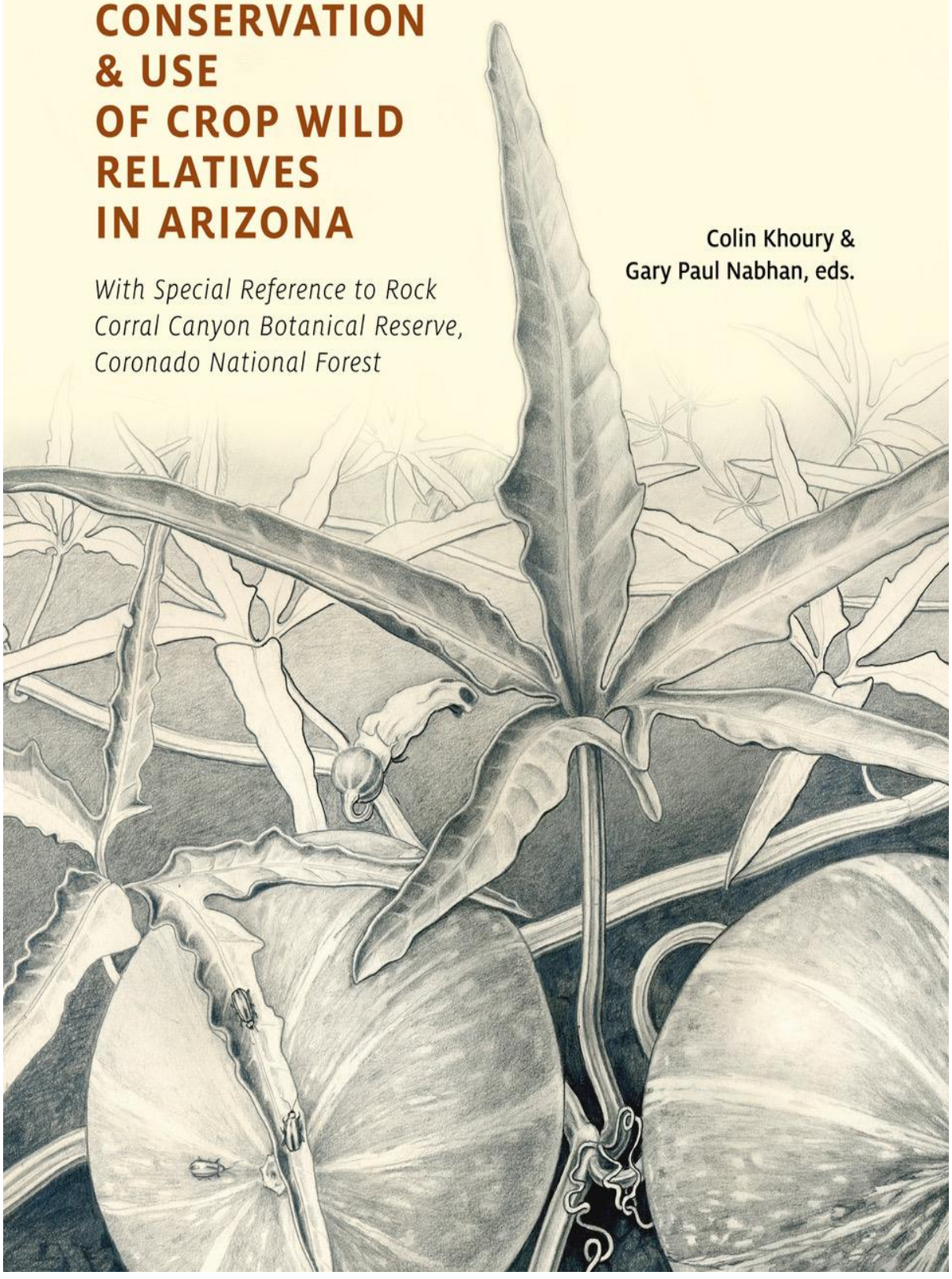
CONSERVATION & USE OF CROP WILD RELATIVES IN ARIZONA

With Special Reference to Rock Corral Canyon Botanical Reserve, Coronado National Forest

Colin Khoury &
Gary Paul Nabhan, eds.



