Conioselinum chinense

Hemlock-parsley

Apiaceae

Conioselinum chinense by J. S. Dodds, 2017

***Conioselinum chinense* Rare Plant Profile**

New Jersey Department of Environmental Protection
State Parks, Forests & Historic Sites
State Forest Fire Service & Forestry
Office of Natural Lands Management
New Jersey Natural Heritage Program

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Life History

Conioselinum chinense (Hemlock-parsley) is a perennial herb in the carrot family. *Conioselinum* plants arise from a cluster of thickened roots. The stems of *C. chinense* are hairless and usually range between 0.5–1.5 meters in height, although they can sometimes be shorter. The leaves are alternate and pinnately compound with deeply cut leaflets. Distinct sheaths are present at the base of the petioles. The lower leaves have long petioles but those of the uppermost leaves are shorter, barely exceeding the sheaths. The inflorescence of *C. chinense* is a compound umbel 2–12 cm wide with 9–16 primary branches (rays) that occasionally have a few narrow bracts at the base. The secondary umbels (umbellets) are small and densely-flowered, and they are usually subtended by several small, linear bractlets. The flowers are tiny and have five white petals with slightly indented tips. The oval fruits are longer than wide (4–6 mm x 2–3.5 mm) and flattened, with broad wings at the edges and sharp ridges on the back. (See Britton and Brown 1913, Henderson 1925, Mathias and Constance 1945, Fernald 1950, Gleason and Cronquist 1991).

Left: Britton and Brown 1913, courtesy USDA NRCS 2022a. Right: M. Hough, 2020.

Conioselinum chinense is most likely to be found in bloom between July and September, with the later end of the spectrum being more frequently reported (Graenicher 1900, Schlessman and Barrie 2004, Rhoads and Block 2007, NJNHP 2022, Weakley et al. 2022). However, the species may flower over a broader time period. *C. chinense* has been known to begin blooming in early

June in New Jersey (Hough 1983) or to continue as late as November 11 in Nova Scotia (Garbary et al. 2011). Garbary et al. suggested that differences in flowering dates could be related to variation in annual temperature patterns.

Care should be taken with identification of species in the Apiaceae, as many genera in the family have overlapping characteristics (Gleason and Cronquist 1991). Britton and Brown (1913) indicated that mature fruits were "necessary for certain determination of most of the genera and many of the species". Results of genetic studies within the family placed *Conioselinum chinense* in two different clades, leading the researchers to conclude that one of the samples utilized for the research had probably been obtained from a misidentified specimen (Downie et al. 2010). Some records of *C. chinense* from Massachusetts turned out to be a similar-looking but exotic species, *Peucedanum palustre*, (Connolly 2011) and another introduced species, *Anthriscus sylvestris*, was initially identified as *C. chinense* when it first appeared in North Carolina (Poindexter et al. 2011). Nearly half of the Apiaceae species that have been documented in New Jersey are non-native (Kartesz 2015), so attention to detail is required when dealing with unfamiliar plants in the carrot family.

Pollinator Dynamics

Conioselinum chinense is a protandrous species (Schlessman and Barrie 2004), meaning that the male reproductive organs mature before the female. The trait has often been perceived as a mechanism for promoting cross-fertilization. Webb (1981) observed that most species in the Apiaceae are both protandrous and andromonoecious (having bisexual and staminate flowers on the same plant) but argued that neither characteristic can be assumed to effectively facilitate outcrossing. Instead, he proposed that the degree to which protandry is developed in a particular species determines the role it plays in assuring cross-pollination, noting that expression of the attribute occurs on a scale ranging from strong to weak in the carrot family. The extent of self-compatibility in *Conioselinum chinense* has not been determined.

Insects appear to be the primary means of pollination for Hemlock-parsley. The staminate flowers on plants in the Apiaceae may play a role in attracting insect pollinators by producing extra pollen (Webb 1981), and all species in the family also have nectaries in both bisexual and staminate flowers (Erbar and Leins 2010). Umbelliferous plants with a flower structure comparable to that of *Conioselinum chinense* can be effectively pollinated by many different insects including types of Hymenoptera, Diptera, and Coleoptera, and the important pollinators for a given species can vary between sites and between years (Nakano and Washitani 2003, Ollerton et al. 2007). Studies of *Daucus carota* found that the blooms were mainly frequented by small insects with relatively low energy demands because the tiny flowers yielded minute amounts of nectar, making them less attractive to larger pollinators (Ollerton et al. 2007). Graenicher (1900) observed two syrphid flies visiting the flowers of *Conioselinum chinense*: *Platychirus hyperboreus* and *Syrphus umbellatarum* (now *Melangyna umbellatarum* per Hilty 2020), noting that both species preferred flowers in the Apiaceae.

