few years, reports began to circulate of the difficulties experienced by loggers. In 1413, the court soundly critiqued the official overseeing logging in Shanxi for overworking the commoners and soldiers under his command. The Board of Revenue reported that logging communities were so heavily taxed that any additional demands would make them resort to selling property, wives, and children. In 1414, military loggers in Sichuan’s tribal regions reported food shortages. In 1416, another group of military lumberjacks was attacked by followers of a Daoist cult in Shanxi. But despite these difficulties, the projects continued until Yongle’s death in 1424.

**THE RETURN TO THE GORGES**

The passing of the Yongle emperor had a huge impact on all the extractive economies of the empire, and imperial logging was no exception. The year after Yongle’s death, his successor issued an edict announcing his pity for
the soldiers and corvée laborers who transported the logs—but making no mention of the tribal laborers who cut much of the timber—and ordered an end to the project. All remaining logs were stacked for future use. This was part of a broader drawdown in state extractions in the late 1420s and the 1430s that culminated in the closure of most official logging and mining projects throughout the empire. With the completion of Beijing and the closure of the Sichuan timber yards in 1424, the Ming largely refrained from large-scale logging operations for more than a century. When officials were dispatched to Huguang to collect large timber for a Nanjing palace in 1426, they soon ran into difficulties, leading the court to cancel logging and issue orders to make do with existing supplies. In 1441, the Beijing court started another round of construction to rebuild the Three Halls in the central aisle of the Forbidden City, which had burned down in 1420 and never been fully repaired. Yet there was still enough timber left over from the Yongle reign to complete these projects using materials on hand. While no complete statistical account of timber procurement exists for the early fifteenth-century operations, these retrospective accounts suggest that their scale was enormous. For much of the fifteenth century, officials preferred to economize by using existing supplies and limiting logging operations in the southwest.

Eventually, the Yongle-era supplies did run out, and the state conducted logging on and off for much of the late fifteenth century. Detailed records are not forthcoming, but we do know that there were some logging projects in the southwest, if only because they were canceled by the Hongzhi emperor (r. 1487–1505). In 1511, the Zhengde emperor sent Assistant Secretary Liu Bing to Sichuan, Huguang, and Guizhou to oversee logging, but soon canceled operations when Liu’s materials were found to be poor quality. In 1521, the Jiajing emperor went so far as to end the dispatch of soldiers to guard the Sacred Timber Depot in Beijing, suggesting that it no longer held any meaningful supplies. In 1528, a new policy required that any further repairs be approved and budgeted by the Board of Works before dispatching logging teams.

While state-overseen logging was minimal and erratic for much of the late fifteenth and early sixteenth centuries, the native officials of Sichuan and Guizhou continued to send shipments of timber according to standardized tributary mechanisms. They presented these timbers—generally the largest and highest-quality nanmu—to the Ming court in exchange for ceremonial gifts, titles, and even money. In 1484, She Lu, the female ruler of Yongning, presented a shipment of large timbers to the court and was
The rulers of nearby Youyang sent twenty poles of timber in 1512, and again in 1524. Peng Shiqi, the native official of Yongshun, sent thirty large logs and two hundred smaller ones in 1514, “personally supervising their transport to the capital” so he could present his son and heir to the court. Three years later, Shiqi sent another 470 poles of nanmu and his son also sent a shipment of unspecified quantity. After the second present, the court advanced Shiqi to a higher rank with the gift of a four-clawed serpent robe and made his son a supernumerary official. These examples, while scattered, show that there were regularized mechanisms for native officials to exchange pillar-sized logs for official titles and regalia. While these ranks were essentially nominal with regard to their placement within the official hierarchy, they clearly carried substantial symbolic power for the non-Han rulers of the southwest, as evidenced by the extreme lengths to which they went to submit timbers to the court.