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Introduction

We welcome you to join us - farmers, foragers, scholars, plant breeders, and conservationists -working to recognize, protect, and utilize the wild relatives of domesticated crops that naturally occur in Arizona and the other nine states along the U.S./Mexico border. North of the border, Arizona is among the states with the richest flora of these culturally and economically valuable wild plants, with species from over 50 genera (*Table 1*). Many of the species found in the Grand Canyon State occur in national forests, national parks and monuments, and on Indian reservations. These crop wild relatives (CWR) are the cousins of important plants cultivated for food, fiber, forage, beverage, and industrial uses around the planet.

While many people might assume that wild crop relatives hold little food value, the native and immigrant foragers of Arizona and surroundings would argue otherwise. Nutritionally and culturally important harvests in the desert Southwest may have begun as early as 10,900–10,100 calendar years B.P. (Louderback and Pavlik 2017) and continue to this day for wild potatoes (*Solanum* L. spp.) onions (*Allium* L. spp.), the wild chile peppers (*Capsicum annuum* var. *glabriusculum* (Dunal) Heiser & Pickersgill) known as "chiltepines," and for many other wild berries, fruits, greens, and culinary herbs. In Arizona alone, native species belonging to at least 24 of the genera listed in *Table 1* have been documented as collected and used by the state's culturally diverse residents. Many of these foods are gathered from vacant lots, along roadsides, and in other urban or disturbed habitats, while others require long treks into wild places. Native traditional knowledge and permits for collecting in protected natural areas enable sustainable management of harvests.

Chiltepin (*Capsicum annuum* var. *glabriusculum* (Dunal) Heiser & Pickersgill). Photo by Gary Paul Nabhan.

Table 1: Major crop wild relative genera occurring in Arizona

GENUS	COMMON ENGLISH NAME OF GENUS	NUMBER OF WILD SPECIES (TAXA) IN ARIZONA	DIRECT USES AS FOOD BY INDIGENOUS & OTHER NORTH AMERICANS	CWR IN GENUS DOCUMENTED AS USED IN PLANT BREEDING OR AS ROOTSTOCK
Agave L.	Agave, Century plant	11	X	
Allium L.	Onion	15	X	
Amaranthus L.	Amaranth	14	X	
Capsicum L.	Chile pepper	1	X	
Chenopodium L.	Goosefoot, Lambsquarters	14	X	
Cucurbita L.	Gourd, Squash	3		X
Dasiphora Raf.	Strawberry	1		
Daucus L.	Carrot	1		X
Drymocallis Fourr. ex Rydb.	Strawberry	1		
Dysphania R.Br	Epazote	2	X	
Elymus L.	Wheat, Rye	13		X
Fragaria L.	Strawberry	2	X	X
Gossypium L.	Cotton	1		X
Helianthus L.	Sunflower	10		X
Hordeum L.	Barley	4		X
Humulus L.	Hops	1		
Ipomoea L.	Sweetpotato	11		X
Jaltomata Schltdl.	Jaltomato	1	X	
Juglans L.	Walnut	1	X	X
Lactuca L.	Lettuce	4		X
Leymus Hochst.	Wheat	3	X	X
Linum L.	Flax	8		
Lupinus L.	Lupine	20		
Macroptilium (Benth.) Urb.	Siratro	1		
Manihot Mill.	Cassava	2		X
Mentha L.	Mint	1	X	
Morus L.	Mulberry	1	X	
Nicotiana L.	Tobacco	4		
Opuntia Mill.	Prickly pear, Cholla	32	X	
Panicum L.	Millet, Panicgrass	10		X
Passiflora L.	Passionfruit	5		
Phaseolus L.	Bean, Tepary	8	X	X
Physalis L.	Groundcherry, Tomatillo	14	X	
Physaria (Nutt. ex Torr. & A.Gray) A.Gray	Bladderpod	1		X
Proboscidea Schmidel	Devil's Claw, Unicorn Plant	2	X	
Prunus L.	Cherry, Plum	4	X	X
Ribes L.	Currant, Gooseberry	10	X	X
Rubus L.	Raspberry	5	X	X
Parthenium L.	Guayule	2		
Salvia L.	Chia	1		
Sesbania Scop.	Colorado River Hemp	1		
Simmondsia Nutt.	Goatnut, Jojoba	1		
Solanum L.	Potato, Wonderberry	11	X	X
Stevia Cav.	Stevia, Sweetleaf	5		
Tagetes L.	Marigold, Mexican Tarragon	2		
Tripsacum L.	Gamagrass	1		X
Vaccinium L.	Blueberry, Huckleberry, Whortleberry	1	X	X
Vicia L.	Vetch	3		X
Vitis L.	Grape	3	X	X
Yucca L.	Banana Yucca, Soapweed, Spanish Bayonet	11	X	
Zizyphus Mill.	Jujube, Lotebush	1		

In addition to these direct uses, crop wild relatives in at least 20 genera are among those utilized by plant breeders and nurserymen for crop improvement. These wild plants have improved crops' tolerance to abiotic stresses, enhanced their resistance to pests and diseases, increased their nutritional quality, made their breeding more efficient, and offered hardier rootstock for fruit, nut, and berry crops.