Seed Dispersal

The fruits of plants in the carrot family (schizocarps) have two carpels that split at maturity into single-seeded units (mericarps) which tend to remain suspended until dislodged. However, mericarp structures and dispersal mechanisms vary throughout the family (Cohen and Plitmann 1997). Detachment of the fruits can be caused by gravity, wind, or the movement of a passing animal (Tiley et al. 1996). Genera in the Apiaceae with flattened, winged fruits like those of *Conioselinum chinense* are likely to be dispersed by wind (Stebbins 1971). Research on *Heracleum mantegazzianum*, another species that has flat, winged seeds, found that the majority of seeds ended up within short distances of the parent plants (Tiley et al. 1996). Jongejans and Telenius (2001) reported that wind does extend the distribution of Apiaceae species with flat, winged seeds but only for short distances. The median dispersal ranges for species in the study with seeds comparable to those of *C. chinense* ranged from 0.79–3.12 meters.

Lacey (1980) noted that *Daucus carota* plants released their seeds slowly over a period of several months. However, that is just one of three dispersal patterns described for the carrot family by Cohen and Plitmann (1997): Some species release their seeds rapidly and others retain them all and release them when circumstances become suitable. No studies addressing dispersal patterns or dormancy in *Conioselinum chinense* were found. Investigation of six other North American members of the Apiaceae showed that—although dormancy strategies varied—all of the species examined were able to maintain a seed bank for several years (Hawkins et al. 2007). Morin and Payette (1988) retrieved some Hemlock-parsley seeds from the soils of a subalpine community in Quebec but the viability of the propagules was not confirmed.

Habitat

Conioselinum chinense typically grows in wet places such as swamps, wet woods, seepage areas, and streamsides (Matthews 1912, Coddington and Field 1978, Hough 1983, Weatherbee and Crow 1992, Rhoads and Block 2007, MANHESP 2019, NJNHP 2022, Weakley et al. 2022). The substrate is often calcareous or circumneutral and nutrient-rich (Coddington and Field 1978, Connolly 2011, Johnson and Walz 2013, Weakley et al. 2022) although the species may occasionally tolerate acidic soils (MANHESP 2019). Along the Canadian coast *Conioselinum chinense* has been reported from rocky cliffs, ledges and woodland edges above beaches where it often grows within reach of sea spray (Hodgdon and Pike 1964). At some inland sites in North Carolina and Virginia, *C. chinense* has been found in high-elevation (1500+ meters) seeps associated with cliffs and boulderfields (Weakley et al. 2022). Ohio habitat for the species was described as "swamps and cold cliffs" (Henderson 1925), and in New York's Catskill mountains the species was noted along the drier borders of a high elevation wetland (Adams and Parisio 2013).

Although Hough (1983) included "open ground of bogs" in the habitat types recorded for *Conioselinum chinense*, most of New Jersey's documented sites are wooded and the plants have been found growing in locations with shade cover that ranges from light to dense (NJNHP 2022). In one New York wetland, *C. chinense* was found in medium to large gaps but was absent from both small gaps and shaded sites (Anderson and Leopold 2002). Humbert et al. (2007)

characterized Hemlock-parsley as a species with a broad tolerance for a variety of light conditions and MANHESP (2019) indicated that the plants can tolerate shady environments.

Wetland Indicator Status

Conioselinum chinense is a facultative wetland species, meaning that it usually occurs in wetlands but may occur in nonwetlands (U. S. Army Corps of Engineers 2020).

USDA Plants Code (USDA, NRCS 2022b)

COCH2

Coefficient of Conservatism (Walz et al. 2018)

CoC = 9. Criteria for a value of 9 to 10: Native with a narrow range of ecological tolerances, high fidelity to particular habitat conditions, and sensitive to anthropogenic disturbance (Faber-Langendoen 2018).

Distribution and Range

The map in Figure 1 depicts the extent of *Conioselinum chinense* in the United States and Canada. *Conioselinum pacificum*, which some sources include in *C. chinense* (see Synonyms section), occurs along the west coast of the United States and Canada, in eastern Siberia, and in Japan (POWO 2022, Weakley et al. 2022). Despite its scientific name, *C. chinense* does not occur in China (Pimenov et al. 2003, Weakley et al. 2022).