The situation changed again in the mid-sixteenth century, when a series of fires damaged some of the greatest structures in the court. In 1540, lightning struck the Ming ancestral temple and it had to be rebuilt. In 1556, the Three Halls burned down again, requiring thousands of large timbers for the repairs needed to retain the scale of the original Yongle construction. The Three Halls burned yet again in 1584 and required large-scale repair. A mere two decades after ending official logging, seemingly for good, the Jiajing emperor resumed it in response to the 1540 fires, sending two high-level Board of Works officials, Pan Jian and Dai Jin, to Huguang and Sichuan to reopen logging. Repeated damage to imperial architecture in the following decades meant that Pan and Dai were followed until at least 1606 by a near-constant rotation of officials drawn from the upper ranks of the Censorate and the Board of Works.

The logging bureaucracy in the mid- to late sixteenth century was both large and complex. The highest-ranking official of each detachment was given the title “timber supervisor” (dumu) and corresponding oversight of other officials. The obituary of one such timber supervisor, vice censor-in-chief Li Xianqing, reveals the extent of this timber bureaucracy. In the 1540s, Li had command of at least twenty-two mid- and low-level officials supervising more than forty-five logging sites in Sichuan, Huguang, and Guizhou (see map 7.1). In 1556, the projects grew even larger. The court dispatched a board secretary and two assistant secretaries to oversee logging of large timber in the three southwestern provinces; two assistant secretaries to supervise logging of smaller timbers, one in the north and one in the lower Yangzi.
region; a board-level official and a bureau-level subordinate to supervise stone quarrying for building slip roads; and four censors to oversee the provisions and salaries for these substantial detachments. Two years later, the court added another board secretary, two vice secretaries, and two high-level eunuch supervisors to the timber administration, along with new regulations limiting their ability to draw salary. The number of lower-level officials and laborers presumably increased by similar proportions.

Overseeing large labor teams in a remote and dangerous frontier was enormously expensive, with frequent cost overruns. In 1556, the court required the Boards of Revenue, War, and Works to produce 300,000 taels of silver for logging expenses. That same year, Guizhou was responsible for 4,709 poles of fir and nanmu at a cost of 720,000 taels of silver, but the provincial treasury held just under 15,000 taels, or about 2 percent of what was required. Additional funds had to be disbursed from other provincial treasuries: 100,000 from Guangdong; 140,000 from Yunnan; and 90,000 from Jiangxi. Logging costs in neighboring Huguang eventually exceeded 3 million taels. The court stripped rank from a number of regional officials for failing to meet deadlines and quotas. Expenses were even worse during the 1584 reconstruction. Despite a much smaller order for 1,132 poles, Guizhou again faced the prospect of cost overruns: the treasury only had 20,000 taels, one-sixth of the estimated 100,000 required. Total expenses for the project exceeded 9 million taels.

Facing the culmination of declining stocks of old-growth timber and growing costs of supplying workers, the logging operations of the sixteenth century could not rival the productivity of the Yongle projects. The mid-century timber supervisor Li Xianqing noted that the best remaining trees were increasingly confined to woodlands far within the gorges and could only be transported to navigable waterways at great difficulty and expense. The trees were so massive and the terrain so remote that it took five hundred workers to tow each log over mountain passes (figure 7.1). Dozens of specialized metal-, wood-, and stoneworkers were needed on-site to make tools and cables and build slip roads. They built “flying bridges” (feiqiao) and capstans (tianche) to transport the logs across thousand-foot defiles and enormous hawsers to tow them up slopes (figure 7.2). Even after these efforts, many trees were unsuitable for use; perhaps 80 percent were discarded because they were hollow, and others were damaged or lost during accidents along the way. Dragging the timber to the waterways was only half the job. Even once the trees reached the rivers, log drivers had to float
them through dangerous rapids (figure 7.3). Upon reaching calmer water, workers tied them into rafts of 604 poles, joined with large quantities of bamboo to make them more buoyant. A team of forty men towed each raft until they reached deeper currents (figure 7.4), whereupon twenty or thirty
such log rafts were launched together for the three-year, 10,000-\textit{li} (approximately 3,000-kilometer) journey to Beijing.$^62$

