

AMUR HONEYSUCKLE (*LONICERA MAACKII*; CAPRIFOLIACEAE): ITS ASCENT, DECLINE, AND FALL

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ABSTRACT

A 150-year chronology of interaction between *Lonicera maackii* and people reveals the diverse roles of arboreta, botanical gardens, and government agencies in plant introduction and eventual naturalization. The species' biology, horticultural value, and conservation use are described.

RESUMEN

Una cronología de 150 años de interacción entre *Lonicera maackii* y la gente revela los roles diversos que han tenido los arboreta, jardines botánicos, y agencias del gobierno en la introducción y eventual naturalización de esta planta. Se describe la biología de esta especie, su valor en horticultura, y su uso para conservación.

In an effort to understand how non-indigenous plants occupy new geographic areas, two processes have received the most attention: population spread as documented from herbarium records (Forcella 1985) and population growth as mediated by plant traits and community-level interactions (Mack 1985). Although most plant invasions result from accidental or intentional introduction by people, relatively little attention has been given to human cultures and the historical and extant exchange systems contributing to plant invasion. A description of these systems, when they operate with plants that eventually escape and become naturalized, may be useful for understanding rates and areal extent of the invasion process.

We present here a 150-year chronology of events that eventually led to introduction and naturalization of the eastern Asiatic shrub *Lonicera maackii* (Rupr.) Herder (Caprifoliaceae), Amur honeysuckle, in North America. Throughout most of this time *L. maackii* was highly valued in gardens and conservation plantings. However, the tendency of the species to naturalize and spread beyond points of original introduction established it as a woody "weed" of concern in eastern U.S. The documented history of interaction between Amur honeysuckle and people is both extensive and varied. The chronology given here may be of value as regulatory decisions are made about future plant introductions.

The addition of *L. maackii* to the alien flora of North America can be traced to three historical interactions between the plant and *Homo sapiens*: (1) Discover the plant, classify it, and describe it as a member of the flora of eastern Asia; (2) Introduce the plant to western horticulture for its attractive foliage, abundant flowers, and showy fruits; and (3) Use the plant to achieve conservation goals, e.g., soil stabilization and/or wildlife-habitat improvement. These three interactions contributed to widespread introduction, thus necessitating a fourth and final one: control or remove the plant from the many biotic communities that have been invaded.

AMUR HONEYSUCKLE: ITS PEREGRINATIONS

From the Pacific to Western Europe: The Russian Role

In the mid 19th century, Russian possessions in coastal eastern Asia were all north of the 55th parallel, a somewhat less than hospitable region. To extend their holdings into more favorable areas, the Russians initiated a series of southward explorations into the relatively greener pastures of Manchuria (Bretschneider 1898). This area, then "but loosely held in the feeble grasp of the Chinese government," had excellent harbors and abundant resources, including timber. Among the targets was the territory north of the Amur River and that bounded by the Amur and Ussuri rivers, the Sea of Japan, and the Korean frontier. Russia eventually annexed these lands by treaty from China in 1858 and 1860, thus extending its domain south to the latitude of present-day Vladivostok.

One of the scientific expeditions sent to explore the valley of the Amur began at Irkutsk in April 1855, returning to Irkutsk 9 months later (Bretschneider 1898). Accompanying the expedition was a naturalist, Richard Maack (1825-1886), professor in the *Gymnasium* of Irkutsk. Maack is remembered today primarily in the name of a genus of Fabaceae, *Maackia*, and in the specific epithets of several species, including one in *Lonicera*.

Among the species that Maack found along the Amur in June was the yet-to-be-described Amur honeysuckle; he made but a single collection of the plant—in the Bureja Range north of the Amur about midway between Khabarovsk and Blagoveshchensk (Maximowicz 1878; Ruprecht 1857). His specimens of woody plants from the trip were sent to St. Petersburg, where they provided the basis for part of the first publication devoted to plants of "Amurland" (Ruprecht 1857), that area on both sides of the Amur between ca. 42° and 55° north and 131° and 141° east (Maximowicz 1859). In that work the honeysuckle was described as a new species, *Xylosteum maackii*, by Ruprecht (Ruprecht 1857). Maack (1859) gave an account of his journey along the Amur; in this work is the first published illustration (at least in western literature) of Amur honeysuckle (Fig. 1). The species was soon included in Maximowicz's *Primitiae florum Amurensis* (Maximowicz



FIG. 1. The earliest drawing of Amur honeysuckle (*Lonicera maackii*) in western literature. Reproduced from Richard Maack's *Journey on the Amur* (1859).



FIG. 2. One of two earliest herbarium specimens (center of sheet) of Amur honeysuckle (*Lonicera maackii*). The collection, *Fortune A34*, was made by Robert Fortune in China in 1845, probably at Amoy, and deposited in the Herbarium of the Royal Botanic Gardens, Kew.

1859), the first flora of Amurland, written after Maximowicz's first trip (1853-1857) to eastern Asia. Five years after publication of the flora, the species was transferred to *Lonicera* as *L. maackii* (Ruprecht) Herder (Herder 1864).