Of close to 4,600 crop wild relative and other wild useful plant taxa (species, subspecies and varieties) inventoried in the United States, over 1,000 (22%) occur in Arizona (Khoury *et al.* 2013). Some 450 of these may be prioritized for their close (congeneric) relationship with one or more crops, or because they are an important food source in their own right. Of these, around 150 are high priority for conservation and research due to their relation to important crops, with 40 of these being of greatest interest to agriculture, as crop progenitors or close cousins with much potential for use in plant breeding (*Table 2*).

Table 2: Close/useful relatives of important or iconic crops, distributed in Arizona

CROP WILD RELATIVE TAXON	**COMMON NAME**	**CONFIMED OR POTENTIAL AGRICULTURAL USE AS BREEDING STOCK, FORAGE, OR ROOTSTOCK**
Amaranthus powelli S. Watson	Powell's amaranth	Grain amaranths
Capsicum annuum var. *glabriusculum* (Dunal) Heiser & Pickersgill	Chiltepin	Chile peppers
Cucurbita digitata Gray	Fingerleaf gourd	Squashes, pumpkins, trap crop for beetles
Cucurbita foetidissima Kunth	Buffalogourd	Squashes, pumpkins, trap crop for beetles
Cucurbita palmata S. Wats.	Coyote gourd	Squashes, pumpkins, trap crop for beetles
Fragaria virginiana Mill. ssp. *glauca* (S. Watson) Staudt	Glaucous strawberry	Yield, disease resistance, and day-neutral traits for strawberries
Gossypium thurberi Tod.	Arizona (desert) cotton	Insect resistance for cottons
Helianthus annuus L.	Common sunflower	Pest and disease resistance, salinity tolerance, yield, oil content, early maturation, and breeding traits for sunflowers
Helianthus anomalus S. F. Blake	Anomalous sunflower	Alkaline soil tolerance, pest resistance, oil content, drought tolerance, and fertility restoration genes for sunflowers
Helianthus arizonensis R. C. Jacks.	Arizona sunflower	Drought tolerance, oil content for sunflowers
Helianthus deserticola Heiser	Desert sunflower	Downy mildew resistance and drought tolerance for sunflowers
Helianthus niveus (Benth.) Brandegee ssp. *canescens* (A. Gray) Heiser	Snowy sunflower	Drought and heat tolerance for sunflowers
Helianthus niveus (Benth.) Brandegee ssp. *tephrodes* (A. Gray) Heiser	Algodones Dunes sunflower	Drought and heat tolerance for sunflowers
Hordeum pusillum Nutt.	Little (Hohokam) barley	Old World barley, plus North American prehistoric domesticate of this species
Juglans major (Torr.) A. Heller var. *major*	Arizona walnut	Rootstock for Old World walnuts
Lactuca canadiensis L.	Canada lettuce	Lettuce
Lactuca graminifolia Michx.	Grassleaf lettuce	Lettuce
Lactuca saligna L.*	Willowleaf (least) lettuce	Insect and disease resistance for lettuce
Lactuca serriola L.*	Prickly lettuce	Insect resistance for lettuce