The USDA PLANTS Database (2022b) shows records of *Conioselinum chinense* in four New Jersey counties: Bergen, Passaic, Sussex, and Warren (Figure 2). The data include historic observations and do not reflect the current distribution of the species.

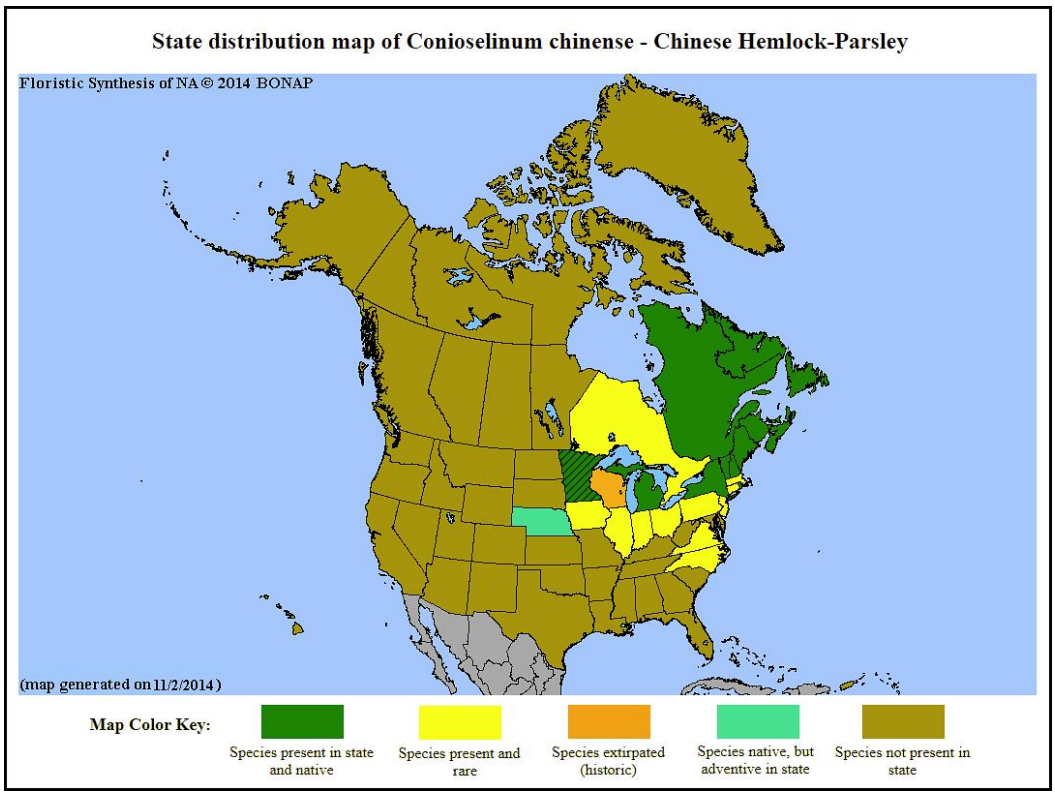

Figure 1. Distribution of C. chinense in North America, adapted from BONAP (Kartesz 2015).