Maximowicz did not see the plant in nature before he wrote *Primitiae florum Amurensis*. However, in a later expedition (1859-1864) he obtained specimens of it for St. Petersburg from five localities (Herder 1878): near the mouth of the Amur, at St. Olga Bay, and at three sites near Vladivostok.

We do not accept reports (e.g., Bretschneider 1898) that Maack "introduced" *L. maackii* to cultivation at the St. Petersburg Botanic Garden; Boom (1959), Rehder (1949b), and Wyman (1969) even date this event as "1860." We conclude that Maack did not bring seeds or living plants of *L. maackii* to the Garden from either of his trips (1855, 1859). If he had brought back such propagules, these would have produced blooming plants much earlier than 1883, the date recorded in *Gartenflora* (Regel 1884) for the first European flowering of the plant, at the St. Petersburg Garden. This beginning of the plant's ascent in western horticulture was some 24 years after Maack's last return from eastern Asia. The species comes into flower in 3 to 5—not 24—years from seed (Lorenz et al. 1989). The flowering of other eastern Asiatic woody plants raised from seeds that Maack *did* send to St. Petersburg (e.g., species of *Clematis*, *Pyrus*, *Deutzia*, and *Syringa*) was reported in the early 1860s (Bretschneider 1898).

According to Thatcher (1922), plants of *L. maackii* were introduced to St. Petersburg from Manchuria—introducer unknown—in 1880; these plants could well have been the ones that came into flower in 1883. (That seeds were the introduced propagules was maintained by Anonymous [1924].)

Regel's (1884) report of the flowering of *L. maackii* in St. Petersburg in 1883 was soon translated, abridged, and published in horticultural works in England (e.g., Anonymous 1884a, 1884b; Nicholson 1888) and the United States (Bailey 1900; Davis 1899); the authors of these reports obviously had not seen living examples of the plant. However, within a decade after the 1884 article, detailed morphological data obtainable only from *live* plants were published in Germany (Dippel 1889; Koehne 1893), indicating cultivation in that country. In 1896 at least one German nursery grew *L. maackii* (Cole, pers. comm.). The National Botanic Gardens, Glasnevin, Dublin, Ireland, purchased plants of Amur honeysuckle from the French nursery Lemoine in 1889 (Nelson, pers. comm.). The plant was cultivated at Kew in 1896 (Royal Gardens 1896), in Ukraine in 1898 (Kokhno 1986), and in the Botanical Garden in Darmstadt, Germany, in 1900 (Purpus 1900). The Purpus article contains the earliest photograph of the species known to us.

The seeds or plants for these early European introductions almost

certainly trace their source ultimately to St. Petersburg. The herbarium and garden there had long been receiving plant materials collected by Russian travellers in central and eastern Asia. Duplicates of these collections were sent to other major European botanical gardens (Bretschneider 1898). As many botanical gardens do, the one at St. Petersburg published annually a list of seeds available; *L. maackii* first appeared in the garden's list, its *Delectus seminum*, in 1887 (Hortus Botanicus Imperialis Petropolitanus 1887).

Within a few decades, Amur honeysuckle was growing in botanical gardens through much of Europe. Seeds of the plant eventually were offered in the seed lists of various European gardens for the first time in the following years: Cambridge, 1913 (Cambridge University Botanic Garden 1913); Oslo, 1917 (Universitet Botanske Have 1917); Dublin, 1919 (Royal Botanic Gardens, Dublin, 1919); Copenhagen, 1924 (Horto Universitatis Hauniensis 1924); Edinburgh, 1924 (Royal Botanic Garden, Edinburgh, 1924); Amsterdam, 1929 (Jardin Botanique de l'Université d'Amsterdam 1929); and Paris, 1931 (Muséum d'Histoire Naturelle 1931).

From the Pacific to Western Europe: The English Role

The earliest recorded observation of *L. maackii* by a European is not that of Maack but appears to be that of Robert Fortune, who in the mid 1840s collected the species in China. *Where* in China the specimen came from, either Amoy or somewhere in "northern China," has been a matter of debate. The specimen (two sheets at Kew) has but scant data: "A" and "34" (Fig. 2). Bretschneider (1894, 1898) concluded that the "A" stands for Amoy, which Fortune did indeed visit. The specimen may well have been collected in a garden because Fortune spent much time searching gardens for new plants to introduce to Europe.

Several authors (e.g., Anonymous 1929, 1934; Bean 1973; Thatcher 1922; Wilson 1929) maintained that the first introduction of *L. maackii* into Great Britain was in 1900 by E.H. Wilson; it was one of the species he collected in China during his first trip there for the James Veitch Nursery. We were, however, unable to reconcile this date and method of introduction with the statement in Bretschneider (1898) that the St. Petersburg Garden sent to the "greater botanical institutions in Europe and America, *especially to Kew*" (*italics ours*), seeds and plants and also duplicate specimens from the collections it received from central and eastern Asia. Because *L. maackii* was growing at St. Petersburg since about 1880 and was first listed in the Garden's *Delectus seminum* in 1887, we wondered why propagules of the plant had not been sent to Kew before 1900. After reading in Truelove (1917) that *L. maackii* was listed in "1894" in the Kew "*Hand-List of Trees and Shrubs*," we finally obtained a copy of that work

