

# *Metasequoia glyptostroboides*—Its Status in Central China in 1980

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After the success of the Communist revolution in 1949, China closed its boundaries to Westerners, ending collaboration between Chinese and American botanists until the 1970s. With the invitation in 1978 to a delegation of American botanists to visit the People's Republic of China, ties broken three decades earlier were renewed. After the month-long visit, the Americans in turn invited their Chinese colleagues to visit the United States the next year. During that visit plans were made for a collaborative expedition to western Hubei Province—the 1980 Sino-American Botanical Expedition—conducted under the auspices of Academia Sinica and the Botanical Society of America.\*

As members of that expedition, the authors of this report did fieldwork in western Hubei Province in the late summer and early fall of 1980. Most of their time was spent in the Shennongjia Forest District, but they also made a brief visit, October 5 to 10, to the region where *Metasequoia* still grows wild, the first foreigners to visit since 1948.

After a visit to Modaoqi to see the tree that was the source of the type specimen of *Metasequoia glyptostroboides*, they continued on to Lichuan. For the next three days, they traveled to Metasequoia Valley, three hours each way. They sought out noteworthy trees of *M. glyptostroboides* and interviewed local officials about their work in inventorying and conserving the naturally occurring trees and about their program of seed collection and propagation. This excerpt relates their observations of the condition of wild-growing *Metasequoia* and of the vegetation associated with it.

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Almost all of the naturally occurring trees of *Metasequoia* grow in the central valley of Xiaohe Commune. Since 1974 the Bureau of Forestry of Lichuan Xian [county] has maintained a staff of five people in the Commune, with one of their objectives being to measure each tree every four years. The Forest Bureau has counted and numbered 5,420 trees with a diameter (at breast height) of at least

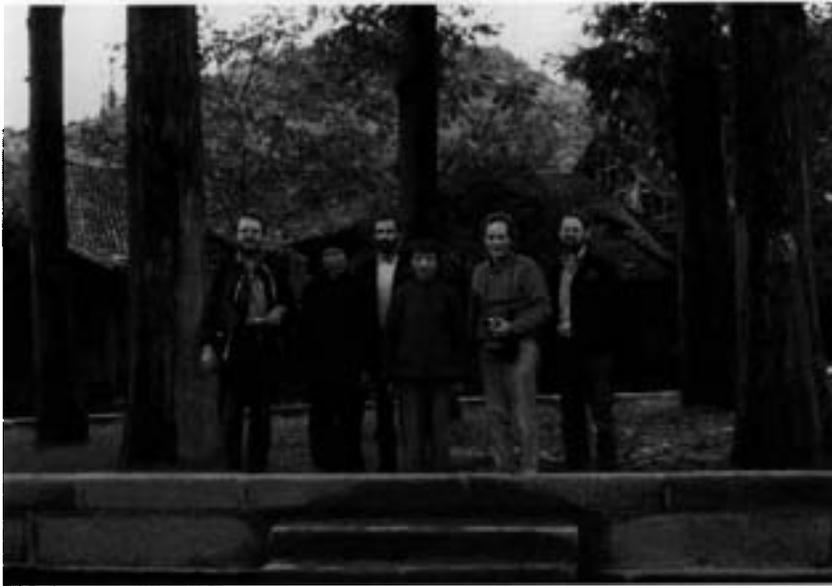
20 centimeters [8 inches]. We were told that approximately 1,700 to 1,800 of these are mature, seed-producing trees. The tallest recorded trees in the valley are on the east side in the vicinity of Hongshaxi: several reach a height of about 50 meters [165 feet]. . . .

In its natural habitat *Metasequoia* is now protected by the government, and not even small trees may be cut. The trees that we saw (includ-

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Excerpted from "*Metasequoia glyptostroboides*—Its Present Status in Central China," *Journal of the Arnold Arboretum* (1983) 64: 105–128.