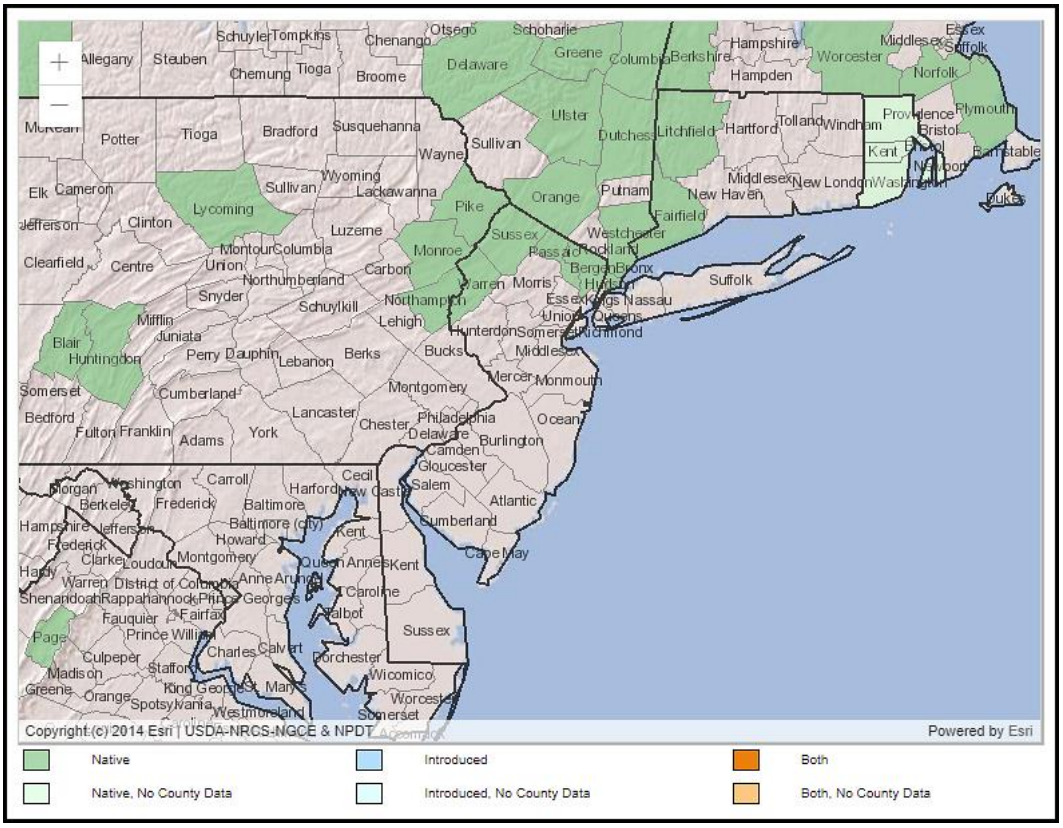

Figure 2. County records of C. chinense in New Jersey and vicinity (USDA NRCS 2022b).

Conservation Status

Conioselinum chinense is considered globally secure. The G5 rank means the species has a very low risk of extinction or collapse due to a very extensive range, abundant populations or occurrences, and little to no concern from declines or threats (NatureServe 2022). The map below (Figure 3) illustrates the conservation status of *C. chinense* throughout its range. Hemlock-parsley is critically imperiled (very high risk of extinction) in six states and one province, imperiled (high risk of extinction) in one province, vulnerable (moderate risk of extinction) in one state and two provinces, and possibly extirpated in Wisconsin. *Conioselinum chinense* is considered exotic in Maine and Nebraska. In other parts of its range the species is secure, apparently secure, or unranked.