(date actually 1896 for volume 2, the one of concern) and found that *L. maackii* is indeed listed there (Royal Gardens 1896). We suggest that seeds from St. Petersburg were sent to Kew some time before 1896 and that the plant or plants from those seeds languished, unheralded, among their congeners in the garden. However, what might be called the "effective" introduction of *L. maackii* into Britain was apparently that in 1900 by Wilson for the Veitch nursery, which then extolled and disseminated it in Britain and elsewhere (Allan 1974). Once the Veitch propaganda machine was activated in its behalf, the plant received many notices in horticultural literature, largely favorable until recently in North America. The company exhibited specimens of Amur honeysuckle at a meeting of the Royal Horticultural Society in 1907 where they received an Award of Merit (Floral Committee 1908; see Anonymous [1915] for a drawing of *L. maackii* made from the 1907 Veitch specimens.). A similar award was bestowed on the plant in 1915 (Floral Committee 1916). Amur honeysuckle was one of the few plants to which, until that time, such a double award had been made (Truelove 1917). Early mentions of the plant in continental European periodicals include one in the Belgian *Tribune Horticole*, with a photograph supplied by Veitch (Anonymous 1909), and one in the French *Revue Horticole*, reporting introduction of the species into France apparently through the agency of Veitch (Mottet 1907). Veitch sent seeds of the plant to the United States Department of Agriculture (U.S.D.A.) as early as 1908 (U.S.D.A. 1909).

From the Pacific and Western Europe to North America

The earliest North American record of Amur honeysuckle we have located is in archives of the Dominion Arboretum, Ottawa: plants were received there in 1896 from Spaeth Nurseries in Germany (Cole, pers. comm.). The first U.S. record is in archives of the New York Botanical Garden: seeds of Amur honeysuckle from Russia were accessioned there in 1898 (Riggs, pers. comm.) (Table 1).

This first U.S. record of *L. maackii* came about through the agency of the then newly organized Section of Foreign Seed and Plant Introduction (S.P.I.) of the U.S.D.A., which was mandated to procure, propagate, and distribute new and valuable seeds and plants. In 1897 the U.S.D.A. dispatched Niels E. Hansen as an agricultural explorer to Russia in search of cold-hardy forage plants. The trip, Hansen's first for the U.S.D.A., extended from June 1897 to March 1898 (Hansen 1909; Taylor 1941). Unilaterally expanding his charge, Hansen sent about 930 accessions of forage, shrub, and tree seeds to Washington, DC, between December 1897 and June 1898 (U.S.D.A. 1899a, 1899b). Some of the seeds were delivered before facilities were ready for their storage and dissemination (Fairchild 1938).

Distribution of seeds received by the Section was started soon after they were received at Washington. One of the first recipients of seeds was the New York Botanical Garden: the "PIE" in the 1898 entry for *L. maackii* in the Garden archives indicated one of the first "Plant Introduction Experiments"—i.e., seed distributions—initiated by the S.P.I.

The seeds and plants imported by the S.P.I. were numbered consecutively starting in "Inventory No. 1," 1898. Hansen's collections are listed in the first two inventories (U.S.D.A. 1899a, 1899b). The data for number 246 in Inventory I are "*Lonicera maackii*. From Russia. Received through Prof. N.E. Hansen, December, 1897." A similar entry, dated January 1898, is number 391 in this first inventory. Seeds of Amur honeysuckle were thus among the first few hundred accessions received by the S.P.I.

The geographical origin of the seeds of *L. maackii* sent by Hansen is an intriguing mystery. According to the inventory data (U.S.D.A. 1899a, 1899b), the sources of Hansen's collections seemed to have spanned much of Russia from St. Petersburg and Odessa to the Pacific. Origins of most of the seeds, including those of Amur honeysuckle, are given in broad terms, often simply "from Russia." More exact data are given for a few species: some came from "Sea Province [now Primorski Krai or Maritime Territory], South Ussurie, Siberia" and some from "Amur." However, in spite of data indicating far eastern Russia, Hansen's 1897-1898 journey did *not* extend into that part of Asia.

The Russian segment of his journey began and ended at St. Petersburg via Tashkent, Semipalatinsk, and Omsk (Taylor 1941). Apparently the farthest east he travelled was when he visited Kuldja (or Kulja; also known as Gulja, Ining, and Yining), a Chinese city in western Sinkiang within ca. 50 miles from the Russian border. (A rather difficult-to-interpret map showing the routes of Hansen's several Asiatic trips was published in Hansen [1909]).

Even though the exact western Chinese range of *L. maackii* is uncertain, the species is not known to occur in that small portion of China visited by Hansen in 1897-1898 (Hsu and Wang 1988). The seeds he sent to Washington, then, must have come from some botanical garden, forestry station, or agricultural school/station in central or eastern Russia; he visited such establishments whenever he had the opportunity. For example, in August 1897 he was at the St. Petersburg Garden (U.S.D.A. 1899b); seeds of Amur honeysuckle certainly were available to him there from the stock maintained by the Garden for exchange.