CROP WILD RELATIVE TAXON	**COMMON NAME**	**CONFIMED OR POTENTIAL AGRICULTURAL USE AS BREEDING STOCK, FORAGE, OR ROOTSTOCK**
Lactuca tatarica (L.) C. A. Mey. ssp. *pulchella* (Pursh) Stebbins	Blue lettuce	Lettuce
Macroptilium atropurpureum (DC.) Urb.	Purple bushbean; Siratro	Forage legume now cultivated in Australia and South America
Panicum hirticaule J. Presl var. *hirticaule (=P. sonorum* Beal sensu latu*)*	Sonoran panicgrass	Old World barley, plus North American prehistoric domesticate of this species
Phaseolus acutifolius A. Gray var. *acutifolius*	Broadleaf tepary bean	Insect and disease resistance, salinity, heat, and drought tolerance, seed protein, and gene transfer for domesticated tepary and common bean
Phaseolus acutifolius A. Gray var. *tenuifolius* A. Gray	Narrowleaf tepary bean	Insect and disease resistance, salinity, heat, and drought tolerance, seed protein, and gene transfer for domesticated tepary and common bean
Physalis philadelphica var. *philadelphica* Lam.*	Wild husk tomato/Tomatillo	Once cultivated by Zuni on AZ-NM border, relative Cape gooseberry and other domesticated husk tomatoes
*Physaria fendleri (*A. Gray) O'Kane & Al-Shehbaz	Fendler's bladderpod	Industrial oil
Prunus emarginata (Douglas) Eaton	Bitter cherry	Disease resistance for cherries and plums
Ribes inerme Rydb.	White-stem gooseberry	Spinelessness for gooseberries and currants
Ribes leptanthum A. Gray	Trumpet gooseberry	Pest and disease resistance, growth habit for gooseberries and currants
Ribes pinetorum Greene	Orange gooseberry	Gooseberries and currants
Ribes quercetorum Greene	Oakwoods gooseberry	Gooseberries and currants
Ribes velutinum Greene	Desert velvet gooseberry	Gooseberries and currants
Rubus leucodermis Douglas ex Torr. & A. Gray	White-stem raspberry	Raspberries and blackberries
Simmondsia chinensis (Link) C. K. Schneid.	Goatnut, Jojoba	Wax for shampoos and lubricants
Solanum jamesii Torr.	Colorado wild potato	Fingerling potatoes once cultivated like the papita guera of Mexico
Solanum stoloniferum Schltdl.	Wild potato	Fingerling potatoes once cultivated like the papita guera of Mexico, and offer heat and drought tolerance and insect and disease resistance
Tripsacum lanceolatum Rupr. ex E. Fourn.	Western gamagrass	Forage grass now in cultivation as well as use in breeding perennial maize
Vaccinium myrtillus L.	Billberry, Wimberry, Whortleberry	Cranberries, blueberries and others
Vitis arizonica Engelm.	Arizona wild grape	Hardy or disease-resistant rootstocks for cultivated grapes, disease resistance in grape breeding
Vitis girdiana Munson	Desert wild grape	Hardy or disease-resistant rootstocks for cultivated grapes

*Non-native taxon, recognized by plant breeders as harboring traits of interest for crop improvement. Table 1 and Table 2 Sources: Metcalf (1980); Nabhan *et al*. (1986); Nabhan (1991); Moerman (1998); Hodgson (2001); Hajjar and Hodgkin (2007); Khoury *et al.* (2013); Hodgson (2015); USDA-ARS GRIN Taxonomy for Plants (2018)

Wild plum (*Prunus* L. sp.). Drawing by Paul Mirocha.

Envisioning a future of greater conservation, appreciation and use of crop wild relatives

Our growing human population and changing dietary expectations across the world are increasing the demand for more and better food at rates that bring into question how agriculture will keep pace both in terms of availability and affordability (Ray *et al.* 2013). Meanwhile farmers are facing natural resource input limitations and changing weather patterns, while trying to respond to calls to improve soil and water conservation, reduce greenhouse gas emissions, and better protect the pollinators and other ecosystem services that bolster crop production (Cordell *et al.* 2009; Godfray *et al.* 2010; Asseng *et al.* 2015).

To produce good, affordable food while reducing the environmental impacts of production, more diversity will be needed - both in the variety of plants cultivated or foraged for the market, and in the genetic variation within domesticated crops. Crop wild relatives offer the world both of these gifts.

Crop wild relatives are often more adapted than their domesticated kin to extreme climates and difficult soils, and to challenging pests and diseases (Hajjar and Hodgkin 2007; Dempewolf *et al.* 2013). Due to the close genetic relationship of these plants with their cultivated cousins, useful traits can be introgressed from wild relatives into crops (Dempewolf *et al.* 2017). Their value is enormous- the annual economic contribution of sunflower wild relatives was recently estimated at $267-384 million (Seiler *et al.* 2017). Their uses as genetic resources are expected only to increase in the future alongside the ongoing improvements in information on the plants and their diversity, and well as the continuing advances in breeding methods and tools (McCouch *et al.* 2012).