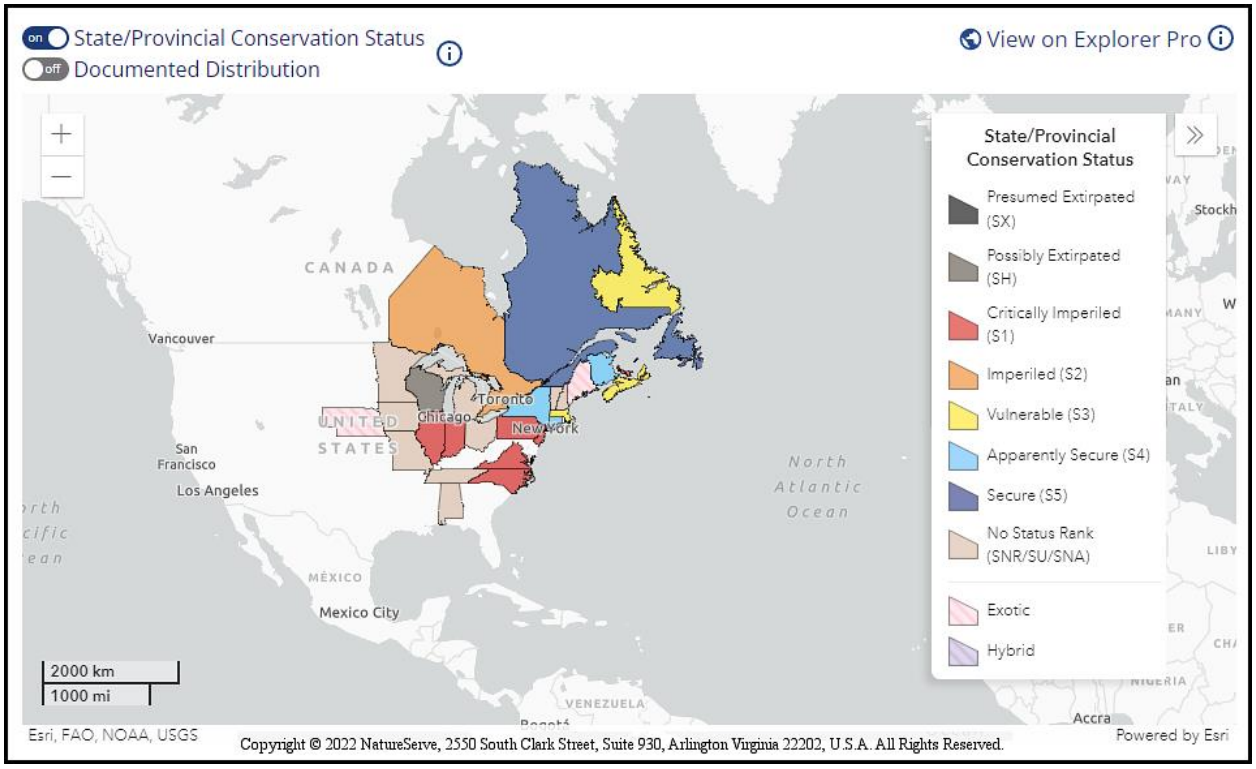

Figure 3. Conservation status of C. chinense in North America (NatureServe 2022).

Conioselinum chinense is critically imperiled (S1) in New Jersey (NJNHP 2022). The rank signifies five or fewer occurrences in the state. A species with an S1 rank is typically either restricted to specialized habitats, geographically limited to a small area of the state, or significantly reduced in number from its previous status. *C. chinense* is also listed as an endangered species (E) in New Jersey, meaning that without intervention it has a high likelihood of becoming extinct in the state. Although the presence of endangered flora may restrict development in certain communities such as wetlands or coastal habitats, being listed does not currently provide broad statewide protection for the plants. Additional regional status codes assigned to *C. chinense* signify that the species is eligible for protection under the jurisdictions of the Highlands Preservation Area (HL) and the New Jersey Pinelands (LP) (NJNHP 2010).

In New Jersey, *Conioselinum chinense* was initially known from one site apiece in Bergen and Sussex counties (Britton 1889, Taylor 1915). Hough (1983) indicated that the Bergen record pre-dated 1930 but reported sight records from both Passaic and Sussex counties. Around the turn of the century, four populations of *C. chinense* were extant in Sussex County and one in Warren County (Breden et al. 2006). Since then another population has been added in Warren County bringing the state's total number of extant occurrences up to six. However, one of the long-known occurrences—when last observed in 1984—consisted of a single plant in degraded habitat (NJNHP 2022) so it is probable that only five populations now remain.

Threats

Conioselinum chinense faces moderate threats from habitat loss and degradation, particularly as a result of land-use conversion, habitat fragmentation, and forest management practices (NatureServe 2022). The calcareous communities favored by *C. chinense* are inherently fragile and changes in hydrology, water quality, or vegetative composition can make the sites unsuitable for rare species that rely on them (Johnson and Walz 2013). At one New Jersey occurrence the establishment of several non-native plant species has been noted as an emerging threat to the Hemlock-parsley population (NJNHP 2022).

All members of the Apiaceae, including *Conioselinum chinense*, produce essential oils. That may be a double-edged sword in terms of insect herbivory: While some potential predators are discouraged by the compounds, there is a suite of specialist insects that have adapted to feed almost exclusively on plants in the carrot family (Berenbaum 1990). Although insect herbivory is not likely to threaten *C. chinense* on a large scale it could take a toll on small or isolated populations. Recent work on other species in the Apiaceae (e.g. Di Napoli et al. 2018) suggests that the essential oils might provide some protection against certain types of bacteria. However, the compounds do not appear to deter herbivory by White-tailed Deer (*Odocoileus virginianus*). *Conioselinum chinense* is regularly browsed by deer (Tremblay et al. 2006). Pellerin et al. (2006) reported that Hemlock-parsley was found in fen plots at sites where deer were not present but was not observed at any sites where deer were abundant.

In 2001, *Conioselinum chinense* extended its previously known flowering period by 41 days (Taylor and Garbary 2003). The authors noted that shifts in blooming dates could be developing in response to the warming climate. Appraisals of how well Hemlock-parsley might fare in the face of changing climactic conditions have generally concluded that the species is vulnerable, although some differed in opinion as to the degree of the risk. *C. chinense* was assessed as moderately vulnerable (abundance or range extent likely to decrease by 2050) in New Jersey and Illinois (Ring et al. 2013, Molano-Flores et al. 2016). In Pennsylvania *C. chinense* was judged to be extremely vulnerable, meaning that it was extremely likely to substantially decrease or disappear by 2050 (Schuette 2022). Greater risk may be associated with certain habitats or communities. For example, New Jersey's fens are highly vulnerable to climate change (Johnson and Walz 2013) and in New York, small populations of *C. chinense* at high elevations in the Catskills are especially susceptible because they already occur at or near the top of the highest mountains and cannot move upward to cooler locations (Adams and Parisio 2013).