Thinking that Hansen's seeds marked simply "from Russia" might have been obtained from St. Petersburg, we obtained a photocopy of the garden's 1899 *Delectus seminum* (the *Delectus* for 1897—the year of Hansen's visit there—and for 1898 were not available to us). The list (*Hortus Botanicus*

Imperialis Petropolitanus 1899) contains a most impressive number of entries—some 3000 of them; some of the species represented among Hansen's seeds are in the *Delectus*, but most are not. *Lonicera maackii* is there, as it is in the 1887 *Delectus*. St. Petersburg, then, could have been the source of Hansen's Amur honeysuckle seeds, but they could have come from some other locality in Russia.

After Hansen introduced Amur honeysuckle, the U.S.D.A. imported it from foreign countries and released it in the U.S. at least eight times through 1927 (Table 1). Some of the introductions were from British botanical gardens; others were collected from native habitats in Manchuria by U.S.D.A. employees. The success of this introduction effort was indicated by the fact that in 1931 Amur honeysuckle was available from at least eight commercial nurseries throughout the U.S. (Farrington 1931). The history of introduction published by the U.S.D.A. indicates that plants of the honeysuckle now naturalized throughout eastern U.S. represent a mixture of genotypes of diverse origins.

Beginning in the 1960s and culminating in five official introductions up to 1984, the U.S.D.A. Soil Conservation Service (S.C.S) sponsored a program to develop improved cultivars of Amur honeysuckle. It was hoped that these cultivars would further traditional goals of the S.C.S.: soil stabilization/reclamation and wildlife-habitat improvement. From plants already naturalized in various parts of the U.S., genotypes were selected for more abundant fruit production, propagated vegetatively, and then cultivated in seed production blocks at various plant materials centers around the country (Sharp and Belcher 1981). Seeds were made available by request. The most successful of these cultivars is 'Rem-Red' (Lorenz et al. 1989).

AMUR HONEYSUCKLE: ESCAPE AND NATURALIZATION

In the New World

The earliest hint we have located of the plant's escape in the New World is in archives of the Morton Arboretum near Chicago, which mention its weedy tendencies: "weed in arboretum since 1924, when first brought in" (Swink, pers. comm.). This early hint of the plant's decline in favor at Morton has accelerated toward a fall, the current situation there being well stated by Swink and Wilhelm (1994): "It would be difficult to exaggerate the weedy potential of this shrub." Floyd Swink has remarked to us that the spread of *L. maackii* in the arboretum is "unbelievable ... it would take a full-time worker to keep Amur honeysuckle and *Rhamnus cathartica* under control."

A host of full-time workers would be required to keep Amur honeysuckle "under control" in the Greater Cincinnati region (including far northern Kentucky) from which the plant was first reported for Ohio by E. Lucy

TABLE 1. A chronology of documented *L. maackii* introductions into North America.

Date	Seed or Plant Origin	Destination	Collector	Reference
1897	Spaeth Nurseries, Germany	Dominion Arboretum Ottawa, Canada	?	(Cole, pers. comm.)
1898	Russia	Washington, D.C.	N.E. Hansen	(U.S.D.A. 1899a)
1908	Chelsea, United Kingdom	Washington, D.C.	J. Veitch	(U.S.D.A. 1909)
1912	Kew, United Kingdom	Washington, D.C.	D. Prain	(U.S.D.A. 1913)
1913	Cambridge Botanic Garden	Washington, D.C.	R.I. Lynch	(U.S.D.A. 1914)
1916	Arnold Arboretum	Washington, D.C.	H.C. Skeels & D.W. Van Fleet	(U.S.D.A. 1921)
1921	Kew, United Kingdom	Washington, D.C.	D. Prain	(U.S.D.A. 1923)
1923	Echo and Tiehlingo, Manchuria	Washington, D.C.	A.D. Woeikoff	(U.S.D.A. 1926)
1926	Harbin, Manchuria	Washington, D.C.	P.H. Dorsett	(U.S.D.A. 1928)
1927	Shitoukhetsy, Manchuria	Washington, D.C.	I.V. Kosloff	(U.S.D.A. 1929)
1970	Maryland	New Jersey	W.C. Sharp	(U.S.D.A. 1981)
1979	United States	Mississippi	?	(U.S.D.A. 1982)
1980	Georgia	Texas	?	(U.S.D.A. 1983)
1983	Canada	North Dakota	?	(U.S.D.A. 1984)
1984	Maryland	Michigan	?	(U.S.D.A. 1985)

Braun (1961) only from Hamilton County, where it was "becoming abundant in pastures and woodlands." (As of October 1994 specimens have been collected in 34 Ohio counties [Trisel, pers. comm.]). In Greater Cincinnati the plant is now omnipresent, being by far the area's commonest shrub, native or alien. Efforts—in part thwarted by birds—are being made by various governmental agencies to eliminate the species from woodlands and other sites. The plant's establishment has been little short of phenomenal. The species is ubiquitous, and often abundant, on open slopes and in fencerows, pastures, prairies, thin woods, woodland borders, road rights-of-way, railroad yards, and waste places. When the junior author moved into his home in Alexandria (Campbell County, KY) in 1973, no Amur honeysuckle was on the property. Now hundreds of individuals are there.