These were far from the only difficulties facing loggers in a distant and dangerous frontier. In his \textit{Essays on Timber Rafting in the Western Regions},
Gong Hui depicts violent robberies (figure 7.5) and snake and tiger attacks (figure 7.6) among the many dangers of the region. Working in a sparsely populated mountain area also meant that labor teams had to carry their own food. Gong’s illustrations also depict workers weak from malaria (yan-zhang) or starving to the point of eating bark and grass and others captured while running away. He sums up the difficulties with a parallel phrase: “The labor force numbers in the thousands; the days number in the hundreds; the supply costs number in the tens of thousands each year.” According to another Sichuan saying, “A thousand enter the mountains, but only five hundred leave” (Ru shan yiqian chu shan wubai). In addition to hard labor, loggers in the mountainous western frontier faced dozens of environmental hazards. The sixteenth-century timber supervisor Li Xianqing expressed his doubts that palace-building timber had ever been obtained in quantity, even during the Yongle reign.

Official logging teams were not the only ones facing increased difficulties obtaining timber in the sixteenth century. Non-Han rulers continued to
supply the court with giant timber in exchange for titles and gifts. But these
native officials logged in the same regions as their peers dispatched from
Beijing, and they faced the same difficulties finding suitable trees. In 1541,
the year after lightning struck the Ming ancestral temple, Guizhou circuit
inspector Lu Jie reported that the tributary polities of Youyang, Yongshun,
and Baoqing were fighting over timber to supply the reconstruction project.
The court ordered officials to prevent the conflict from spreading through
the region.⁶⁷ The absence of further records suggests that the conflict was
suppressed. Yet these expedient measures did not eliminate the roots of the
problem—growing demand for a shrinking supply of old-growth trees—
and the next round of timber requisitions led to further escalations.

The second documented timber war started in the mid-1580s, at the height
of western logging to supply the Wanli-era reconstruction of the Three
Halls. In 1585 or 1586, Yang Yinglong, the hereditary pacification commis-

FIG 7.4 Fatigues and harms of transport. Woodcut from Essays on Timber Rafting in
the Western Regions (Xi cha huicao; 1533). Courtesy of the Library of Congress,
Chinese Rare Book Digital Collection.

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emperor and was gifted a flying fish robe, the mark of a second-rank official. An Guoheng, the ruler of the native office of Shuixi, became jealous of Yang’s growing status and also requested to send timber to the Ming court. But Guoheng’s shipment did not arrive at court. Furious, the emperor threatened to strip Guoheng of his rank unless he made up the promised tribute. Three years later, Zaiweibing, the head of the Youyang native office, sent twenty timbers valued at over thirty thousand taels and was granted the robes

FIG 7.5 Violent fires and robbery. Detail of a woodcut from Essays on Timber Rafting in the Western Regions (Xi cha huicao; 1533). Courtesy of the Library of Congress, Chinese Rare Book Digital Collection.
By 1589, the logging competition among native officials, doubtless further inflamed by other rivalries, devolved into open warfare. Yang Yinglong infuriated the court even further when he reneged on a commitment to send troops to fight Hideyoshi in Korea, one of the...
requirements of native chiefs. Eventually, Yang united several groups in an all-out rebellion that spread through large parts of the southwest. Sentenced to beheading, Yang was allowed to ransom himself in 1593 for forty thousand taels, an astronomical fee slated for contribution toward the logging effort. But Yang reneged on this commitment, and the rebellion continued. By 1598, Yang reportedly had 140,000 troops in arms, forcing the Ming court to dispatch an even larger army to put down the rebels. Yang eventually committed suicide, his family was executed, and the Bozhou native office was eliminated, its territory integrated into nearby counties. In many ways, his death signaled the end of the timber tribute system. While Yang Yinglong’s rebellion was not just about timber, the competition to log the last and best trees was a major contributor to conflicts between native officials.