Management Summary and Recommendations

Conioselinum chinense is vulnerable or imperiled in about half of the districts where it occurs, and research that focuses directly on the species is needed in order to effectively plan for its conservation. Information is lacking about the dispersal patterns, dormancy, germination, establishment, and typical life stages of *C. chinense*. While the species seems to tolerate a variety of light levels and hydrologic conditions, its competitive abilities are unknown. Gaps in knowledge regarding Hemlock-parsley's life history must be filled in order to both identify and manage threats. For example, one New Jersey population was noted as having more vegetative than flowering plants but there is no data to indicate whether that might be a sign of population expansion or decline. Pinpointing the identity of specific pollinators would help to determine if they are likely to adapt to changing climactic conditions in synchrony with *C. chinense*, and understanding the extent of self-compatibility in the plant would clarify the extent of its dependence on the insects.

Meanwhile, conservation of fragile habitats where *Conioselinum chinense* is extant should be a priority. Management efforts should target both the immediate communities and adjacent buffer areas in order to maintain the natural characteristics of the sites. In places like New Jersey where deer are overabundant, reduction of herd size might be a consideration. Many commonly grazed plants like *C. chinense* can persist in areas where predator density remains below 15 deer/km^2, although some species are more sensitive to browsing and may require lower densities (Tremblay et al. 2006, Côté et al. 2014). Potential threats from invasive plant species should also be noted during monitoring visits so that action can be taken to limit their spread in a timely manner.

Synonyms

The accepted botanical name of the species is *Conioselinum chinense* (L.) Britton, Sterns & Poggenb. Orthographic variants, synonyms, and common names are listed below (USDA NRCS 2022b).

Botanical Synonyms	**Common Names**
Conioselinum pumilum Rose	Hemlock-parsley Chinese Hemlock-parsley Eastern Hemlockparsley Milk Parsley

Pacific Hemlock-parsley (*Conioselinum pacificum*/*C. gmelinii*) is recognized as a distinct species by Kartesz (2015), NatureServe (2022), and USDA NRCS. However, a number of other sources treat *C. pacificum* as part of *C. chinense* (e.g. Matthias and Constance 1945, Piminov et al. 2003, ITIS 2022, POWO 2022, and Weakley et al. 2022). Some of the more inclusive references (Matthias and Constance 1945, POW0 2022) list the following additional synonyms: *Apium bipinnatum* Walter, *Athamanta chinensis* L., *Cnidium canadense* (Michx.) Spreng., *Cnidium chinense* (L.) Spreng., *Conioselinum benthamii* Fernald, *Conioselinum bipinnatum* (Walter)

Britton, *Conioselinum canadense* (Michx.) Torr. & A. Gray, *Conioselinum chinense* var. *anticostense* J. Rousseau, *Conioselinum chinense* var. *latilobum* J. Rousseau, *Conioselinum chinense* var. *pacificum* (S. Watson) B. Boivin, *Conioselinum dawsonii* (J. M. Coult. & Rose) J. M. Coult. & Rose, *Conioselinum filicinum* (H. Wolff) H. Hara, *Conioselinum fischeri* Hook., *Conioselinum gmelinii* (Bray) Steud., *Conioselinum gmelinii* J. M. Coult. & Rose, *Conioselinum kamtschaticum* Rupr., *Conioselinum nipponicum* H. Hara, *Conioselinum pacificum* (S. Watson) J. M. Coult. & Rose, *Kreidion chinensis* (L.) Raf., *Laserpitium hirsutum* Hook., *Ligusticum chinense* (L.) Crantz, *Ligusticum gmelinii* Cham. & Schltdl., *Peucedanum filicinum* H. Wolff, *Peucedanum wolffianum* Fedde ex H. Wolff, *Selinum benthamii* S. Watson, *Selinum canadense* Michx., *Selinum chinense* (L.) Druce, *Selinum dawsonii* J. M. Coult. & Rose, *Selinum gmelinii* Kurtz, *Selinum hookeri* S. Watson ex J. M., Coult. & Rose, and *Selinum pacificum* S. Watson.

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