

Habitat Improvement with Installed Bee Pastures

Bee conservation can go beyond passive habitat *preservation* to active habitat *improvement* by installing permanent bee pastures. Bee pasture is a permanent planting of flowering annuals or perennials designed to attract bees over many weeks or months. The goal is improved bee nutrition to encourage high bee numbers, either by attracting them to the area, increasing the number nesting in the area, or by increasing their reproductive output. Long-term payoff of perennial pastures may be good, especially since non-honey bees tend to nest near where they were reared the previous year⁹.

Candidate bee pasture plants should be rich in nectar and pollen, easy to grow, cost-effective, non-invasive, long-blooming, and not bloom at the same time as the crop and thus compete with it for pollinators. Here are some principles and practices for bee pasture plantings.

Principle 1

Bees reproduce better in habitats that have an uninterrupted season-long succession of bloom. This is best illustrated with bumble bees. The number of queens a colony can produce depends partly on the number of workers it can produce in the weeks leading up to the queen production period in late summer¹⁰. Producing workers requires energy, so a colony's queen output ultimately hinges on season-long availability of food.

- *Practice*
- In planning a bee pasture, it is important to choose a collection of plants that will produce an unbroken succession of bloom throughout the season. Local beekeepers, county extension agents, and horticulturists are good sources of information about the important bee plants in an area and their historic bloom times. This information can help you identify dearth times in the natural bloom calendar. Your county extension agent, horticulture specialist, or the Appendix at the back of this bulletin can help you select bee pasture plants that bloom during those dearth times (Fig. 9). Avoid installing pasture plants that bloom at the same time as the crop or else you run the risk that bees may prefer the pasture flowers over the crop flowers.

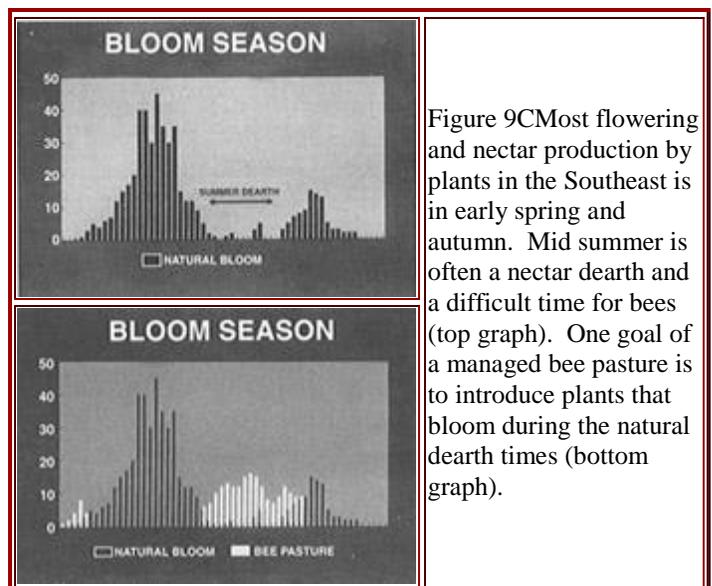


Figure 9C Most flowering and nectar production by plants in the Southeast is in early spring and autumn. Mid summer is often a nectar dearth and a difficult time for bees (top graph). One goal of a managed bee pasture is to introduce plants that bloom during the natural dearth times (bottom graph).

Here is a seed blend of eleven annuals that provides long-blooming bee pasture for set-aside farmlands. Although this list was developed in Germany¹¹, these plants are available as seed in North America.