\* Richard Howard's account of his 1978 visit to China was published in *Arnoldia* (Nov./Dec. 1978) 38(6): 218–237. See also Stephen A. Spongberg, *A Reunion of Trees* (Cambridge: Harvard University Press, 1990), 238–239.



ing the two ancient ones at Modaoqi and Xiaohe) all appeared to be in good health. However, we did not see any small seedlings. This differs from the situation in 1948, when Chu and Cooper found seedlings in thickets surrounding older *Metasequoia* trees. In 1980 vegetation was either absent around the trees of *Metasequoia*, or very closely cropped, presumably by the local people and not by animals. The lack of governmental protection of the habitat (and thus the lack of associated vegetation) probably accounts for the lack of seedling establishment.



#### The "Metasequoia Flora"

The habitat of *Metasequoia* is reminiscent of that of *Taxodium distichum* in the southeastern United States, a parallel previously drawn by Chaney. *Metasequoia* is a riparian species, and before habitation the valley floor may well have been a *Metasequoia* forest. *Metasequoia* trees that occur away from the valley floor are restricted to the moist bottoms of ravines and draws that drain into the main valley. *Taxodium* commonly occurs in flat,

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Above, participants of the 1980 expedition to western Hubei Province, Bruce Bartholomew, David Boufford, Stephen Spongberg, and James Luteyn, with two residents who remembered the 1948 visit of J. L. Gressitt to Metasequoia Valley.

Below, the type tree, near Modaoqi, looked essentially the same in 1980 as it does in photographs taken in 1948. The shrine seen at the base of the tree in photographs from 1948 had been removed, and the tree was surrounded by rice fields and a small, ditched stream. It appeared healthy and bore seed-filled cones, but it had grown only very slightly in the previous thirty years.



The oldest *Metasequoia* tree in Xiaohe Commune stands near the town of Xiaohe. A partial coring in 1977 yielded an age estimate of 420 years.

poorly drained depressions behind natural levees along slow-moving rivers. Based on this similarity of habitats, on reports of the species associated with *Metasequoia* (Chaney, Chu & Cooper, Gressitt), on [Shuiying] Hu's enumeration of the "*Metasequoia* Flora," and on our own observations, both in the southeastern United States and in the *Metasequoia* Valley in 1980, it is possible to hypothesize a past *Metasequoia* forest analogous to present-day *Taxodium distichum* forests.

Among the dominant tree species usually found with *Taxodium distichum* are *Nyssa aquatica*, *N. sylvatica* var. *biflora*, *Populus heterophylla*, *Quercus* spp., *Liquidambar styraciflua*, *Carpinus caroliniana*, *Betula nigra*, *Acer rubrum*, *Ulmus americana*, *Carya* spp., *Fraxinus* spp., and *Salix* spp. The associated shrubs include *Ilex* spp., *Viburnum* spp., *Itea*

*virginica*, *Cornus* spp., and *Lindera benzoin*. . . . While each of the species of this group has specific microhabitat requirements, all are usually found growing in close proximity to *Taxodium*.

In their list of plants growing with *Metasequoia*, Chu and Cooper included species of many of the same genera. We noted several large trees of *Liquidambar acalycina* and species of *Salix*, *Acer*, *Pterocarya*, and *Quercus* in habitats similar to those occupied by *Metasequoia*, but not on the adjacent slopes. Moreover, it seems likely that at one time the floor of the *Metasequoia* Valley was occupied by trees that were



The group was disappointed to find that the ecological conditions in *Metasequoia* Valley had changed drastically since the 1948 expeditions. The thickets in which Chu and Cooper had found seedlings and young plants had been cleared from the base of each *Metasequoia* tree. This grove of *Metasequoia glyptostroboides* is growing at the bottom of a small ravine above the main valley floor near the village of Xiaohe.



Two views of *Metasequoia* Valley. At the top is J. L. Gressitt's 1948 photograph. The slopes in the background are covered in forest, and only on the level valley floor are there fields.

Below, in a photograph taken in 1980, rice is cultivated extensively on the lower slopes as well as on the valley floor. The columnar trees along the edges of the paddies are a mixture of *Metasequoia glyptostroboides* and *Cunninghamia lanceolata*; the columnar habit has resulted from pruning the lateral branches for firewood. (This photo can be seen in color on the cover.)