We conducted a survey of selected botanical gardens and arboreta in the eastern United States and in eastern and western Canada. Although many botanists and arborists who responded noted that *L. maackii* was naturalized, the species was considered a problem weed only in the following localities: National Arboretum, DC; Morton Arboretum, IL; Butler University, IN; Bernheim Forest, KY; Matthei Botanical Gardens, MI; W.J. Beal Botanic Gardens, MI; Shaw Arboretum, MO; Morris Arboretum, PA; Core Arboretum, WV. The species may not be winter hardy at Edmonton and Montréal. Non-cultivated plants of Amur honeysuckle are currently known in at least 24 states of the eastern U.S. (Trisel and Gorchov 1994) and in Ontario (Pringle 1973).

The spread of Amur honeysuckle beyond the points of introduction is clearly facilitated by bird dispersal (Ingold and Craycraft 1983). Dirr (1990) noted that "birds deposit the seeds in old shrub borders, hedges, wasteland and before one knows it, Amur honeysuckle has taken over." Seed production is so prodigious, however, that most seeds simply fall to the soil. Such gravity dispersal, plus rainwash at least on slopes, is sufficient to allow seedling establishment at edges of existing colonies or individuals (Luken and Goessling 1995). Soil seedbanks as high as 1100 seeds/m² have been recorded (Luken and Mattimiro 1991).

Despite the published record of the plant's invasiveness, a U.S.D.A.-S.C.S. leaflet (Anonymous 1977) described Amur honeysuckle as a useful specimen plant for borders, hedges, and screens. Then followed the understatement that the species "may spread into old fields, fence rows and open woodland." Other sources (Anonymous 1980; Sharp 1970) asserted that the shrub has "no objectionable features." Amur honeysuckle is, unwisely, still recommended (Lorenz et al. 1989) and commercially available (e.g., Southmeadow Fruit Gardens 1994).

Not until the 1960s, after the shrub achieved some notoriety as a "weed" of concern in the U.S., did ecological studies of Amur honeysuckle begin. The data base on the species has been greatly augmented through research on population structure, productivity, interaction with herbivores, and community dynamics (Ingold and Craycraft 1983; Luken 1988; Luken and Goessling 1995; Williams et al. 1992). As yet, no definitive study has been undertaken to determine if invasion of Amur honeysuckle is directly linked to local changes in native floras.

Because of conservation goals calling for native species only, numerous prescriptions are now available for "control" of this species and for eliminating it from natural areas (Nyboer 1992). What is probably the nadir in the fall of Amur honeysuckle was reached in 1989 when the Illinois Department of Conservation adopted a policy mandating that no uses of the plant are acceptable in that state (Harty 1993).

In Europe

Even though *L. maackii* has been cultivated in Europe longer than in North America, we have seen no records of its naturalization or even of its weediness there. One possible explanation is that fruit production by the shrub in at least *western* Europe, especially in England, seems to be less predictable than it is in eastern North America. The original report of flowering of Amur honeysuckle in *eastern* Europe (Regel 1884) mentioned the fruit, but early *western* European accounts described flowers only—e.g., Belgium (Anonymous 1909), France (Mottet 1907), Germany (Purpus 1900; Schneider 1911), and Great Britain (Anonymous 1907a, 1907b, 1915).

An early report from Germany (Dippel 1889) noted the lack of fruit development. Not until 20 years after the species' introduction into Great Britain were the fruits described in British horticultural literature (e.g., Anonymous 1917). The fruiting habits of *L. maackii* in England were singled out for comment in two articles. The first cautioned that "no shrubby Honeysuckles can be depended on to fruit with the same constant profusion in our English climate as they do in the United States, where ... gardeners do not suffer from frosts after winter is over" (Thatcher 1922). The second mentioned that "as a fruiting shrub ... its merits are not so well known, but, apparently, in warm seasons and on certain soils it fruits abundantly and becomes a highly attractive plant in October" (Anonymous 1934). Another explanation may be the fact that *L. maackii* apparently is grown in Europe largely on estates or in botanical gardens where weediness is often simply not tolerated, any volunteer plants being quickly removed. Further, climatic differences between western Europe and eastern Asia/eastern North America may be such that potential for naturalization is suppressed.

HABITATS AND ASSOCIATED PLANTS

In Eastern Asia

In its Asiatic range, *L. maackii* occurs in "mixed forests" (North Korea; Kolbek and Kučera 1989); edges of montane deciduous forests, sometimes on calcareous rocks (Japan; Hara 1983; Iwatsuki et al. 1993); in oak- and elm-woodland (Amurland; Herder 1878; Ruprecht 1857); in xerophytic forests dominated by spinous-leaved oaks (northwestern Yunnan; Forrest 1915); in forests of *Abies delavayi*, *Picea yunnanensis* and other *Picea*, *Tsuga yunnanensis*, and species of *Acer*, *Prunus*, *Pyrus*, *Sorbus*, and *Tilia* (northwestern Yunnan; Forrest 1916); and forests of *Liriodendron chinense* (western China; Wilson 1913). In 1994 at Changbai Mountain Forest Research Station in northeastern China, the first author (JOL) found Amur honeysuckle growing exclusively in frequently disturbed floodplain forests with *Acer mono*, *Fraxinus mandschurica*, *Juglans mandshurica*, *Phellodendron amurense*, *Populus davidiana*, *Prunus padus*, *Syringa amurensis*, and *Ulmus propinqua*. In the lower elevation montane forest at Changbai, the species grew with *Larix principis*, *Quercus liaotungensis*, and *Tilia mandshurica*. According to Wang (1961) *L. maackii* was part of the undergrowth of shrubs in the "Montane-boreal Coniferous Forest of the Northeastern Province," which is characterized by *Abies holophylla*, *A. nephrolepis*, *Picea jezoensis*, *P. obovata*, and species of *Larix*, *Pinus*, and *Taxus*. Forrest (1915, 1916) and Wilson (1913) listed other woody associates in China: *Amelanchier asiatica*, *Berberis* sp., *Corylus* sp., *Crataegus cuneata*, *Deutzia* sp., *Diervilla* [Weigela] *japonica*, *Indigofera pendula*, *Ligustrum ionandrum*, *L. Henryi*, *L. ligustrina* forma *yunnanensis*, *Lonicera xerocalyx*, *Philadelphus* sp., *Rhamnus* sp., *Rosa sericea*, *Styrax hemsleyanus*, *Symplocos crataegoides*,