40% phacelia (<i>Phacelia tanacetifolia</i>)	3% red radish (<i>Raphanus sativus</i>)
25% buckwheat (<i>Fagopyrum esculentum</i>)	3% cornflower (<i>Centaurea cyanus</i>)
7% white mustard (<i>Sinapis alba</i>)	3% mallow (<i>Malva sylvestris</i>)
6% coriander (<i>Coriandrum sativum</i>)	2% anethum (<i>Anethum graveolens</i>)
5% calendula (<i>Calendula officinalis</i>)	1% borage (<i>Borago officinalis</i>)
5% black cumin (<i>Nigella sativa</i>)	

Principle 2

Perennials are better bee pasture plants than annuals (Fig. 10). Although some annuals provide quick and relatively abundant bee forage, perennial herbs and shrubs are superior bee forage plants and deserve special attention by bee conservationists^{12,13}. Compared to annuals, perennials are generally richer nectar sources. Because of their longevity, perennials provide bee populations a more-or-less dependable food source year after year and encourage repeated nesting in the area. This partly explains why the number of bee and plant species increase together over time in undisturbed meadows.

- *Practice*
- When possible, plant perennials for bee pasture. Considering the repeated labor and inputs required for annuals, perennials are a cost-effective, low-maintenance choice for bee conservationists.

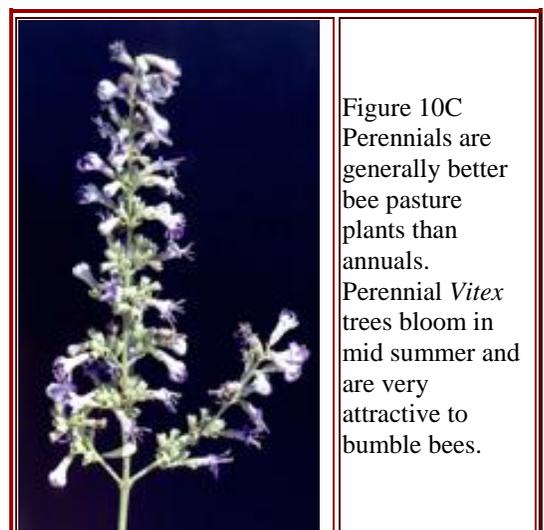


Figure 10C Perennials are generally better bee pasture plants than annuals. Perennial *Vitex* trees bloom in mid summer and are very attractive to bumble bees.

Principle 3

Bee nesting and foraging activities center on flower-rich habitats. Bumble bee queens prefer to nest in flower-rich meadows¹⁴, and most bee species prefer to forage close to their nests¹⁰. The foraging range of non-honey bees is probably smaller than that of honey bees⁵.

- *Practice*

Place bee pastures as near as possible to the crop of interest. This increases the chance of bees nesting near to, and foraging on, the crop.

Bigger is Better

As conservationists think of bee sanctuaries and pastures, they need to think big. The diversity of bee species is highest in large, continuously-connected areas of suitable habitat. Unfortunately, farming and urbanization do the exact opposite: break up habitats into small fragments or "islands." When there are many edges to a species's natural habitat, the edges may increase invasion of competitors, parasites, and predators, decrease the species's dispersal ability, and increase chance of inbreeding.

Thus, bee sanctuaries and pastures should be as large as possible. One large, connected bee sanctuary, ideally on a scale larger than that of an individual farm, is better than several small, disconnected sanctuaries. One expert recommends that for a normally functioning agricultural landscape the area of land in cultivated fields or mowed meadows should not exceed 75 percent of the total area. The remaining 25 percent should be left as bee sanctuary⁶.

Bee Conservation and Plant Conservation

Altered natural habitats are a prime cause of species loss not only of bees but of native plants. Plants whose habitats become fragmented are widely separated from each other and may have trouble attracting pollinators. One can imagine the vicious cycle at work here: habitat fragmentation separates the plants from their pollinators; plant numbers decline for lack of pollinating bees; bee numbers decline for lack of food plants.

Some modern agricultural practices may also rob native plants of habitat and lure away their pollinators. Large acreages of bee-attractive crops, such as canola, may lure all bees, native and exotic, away from native plants, depriving them of pollination and contributing further to their decline¹⁵.