The results of human habitation can be seen on the highly disturbed slopes of a side valley photographed in 1980. The upper slopes are largely denuded of native vegetation, and the lower slopes have been given over to rice paddies and cornfields. (The tree behind the building is *Ginkgo biloba*.)

tolerant of periodic flooding, could grow in poorly drained soils, and occupied more or less specific microhabitats. Among the species listed as being associated with *Metasequoia glyptostroboides* by Chu and Cooper, Gressitt, and Hu, the following grow in habitats similar to those of their American counterparts associated with *Taxodium*: *Houttuynia cordata* (in place of *Saururus cernuus* in the southeastern United States); *Populus adenopoda*; *Salix* spp.; *Pterocarya hupehensis*; *P. paliurus* and *P. stenoptera* (all in place of *Carya* spp.); *Betula*

*luminifera*; *Carpinus fargesii*; *Quercus* spp.; *Morus* sp.; *Cocculus orbiculatus*; *Ulmus multinervis*; *Lindera glauca*; *Liquidambar acalycina* (*L. formosana* in Chu and Cooper); *Ilex* spp.; *Berchemia* spp.; *Nyssa sinensis*; *Cornus controversa* and *C. macrophylla*; *Clethra fargesii*; *Styrax bodinieri* and *S. suberifolius*; *Viburnum* spp.; and *Smilax* spp. . . .

Chu and Cooper stated that *Metasequoia* appears to grow naturally only in sandy soil derived from Jurassic sandstone, and that only cultivated trees grow over limestone. They also mentioned that the valley floor is derived mainly from sandstone, providing rather strong suggestive evidence that the floor could have been occupied—and perhaps dominated—by much more extensive stands of *Metasequoia*. Additional evidence of a once more widespread *Metasequoia* forest on the valley floor is provided by several large trunks of *Metasequoia* that we saw that had recently been unearthed in the center of paddy fields far from the nearest slopes and ravines where the trees now grow. Altogether more than 200 of these trunks, many over two meters [6 1/2 feet] in diameter, have been found in the paddies along the level floodplain of the main river and side streams (T. S. Ying, pers. comm.). Also (according to Liu et al.), some of the houses in the valley were constructed of boards cut from *Metasequoia*. These houses are believed to be 200 to 300 years old

and date roughly from the time of the original settlers. . . .

The high population density [of the valley containing the main *Metasequoia* population] has resulted in considerable damage to the local vegetation. Both Chu and Cooper and Gressitt reported that the forests had largely been destroyed by the time of their visits, and even the *Metasequoia* communities showed signs of alteration due to man's activities. We found that conditions had deteriorated even more since these reports. Our observations indicate that

there has been so much human and domestic animal disturbance that there are very few plants now associated with *Metasequoia*. However, there are areas in Xiaohe Commune, particularly in side ravines and on slopes on the east side of the main valley, where secondary forests are developing. Although these areas are close to the *Metasequoia* groves, they are separated by cut-over slopes and cultivated fields from the riparian areas occupied by *Metasequoia*. Comparison of the present condition of the forests with photographs taken in 1948 shows considerable destruction during the past 32 years. We were told that many large trees, particularly *Castanea henryi* and *C. mollissima* were cut in the mid to late 1950s during the Great Leap Forward to make charcoal for smelting iron. However, no significant amount of iron was ever produced.

The protected status currently given by the government to the remaining naturally occurring trees of *Metasequoia* will probably insure their survival for the immediate future, but the lack of protection for the surrounding habitat will likely result in little, if any, natural reproduction. The thickets that Chu and Cooper mentioned as being around many of the trees are no longer there, and it was in those habitats that they reported finding seedlings and small trees of *Metasequoia*. The efforts to monitor the natural populations of *Metasequoia* may have

resulted in disturbance and clearing of other vegetation, thereby contributing to the destruction of suitable germination sites.

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Bruce Bartholomew, leader of the expedition in 1980, was then at the University of California Botanical Garden in Berkeley. Presently he is at the California Academy of Sciences. David Boufford was at the Carnegie Museum of Natural History in 1980, but soon thereafter moved to the Harvard University Herbaria. Stephen A. Spongberg, then at the Arnold Arboretum, has recently moved to Martha's Vineyard, Massachusetts, where he is director of the Polly Hill Arboretum.