Conservation and community-based restoration

Our high hopes for crop wild relatives are based on the assumption that they will be readily available for use, which requires their conservation – both in genebanks where they are accessible to plant breeders, and in their natural habitats, where they can continue to evolve alongside pests, diseases, heat, drought, and other stresses. Unfortunately, public genebank collections of crop wild relatives are known to be deficient for most crop genepools (Ramírez-Villegas *et al.* 2010; Castañeda-Álvarez *et al.* 2015; Kantar *et al.* 2015; Khoury *et al.* 2015; Castañeda-Álvarez *et al.* 2016; Khoury *et al.* 2019). At the same time, the habitats of a wide range of wild relatives are threatened by habitat fragmentation through urbanization and agricultural expansion, invasive species, mining, climate change, pollution, over-harvesting, and more (Jarvis *et al.* 2008; Zhang *et al.* 2017; Frances *et al.* 2018). Even in protected natural areas, such plants are often susceptible due to inadequate prioritization and insufficient resources to manage the populations (Hampe and Petit 2005; Le Saout *et al.* 2013).

More than six dozen crop wild relatives have been considered as candidates for Federal listing as threatened and endangered species since the first "redbook" of plants at risk in the United States was published by the Smithsonian (Ayensu and DePhillips 1978). However, only a small percentage of these taxa have actually been formally listed, and fewer still have been afforded critical habitat protection for their populations. Thus *in situ* conservation has mainly been achieved by other means. Examples include reserves within California state parks for wild strawberries (Cristopher *et al.*1984), botanical areas on USDA Forest Service lands such as the Rock Corral Canyon Wild Chile Botanical Area in Arizona for wild chile peppers and other species (Nabhan 1990; USFS 2016) (Table 3), and community-based reserves on Native American Nations' sovereign lands or Indian Reservations.

Conserving and studying these crop wild relatives in their natural habitats can provide plant breeders and evolutionary biologists unique insights into these plants' interactions with pollinators, seed dispersers, predators, and pests and diseases (Tewksbury *et al.* 1999; Chen 2017; Luna-Ruiz *et al.* 2018). Such insights may prove to be useful not only in crop improvement but also in devising novel strategies for integrated pest and disease management.

Table 3: Crop wild relatives occurring in Rock Corral Canyon, Santa Cruz County, AZ