By the sixteenth century, the western old growth was in such decline that the Ming court had to supplement its timber with materials bought from southern merchants. Li Xianqing writes that officials of the 1540s oversaw logging itself in Sichuan and parts of western Hunan (du [place-name] zhi mu), but oversaw the purchase of timber (gou mu) in the rest of Huguang. Reliance on merchants increased in the late 1500s due to cost overruns. In the 1580s, two Guizhou officials, Shu Yinglong and Mao Zai, cited the recurrent nature of lumbering expenses (caimu gongfei xun zhi xing) and the tendency toward cost overruns to argue that it was impractical to resort to temporary solutions like forwarding bullion from other jurisdictions. They suggested asking merchants to quote market prices for standardized grades of timber, a practice that was by then standard in the shipyard administration. Because prices were best in Guizhou but the province had little local tax base, Shu and Mao argued that funds from other provinces should continue to be directed there to purchase timber on the market and that officials be stationed there to oversee the merchants and loggers. The reliance on timber merchants only increased thereafter.

Despite the declining yields of the late Ming, early Qing monarchs again dispatched loggers to the gorges. In 1667, almost immediately after the pacification of Sichuan, the Kangxi emperor ordered cutting in the region. While his officials reported that there were still large trees in the mountains, they failed to supply enough fir and nanmu for palace construction, and the court substituted pine from Manchuria. In 1683, Kangxi ordered another southwestern logging operation but halted it after surveys revealed the difficulty of the task. Most timber was purchased from southern merchants instead. The Yongzheng and Qianlong emperors sent further logging
expeditions in 1726 and 1750, but quickly canceled them in the face of declining yields. As in the Ming, the Qing court ordered timber to be purchased at market rates; this became the main source of imperial timber in the 1680s and the exclusive source after 1750.⁷⁷

**PEAK TIMBER**

Despite the repeated failures to provide sufficient quantities of timber, the surveys and logging operations of the 1540s, 1580s, 1660s, 1680s, and 1720s were substantial projects that demonstrated the capacities of the Ming and Qing states. Dozens of officials were dispatched to distant frontiers to oversee large labor teams. They noted in official registers (ce) the size and grade of any fir or nanmu poles and the distance between the trees and the nearest river. These surveys were forwarded to higher-level officials for planning purposes. Over the course of the sixteenth and seventeenth centuries, successive rounds of surveys gave later generations of officials a panoptic view of the western forests that allowed them to make necessary changes to the logging administration, in particular the switch to purchasing timber on the market.⁷⁸

Did the large-scale logging of the three-province frontier result in deforestation and environmental degradation?⁷⁹ The evidence for deforestation is mixed. From the early 1500s onward, officials repeatedly noted that near the main rivers the hills were bare (tongshan), a result of overcutting, and wrote that lumber teams had to push deeper into the mountains to find poles of sufficient size. The removal of old-growth fir and nanmu is further apparent when we compare the lumber yields (table 7.1). In 1441, 380,000 poles were left over from the Yongle-era logging (1406–24). Yields were substantially lower in the sixteenth century. In 1557, the Sichuan-Guizhou region yielded 15,007 poles. Logging teams cut a reported 24,601 poles in 1606. In the 1680s, they cut 4,500 poles of nanmu and a similar amount of fir in Sichuan and Guizhou; officials remarked that this was only one-third of the earlier yield and that only one-tenth of the nanmu and one-fifth of the fir were considered adequate for use. The 1727 requisitions obtained only 1,044 suitable poles of nanmu. A low was reached in 1750, when the yield of the logging bottomed out at a mere 144 poles.⁸⁰ According to these figures, the best yields of late Ming logging approached only 1–2 percent of early Ming operations, and mid-Qing logging obtained no more than 5 percent of the already-diminished late Ming yields.
Yet declining timber yields were not the same as total deforestation. Official reports made clear that there were still large woodlands in Sichuan in the late sixteenth century, and even in the seventeenth and eighteenth centuries. Total clearance was limited to valleys with good water access; in the deeper mountains, there were still large stands of old growth. Instead, declining timber yields reflect a fundamental shift in the nature of imperial logging. In the late 1300s and early 1400s, sparse records suggest that logging concentrated on a small region in southern Sichuan and neighboring parts of Yunnan and Guizhou. By the 1540s, officials were sent to oversee timber extraction across a much larger frontier covering Sichuan, Guizhou, and Huguang (Hunan and Hubei). Except for a few sites in central Huguang, all of these forests were logged by corvée or tribal laborers overseen by Ming officials. But by the 1680s, conscript lumbering concentrated once again on southern Sichuan, roughly the same region targeted in the early Ming (map 7.1). This suggests two progressive adaptations: in the 1500s, timber supervisors responded to shortages of large trees in southern Sichuan by expanding the logging frontier to new regions; in the late 1600s and early 1700s, their successors concentrated imperial logging where extreme topography limited commercial operations. Paradoxically, this returned them to the same sites targeted in the early Ming: the deep mountains of southern Sichuan.