Viburnum tomentosum, and *Wikstroemia* sp. Woeikoff (1941) remarked on the "enormous number" of species of *Lonicera*, including *L. maackii*, "in forests and on mountains of Manchuria."

In North America

As is the case with many successful introduced species, *L. maackii* thrives in communities with histories of human disturbance. Specifically, urban or exurban forests with histories of fragmentation, cattle grazing, or wood-cutting are often heavily invaded. In such sites in northern Kentucky/southwestern Ohio *L. maackii* forms a dense understory and associates with *Acer saccharum*, *Celtis occidentalis*, *Fraxinus americana*, *Gleditsia triacanthos*, *Maclura pomifera*, *Prunus serotina*, *Quercus rubra*, *Robinia pseudoacacia*, and *Ulmus rubra* (Luken 1988, 1990; Williams et al. 1992; Yost et al. 1991). In large, closed canopy forests, *L. maackii* may be relegated to forest edges, suggesting moderate shade intolerance.

The plants are fully capable of thriving in full-sun environments. Productivity in open sites is higher than in forests (Luken 1988); open-grown plants also show strong resilience when cut repeatedly (Luken and Mattimiro 1991). Open sites heavily invaded by *L. maackii* may, after invasion, be converted to a scrub-type community. The understory in this scrub is often dominated by the grasses *Festuca arundinacea* and *Poa pratensis* and by introduced herbaceous species such as *Coronilla varia* and *Melilotus alba* (Luken and Thieret 1987; McClain and Anderson 1990).

AMUR HONEYSUCKLE IN FLORISTIC WORKS

Eastern Asia

Lonicera maackii is part of many publications on the flora of Japan, China, Korea, and far eastern Russia. The information available in these varies from mere mention in checklists to accounts with descriptions, ecological and morphological notes, and geographical data. Some works of the latter kind are, for Japan, those by Hara (1983), Iwatsuki et al. (1993), Kurata (1971), Nakai (1921b), and Ohwi (1965); for China, those by Hao (1934), Hsu and Wang (1984, 1988), Komarov (1907), and Noda (1971); for Korea, those by Kolbek and Kučera (1989), Lee (1989), and Nakai (1909, 1911, 1921a); and for Russia, those by Charkevicz (1987), Maximowicz (1878), Penkovsky (1901), Poyarkova (1958), and Vol'f (1899). The earliest reports known to us from countries in the species' range are the following: Russia (Ruprecht 1857), China (Maximowicz 1878), Japan (Maximowicz 1878), and Korea (Palibin 1898).

North America

Documentation in North American floras of the plant's travels was surprisingly slow. Examples follow.



FIG. 3. Illustration of Amur honeysuckle (*Lonicera maackii*) from Hao (1934) in *Flore illustrée du nord de la Chine* (T.-n. Liou, ed.).

Although collected in Maryland as early as 1937, Amur honeysuckle is absent from *Gray's manual of botany* (Fernald 1950) and from *The new Britton and Brown illustrated flora of the northeastern United States and adjacent Canada* (Gleason 1952). Two decades later, in the Gleason and Cronquist (1963) *Manual*, it received passing mention—"it is becoming established in

Maryland"—but was not included in the key to species of *Lonicera*. By the 1991 edition of the *Manual* (Gleason and Cronquist 1991) it had been admitted and placed in the key as a full-fledged member of the flora: "escaped and becoming naturalized in our range, as in N.Y., Md., Ky., and Oh." (The species was not listed for New York just 5 years before [Mitchell 1986], even though herbarium records for that state indicate the presence of Amur honeysuckle there as early as 1954 [Trisel and Gorchov 1994]).

Amur honeysuckle was collected as early as 1966 in Virginia (Trisel and Gorchov 1994), but it is missing from the 1981 atlas of the Virginia flora (Harvill et al. 1981). In the 1992 edition (Harvill et al. 1992) it is listed from seven counties. The plant is "taking over people's back yards" in parts of Virginia (Luken, personal observation).

Some field guides, too, have been slow in recognizing the establishment of Amur honeysuckle in North America. For example, the plant is not to be seen in Petrides' field guide (Petrides 1986) to "all" trees, shrubs, and woody vines in the northeastern and central United States and adjacent Canada.