CROP WILD RELATIVE TAXON	COMMON NAMES	STATUS AND NOTES
Agave palmeri Engelmann*	Palmer's agave, Lechuguilla	Although distantly related to agave domesticates it is wild-harvested for distilling Mezcal Lechuguilla in Sonora
Agave parviflora Torrey*	Santa Cruz striped agave, Amole	Once used as soap and shampoo
Agave schottii Engelmann*	Amole; Shindagger	Still used as soap and shampoo in Mexico
Allium plummerae S. Watson*	Plummer's wild onion	Historically eaten as ramp-like wild onion
*Amaranthus palmeri** S. Watson	Palmer's amaranth; Bledo; Quelite de las aguas	Although distantly related to domesticates, it is still widely harvested as summer spinach green
Amaranthus powellii S. Watson	Powell's amaranth; Quelite	Probable progenitor or introgressed relative of domesticated grain amaranths of the Colorado Plateau and Mexico
Capsicum annuum L. var. *glabriusculum* (Dunal) Heiser & Pickersgill*	Wild chile, Chiltepín	Closely related to & introgressed with domesticated *C. annuum* L. var. *annuum,* with unique genes at northern limits of its range
Chenopodium berlandieri Moquin-Tandon*	Pitseed goosefoot; Chual, Huazontle silvestre	Closely related to and probable progenitor of domesticated *C. berlandieri* Moq. ssp. *nuttalliae* (Saff.) H. D. Wilson & Heiser*;* still widely wild-harvested as spinach green
Chenopodium fremontii S. Watson*	Fremont's goosefoot; Chual	More distantly related to domesticates but wild-harvested as spinach green
Chenopodium neomexicanum Standl.*	New Mexico goosefoot	More distantly related to domesticates but wild-harvested as spinach green
Cucurbita digitata A. Gray*	Coyote gourd, Calabacilla del coyote	Although distantly related to domesticates was experimentally grown in Arizona as oilseed & starch sources in 1980's
Cucurbita foetidissima Kunth.*	Buffalogourd; Calabacilla loca	Although distantly related to domesticates was experimentally grown in Arizona as oilseed & starch sources in 1980's; still used as trap crop for diabrocite beetles
Gossypium thurberi Todaro	Wild cotton; Algodoncillo	Used as breeding material to reduce calyx dust causing black lung disease
Helianthus annuus L.	Common sunflower; Girasol; Mirasol	Closely related to and progenitor of sunflower domesticate. Used for pest and disease resistance, salinity tolerance, yield, oil content, early maturation, and breeding traits for sunflowers
Helianthus petiolaris Nuttall	Prairie sunflower	Secondary relative of the domesticated sunflower
Hordeum murinum L. ssp. *glaucum* (Steudel) Tzvelev)	Mouse barley	
Hordeum pusillum Nutt.	Little barley	Closely related to and progenitor of prehistoric domesticated little barley of Mississippi Basin and Sonoran Desert
Jaltomata procumbens (Cavanilles) J. L. Gentry	Jaltomate	Progenitor of one of three tomato-like crops of this genus in Latin America
Juglans major (Torrey) Heller *	Arizona walnut; Noga;	Closely related to domesticated walnuts and used as commercial rootstock
Linum puberulum (Engelm.) Heller*	Plains flax	Medicine and dye
Macroptilum atropurpureum (Mossino & Sesse ex. DeCandolle) Urban	Purple bushbean; Siratro	Closely related to and progenitor of forage domesticate siratro, which is displacing poorly-adapted alfalfa and clover in arid zones of Australia
Manihot angustiloba (Torrey) Mueller	Desert mountain manihot	Not closely related to domesticates
Manihot daviseae Croizat*	Arizona manihot	Not closely related to domesticates
Morus microphylla Buckley*	Littleleaf mulberry, zarza mora	Not closely related to domesticate; wild harvested for tart fruits
Opuntia chlorotica Engelm. & J. M. Bigelow var. *santa-rita* (Griffiths& Hare) Rose*	Pancake prickly pear cactus; Santa Rita prickly pear	Distantly related to domesticates; wild-harvested for fruits
Opuntia macrocentra Engelm.*	Long-spine purple prickly pear	Distantly related to domesticates; wild-harvested for fruits

CROP WILD RELATIVE TAXON	COMMON NAMES	STATUS AND NOTES
Opuntia phaecantha Engelmann	Engelmann's prickly pear	distantly related to domesticates; fruits wild-harvested commercially for syrup, jelly and "nectar"
Panicum hirticaule J. Presl.	Sonoran/Mexican panicgrass	Progenitor of millet-like domesticated Sonoran panicgrass of U.S. & Mexico
Passiflora foetida L. var *arizonica* (Killip) D. H. Goldman	Arizona passion-flower, Scarlet-fruit passionvine; Tayalote, Buli de venado	Distantly related to domesticates; wild-harvested
Passiflora mexicana Jussieu	Mexican passion-flower, Ojo de venado	Distantly related to domesticates; wild-harvested
Phaseolus acutifolius A. Gray	Tepary bean, frijol tepari;	Progenitor of heat-adapted tepary bean and used as genetic bridge in hybridization with common bean; rarely wild-harvested
Phaseolus maculatus Scheele;	Metcalfe's bean, Cocolmeca	Distantly related to domesticates but cultivated as forage crop in New Mexico a century ago
Physalis acutifolia (Miers) Sandwith	Sharpleaf groundcherry	Fruits wild harvested as food
Physalis longifolia Nutt.	Longleaf groundcherry	Fruits wild harvested as food
Prunus serotina Ehrh.	Southwest black cherry; Capulín	Rootstock for cherries & plums
Rubus idaeus L. var. *melanolasius* (Dieck) R. J. Davis*	American red raspberry	Possible source of cultivars of commercial selections
Solanum douglasii Dunal	Wonderberry, Chichiquelite	Closely related to and possible progenitor to domesticated *S. nigrescens* M. Martens & Galeotti or *S. americanum* Mill.
Tagetes lemmoni A. Gray*	Mexican bush marigold; Mt. Lemmon marigold; Tangerine scented marigold	Widely-cultivated bedding and spice plant
Tagetes micrantha Cav.*	Mountain marigold, Yerba anís; Licoricemarigold	Cultivated aromatic bedding plant
Stevia lemmonii A. Gray	Mt. Lemmon Stevia; Sweetleaf	Herbaceous perennial shrub distantly related to the commercial sugar crop *Stevia rebaudiana* (Bertoni) Bertoni
Stevia micrantha Lagasca	Annual candtleaf; Sweetleaf	Erect annual distantly related to the commercial sugar crop *Stevia rebaudiana* (Bertoni) Bertoni
Stevia serrata Cavanille	Sawtooth candyleaf	Distantly related to the commercial *Stevia rebundiana*
Vitis arizonica Engelmann	Arizona wild grape; Parra Silvestre; Uva silvestre	Related to and has already been experimented with as potential rootstock for domesticated *V. vinifera* Merlot
Zizyphus obtusifolia (Hooker) ex Torrey & A Gray	Lotebush	Distantly related to jujube but possible rootstock