While imperial logging ceased in most of the western frontier by the end of the Ming, commercial logging continued under the oversight of private landowners, private logging teams, and private merchants. In Hunan and

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**Table 7.1. Timber yields from imperial logging**

<table>
<thead>
<tr>
<th>Year(s)</th>
<th>Poles cut in the southwest</th>
<th>Poles reaching Beijing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1406–1424</td>
<td>*760,000–1,500,000 or more</td>
<td>380,000 remaining as of 1441</td>
</tr>
<tr>
<td>1557</td>
<td>15,007</td>
<td>—</td>
</tr>
<tr>
<td>1606</td>
<td>24,601</td>
<td>—</td>
</tr>
<tr>
<td>1685</td>
<td>8,559</td>
<td>1,830 suitable for use</td>
</tr>
<tr>
<td>1727</td>
<td>*5,220</td>
<td>1,044 suitable for use</td>
</tr>
<tr>
<td>1750</td>
<td>*720</td>
<td>144 suitable for use</td>
</tr>
</tbody>
</table>

_Sources_: “Timber Administration,” Yongzheng Sichuan tongzhi 16; “Timber Administration,” Daoguang Zunyi fuzhi 18; Lan, “Ming Qing shiqi de huangmu caiban.”

* Indicates an estimate based on the number of poles reaching Beijing.
Map 7.1 The Ming and Qing logging frontiers. Data from prefecture and province-level gazetteers, Ming History, and other sources. Georeferenced using TGAZ. Map layers from China Historical GIS version 6.
Hubei and along the east-flowing rivers in eastern Guizhou, the state switched to taxing the timber harvest at the market rather than in the forest. As Meng Zhang shows, the Qing reinterpreted the timber tribute as a system of licenses for wood merchants to procure materials on behalf of the state. Eastern Guizhou later became a major site for the expansion of commercial silviculture. These markets produced more than enough ordinary-size timber for most building projects without the need for direct oversight of loggers. Imperial cutting continued in the Sichuan gorges, but only to obtain timber bigger than commercial forests could provide. The decline of imperial timber yields was therefore tied to the last major period of logging in the natural growth. While some old-growth woods remained, largely in inaccessible valleys and at high altitudes, the riverward slopes of mountains were logged clear of their best timber.

The three booms in imperial logging—in the early 1400s, mid- to late 1500s, and late 1600s—were the dying gasps of the old forest system, one predicated on bountiful nature harvested by forced labor. Once the deep valleys of the far west were cleared of accessible old growth, commercial plantations were the only remaining sources of timber in the Yangzi River watershed. Outside of remote mountains and sacred groves, anthropogenic forests also accounted for the overwhelming majority of tree cover in the region. From its beginnings in western Jiangnan and Zhejiang around 1100, the revolution in forest ownership, forest oversight, and forest composition had spread west and south along the Yangzi River and its tributaries. By 1700, this transformation reached its political and environmental limits in the mountains of Sichuan and Guizhou.