THE SPECIES

Morphology

Known also as bush honeysuckle, tree honeysuckle, Maack's honeysuckle, or even (through misinterpretation of the specific epithet), "Maacky's" honeysuckle (Darnell 1930), Amur honeysuckle is a robust, upright, multi-stemmed, deciduous shrub that can grow to 6 m tall, with stems to 15 cm in diameter near the base, and can attain a spread of 9 m (Doney 1947). The bark of the largest stems, longitudinally fissured, is dark gray to grayish brown. Long shoots can grow as much as 1.2 m in their first year and can bear some flowers. Short shoots develop from axils of long shoots; they flower freely. The branchlets are hollow. Dark green and lightly pubescent, the leaf blades average about 7 cm long; on fast-growing shoots they may reach 15 cm. Their acuminate apex is one of the species' distinguishing features. Distinctive, too, is the early leafing out of the species before that of associated deciduous-leaved plants and the persistence of the leaves in fall, sometimes into December (a few even into January) in central U.S.

The paired, axillary flowers (Fig. 3), produced in profusion especially on short shoots, are borne on peduncles 1.5 to 5 mm long (shorter than the subtending petioles); variation in peduncle length can be seen on a single branch. Five-lobed, the calyx is 2 to 3 mm long and eventually deciduous. Like those of some other honeysuckles, the white to pink corollas, 1.7 to 2.5 cm long, are two-lipped, the upper lip four-lobed, the lower lip entire. In age, the corollas become a dull yellow, a color change seen also in certain other species of *Lonicera*, e.g., *L. japonica*, *L. morrowii*, and *L. tatarica*.

Characteristics of the flowers make Amur honeysuckle a good bee plant. Unlike those of some other species of *Lonicera*, the "corolla tubes are short enough for honey bees to work successfully, and good nectar secretion takes place in cool, damp weather as well as under hot, dry conditions" (Clark 1984).

The twinned berries, admittedly one of the glories of the species, mature in fall. Ranging in diameter from 3.8 to 8.5 mm, they are glossy, translucent red (sometimes with a slight orange cast), and \pm globose to somewhat ovoid or ellipsoid. To us they look much like red currants (*Ribes*). In mild seasons the fruits may persist, on leafless plants, until nearly Christmas in the Northern Kentucky/Cincinnati area.

The fruits of some honeysuckles have been reported to be toxic. In a study by Leveau et al. (1977) the fruits of eight species, including *L. maackii*, were found to "contain a small quantity of alkaloids, but saponosides seem to be responsible of [i.e., for] toxicity"; "immature fruits are more toxic than mature fruits" and "pericarps are much more toxic than seeds." Frohne and Pfänder (1984) suggested that, for problems to develop, about 30 fruits would have to be eaten, which is not likely to be done by people with functional taste buds—the fruits are exceedingly bitter.

A chromosome count of $2n = 18$ was published for *Lonicera maackii* var. *maackii* and for *L. maackii* var. *erubescens* (Janaki Ammal and Saunders 1953).

Horticultural Value

Its serious drawbacks in North America notwithstanding, Amur honeysuckle *is* a most handsome shrub, whether in flower or in fruit. It has been much extolled for horticultural purposes, as the following quotes attest. "Among all eastern Asiatic species [of *Lonicera*] *L. maackii* is the most beautiful" (Regel 1884). "There are few of the bush honeysuckles more beautiful than this variety" (Anonymous 1917). "... among the three best bush honeysuckles for the pleasure grounds and shrubbery borders" (Anonymous 1924). "... one of the most all-round beautiful members of an indispensable family" (Wilson 1929).

Its attractive foliage was singled out for special mention by some authors (e.g., Beezley 1939; Henry 1932; Purpus 1900). Alexander (1944) wrote that its "dark green foliage remains green until Christmas, thus rivalling some of the hollies in outdoor effect."

The fruiting habits of the plant have often been mentioned quite favorably: "Since it holds its fruit late into the winter it is a valuable addition to garden beauty when that beauty is limited" (Wilson 1925). "While nearly every other shrub is bare [*L. maackii*] stands out with its mantle of green studded with red berries strong and defiant" (Wilson 1925, 1928).

We assume that *L. maackii* has, by now, been widely distributed through-

out the temperate horticultural world, even though we made no special effort to determine in what areas it is now grown. We did note, however, that it is cultivated in Italy (Cocker 1935), Japan (Kurata 1971), and New Zealand (Cook 1949). We have seen no published hints of the plant's weediness in any area other than North America.

Taxonomy

Authorship of the binomial *Lonicera maackii* has been controversial. Most authors cite Maximowicz as having made the combination *Lonicera maackii* in *Primitiae florum Amurensis* (Maximowicz 1859), but he did not validly publish such a new combination there. The binomial *Lonicera maackii* (Rupr.) Herder was validly published in 1864 (Herder 1864).