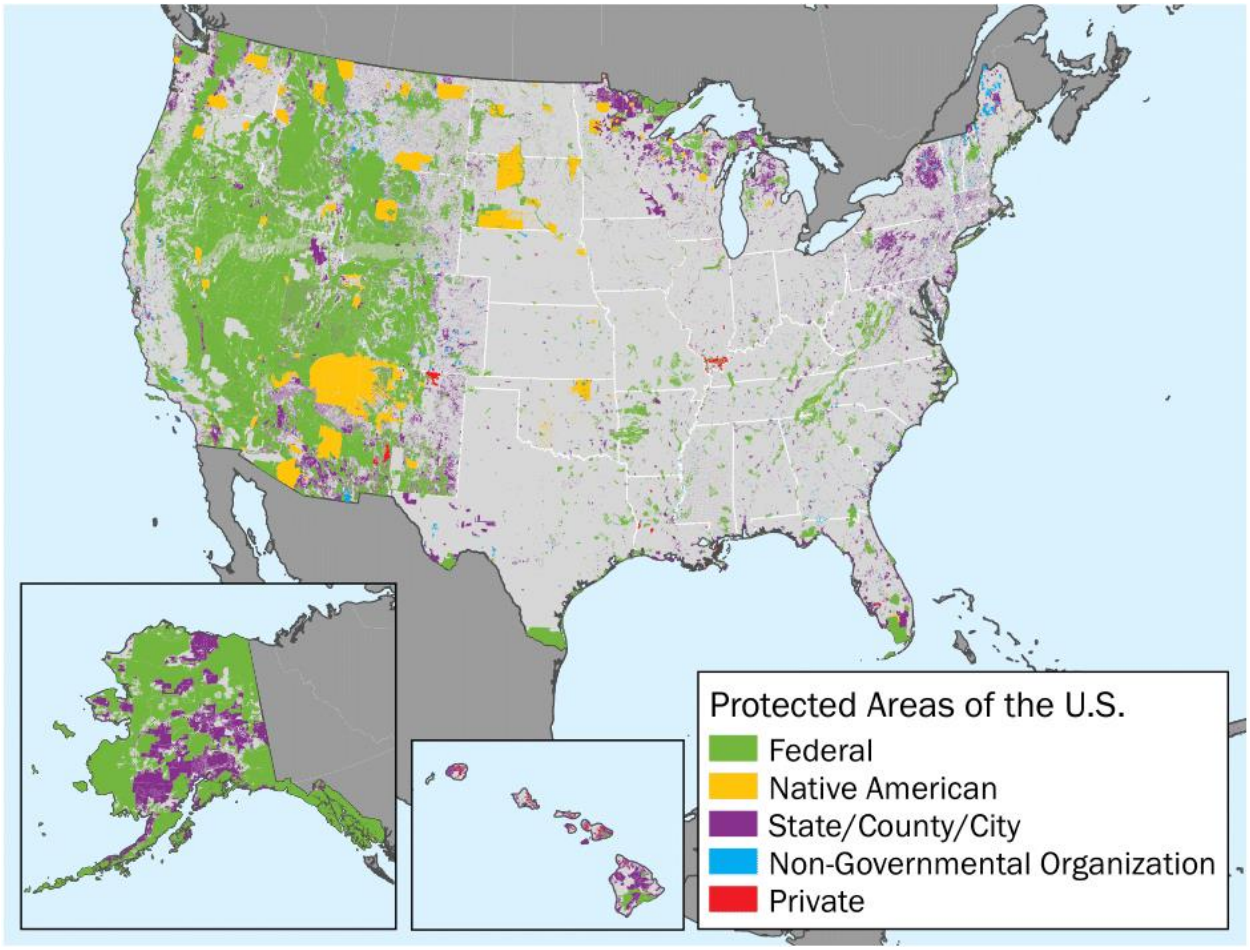
*flowering and/or fruiting herbarium specimens useful in making valid specific or subspecific identifications of plants collected in the 2300 acre Rock Coral Canyon Botanical Area are available at the University of Arizona, Arizona State University, and/or Desert Botanical Garden herbaria. All other taxa listed in Table 4 are either in the 6300 acre Rock Corral Canyon watershed above Tumacacori AZ, but not in the botanical area, or are sightings of plants without flowers or fruit. (See Nabhan 1990).

Moving forward

Collaborations over the past few decades demonstrate diverse efforts to come together to fill the conservation gaps for crop wild relatives and to increase their use:

- The U.S. public genebank system is prioritizing native crop wild relatives, including within its plant exploration program. Most of the 218 explorations conducted in the U.S. over the past 65 years supported by this program targeted native wild species (Williams and Greene 2018).
- Many botanic gardens and other *ex situ* conservation institutions are collaborating on crop wild relative conservation and education (Miller *et al.* 2015; BGCI 2016; Krishnan and Novy 2016).
- Federal lands, State and local forests and parks, Native American lands, conservation organizations, and private lands offer critically important habitat for a wide diversity of native crop wild relatives, particularly in the Western U.S.
- The U.S. Forest Service and local organizations combined forces to create the Wild Chile Botanical Area in Arizona (Nabhan 1990; USFS 2016).
- The USDA Agricultural Research Service and the Forest Service have created a Strategic Framework on the Conservation and Use of Native Crop Wild Relatives in the United States (USFS and USDA-ARS 2014). Under these arrangements, the agencies are collaborating on conserving the wild relatives of cranberry (USFS 2016), and are looking to expand to other taxa.
- The Bureau of Land Management-led Seeds of Success (SOS) program has accumulated over 15 years of experience of Federal and non-Federal partners collecting wildland native seed for long-term germplasm conservation and for use in seed research, development of native plant materials, and ecosystem restoration (Haidet and Olwell 2015; SOS 2018). The program is interested in prioritizing crop wild relatives during collecting targeting.
- The National Seed Strategy for Rehabilitation and Restoration, created by twelve Federal Agencies and over 300 non-Federal cooperators has outlined native seed collection, research, and land management needs from 2015-2020, including specifically targeting crop wild relatives (PCA 2017).
- The U.S. Fish and Wildlife Service provides Federal protection for threatened and endangered plants, including a handful of native crop wild relatives, under the U.S. Endangered Species Act. Two nongovernmental organizations- Natureserve and the IUCN, provide threat-related information on U.S. flora, including crop wild relatives, which are important to prioritization setting (Frances *et al.* 2018).

- Researchers across North America have recently come together to begin to document current conservation needs for crop wild relatives (Greene *et al.* 2018, 2019).



Protected areas in the United States. Based on data downloaded from the Protected Areas Database (PAD-US) (U.S. Geological Survey 2016). Map from Williams and Greene (2018).

Building on this momentum, agencies, organizations, and individuals from different sectors are looking to combine forces to more effectively celebrate, conserve, and make use of crop wild relatives. Five priority areas for action have been identified:

1. *Understand and document native crop wild relatives, assess threats to their natural habitats, and determine gaps in their conservation*
2. *Collect native wild relative populations not yet represented in the public genebanks, botanic gardens, or other conservation repositories*
3. *Make native crop wild relatives accessible to plant breeders, researchers, and educators*
4. *Protect native crop wild relatives in their natural habitats*
5. *Raise public awareness about native crop wild relatives*

We invite you to join us in the effort to recognize, protect, and utilize our natural heritage of crop wild relatives.

Pecos sunflower (*Helianthus paradoxus* Heiser) at Blue Hole Cienega, Santa Rosa, New Mexico. Pecos sunflower is a source of salt tolerance for cultivated sunflower, and is listed threatened under the Endangered Species Act and globally imperiled in NatureServe (Khoury *et al.* 2013). Photo by Laura Marek.

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Wild potato (*Solanum jamesii* Torr.) in New Mexico. Photo by John Bamberg.

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