The first infraspecific taxon within *L. maackii* was described by Rehder (1903): *L. maackii* forma *podocarpa* Franchet ex Rehder. A plant of western and central China (Sargent 1913; Schneider 1911) introduced by Wilson in 1900 (Farrington 1931), it was said to differ from the typical form as follows: "Has the ovaries, together with the bractlets, on a short, stalk-like elongation raised above the bracts which gives the impression of a somewhat abnormal form, though it occurs in most Chinese specimens." Ten years later Rehder (1913) adopted varietal status for the taxon: *L. maackii* var. *podocarpa* (Franchet ex Rehder) Rehder, but in 1949 he returned to the status of forma (Rehder 1949a). Although a few authors have used the designation of forma (e.g., Anonymous 1929; Forrest 1916; L  veill   1915-1916) most consider the taxon to be a variety (e.g., Bailey 1916; Bean 1914; Sargent 1913, 1922; Schneider 1911; Wilson 1913, 1917, 1925, 1928; Wyman 1962).

Variety *podocarpa* has been called "superior to the type" (Anonymous 1924), "especially fine" (Hadden 1925), and "a better flowerer" (Dirr 1990). Bonstedt (1932), in contrast, said of it that "it is not so beautiful as the species." According to Wyman (1962), "The chances are that [*L. maackii*] and its variety *podocarpa* are badly mixed in nurseries." Hsu and Wang (1988) wrote that the feature by means of which Rehder originally distinguished forma *podocarpa* shows continuous variation in the species and thus no evidence has been found to support recognition of the form. We, too, have noted that the feature is quite variable, even on a single individual, and so do not recognize this taxon.

A pink-flowered variant of *L. maackii*, described as forma *erubescens* by Rehder (1913), was said to have arisen from seeds collected by Wilson in China. The taxon is recognized as a form by some (e.g., Rehder 1949a; Sargent 1922) and as a variety by others (e.g., Alexander 1944; Bailey 1916; Hsu and Wang 1988; Royal Botanic Gardens, Kew 1934). We, however, do not recognize the variant at any rank because the corollas vary continu-

ously from essentially pure white to a deep pink; all intergrades between these extremes can be found in a single population. Some of the pink individuals we have seen are an excellent match for the colored illustration of "var. *erubescens*" in *Addisonia* (Alexander 1944); others, however, are much more deeply pigmented.

According to Hara (1983), Japanese representatives of *L. maackii* "seem to differ slightly from the [East Siberian] plants ecophysiologically. When planted side by side in Tokyo, the East Siberian plants grow more vigorously bearing larger leaves with slightly impressed nerves, and flower and fruit much earlier, as compared with the Japanese plants." Earlier, Nakai (1938) had proposed a varietal name for Japanese plants but did not publish it validly. And most recently Iwatsuki et al. (1993) did not recognize any infraspecific taxa for the Japanese representatives of the species.

Accordingly, synonymy for Amur honeysuckle is as follows:

Lonicera maackii (Ruprecht) Herder, Bull. Soc. Imp. Nat. Moscou 37(1):204. 1864.

Xylosteum maackii Ruprecht, Bull. Cl. Phys.-Math. Acad. Imp. Sci. St.-Petersbourg 15:369. 1857; *Caprifolium maackii* (Rupr.) Kuntze, Rev. Gen. Plant. 1:274. 1891; *L. maackii* forma *podocarpa* Franchet ex Rehder, Ann. Rept. Missouri Bot. Gard. 14:141. 1903; *L. maackii* var. *podocarpa* (Franchet ex Rehder) Rehder, Mitt. Deutsch. Dendrol. Ges. 1913:263. 1913; *L. maackii* forma *erubescens* Rehder, Mitt. Deutsch. Dendrol. Ges. 1913:263. 1913; *L. maackii* var. *erubescens* (Rehder) Rehder in Bailey, Standard Cycl. Hort. 4:1910. 1916.

CONCLUSION: FROM COMMENDATION TO CONDEMNATION

The ascent of Amur honeysuckle began when the species was introduced from eastern Asia to St. Petersburg, where it first flowered in Europe. Because of its attractive flowers and fruits, it was soon disseminated via diverse channels to other parts of Europe and to North America where, as a new introduction, it won great praise. In the New World its decline in favor began once its weedy, aggressive, and invasive nature came to the fore. Though still touted—and even sold—by some for conservation or wildlife purposes, the shrub has fallen from grace rather recently when various authors warned that it should not be planted and a U.S. state even proscribed its use.

The story of Amur honeysuckle recalls the stories of other Old World woody plants introduced into temperate eastern North America, only to become naturalized and often troublesome. Coming immediately to mind are *Ailanthus altissima*, *Celastrus orbiculata*, *Elaeagnus umbellata*, *Lonicera japonica*, *Rhamnus cathartica*, *Rosa multiflora*, and *Ulmus pumila*. One can but assume that the saga of introduction/naturalization, sometimes with unfortunate consequences, will be a continuing one.

AFTERWORD

We close our account of Amur honeysuckle with mention of the passing, some 6 decades ago, of E.H. "Chinese" Wilson, the man responsible for the "effective" introduction to Great Britain of the species—and of others that have found their way into western horticulture. On 15 October 1930 he and his wife were killed in an automobile accident near Boston (Tozer 1994). At the double funeral service, the caskets were covered in floral tributes representing some of Wilson's introductions (Briggs 1993). Among these tributes were fruiting branches of *Lonicera maackii*.

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