Native bee conservation goes hand in hand with conservation of native plants that depend on them for pollination. Without their pollinators, the colorful bee-pollinated plants that beautify our surroundings, control erosion, and increase our property values would decline with unknown effects on the wildlife that depends on them for food. Thus, bee conservation is not just an issue for beekeepers and crop growers and home gardeners, although food production is by far the most important arena. It is at the very center of plant production and conservation, and all who use and enjoy plant products are stakeholders.

Appendix

Below is an incomplete list of wild and commercially-available plants that provide prolonged-blooming bee pasture in the Southeast. It is important for bees, especially bumble bees, to have an unbroken succession of bloom all season to build up their local populations. If you want to encourage large bee populations, consider growing an assembly of plants from this list so that bloom is more or less continuous. It is important to choose bee pasture plants that are rich in nectar and pollen, easy to grow, cost-effective, non-invasive, long-blooming, and do not bloom at the same time as the crop. Plants in the table are listed in chronological order of their average first month of bloom.

Plants for prolonged-blooming bee pasture in the Southeast ^{16,17,18,19,20,21}					
Common Name	Scientific Name	Type	Availability	Resource (nectar or pollen)	Bloom Dates
Cajeput (Tea Tree)	<i>Melaleuca quinquenervia</i>	tree	feral	n,p	much of the year
Chickweed	<i>Stellaria</i> spp.	ann. or per. herb	feral	n,p	much of the year
Cucumber	<i>Cucumis sativa</i>	ann. herb	cultivated	n,p	much of the year
Pumpkin	<i>Cucurbita</i> spp.	ann.	cultivated	n,p	much of the year
Alder	<i>Alnus</i> spp.	tree	feral	p	January-June
Blueberry	<i>Vaccinium</i> spp.	shrub	cultivated, feral	n,p	January-June
Maple	<i>Acer</i> spp.	tree	feral	n,p	January-May
Cantaloupe	<i>Cucumis melo</i>	ann. herb	cultivated	n,p	February-August
Citrus	<i>Citrus</i> spp.	tree	cultivated	n,p	February-May
Dandelion	<i>Taraxacum</i> spp.	bien. or per. herb	feral	n,p	February-September
Dead Nettle (Henbit)	<i>Lamium</i> spp.	ann. or per. herb	feral, ornamental, sometimes invasive	p	February-October
Elm	<i>Ulmus</i> spp.	tree	feral	n,p	February-April
Groundsel	<i>Senecio</i> spp.	ann. or per. herb, shrub	feral, ornamental	n,p	February-May
Hawthorn	<i>Crataegus</i> spp.	shrub, tree	feral	n,p	February-June
Peach	<i>Prunus persica</i>	tree	cultivated	n,p	February-April
Pine	<i>Pinus</i> spp.	tree	cultivated, feral	p	February-April

Common Name	Scientific Name	Type	Availability	Resource (nectar or pollen)	Bloom Dates
Skunk Cabbage (Polecat Weed)	<i>Symplocarpus foetidus</i>	per. herb	feral, ornamental	p	February-April
Titi (Spring Titi)	<i>Cliftonia</i> spp.	shrub	feral	n,p	February-April
Willow	<i>Salix</i> spp.	tree	feral	n,p	February-June
Apple	<i>Malus</i> spp.	tree	cultivated	n,p	March-May
Ash	<i>Fraxinus</i> spp.	tree	feral	p	March-May
Blackberry	<i>Rubus</i> spp.	shrub	cultivated, feral	n,p	March-June
Black Locust	<i>Robinia pseudoacacia</i>	tree	feral	n,p	March-June
Cherry (cultivated and uncultivated)	<i>Prunus</i> spp.	tree, shrub	cultivated, feral	n,p	March-May
Cottonwood	<i>Populus</i> spp.	tree	feral	p	March-May
Flowering Dogwood	<i>Cornus florida</i>	tree	feral	n,p	March-April
Gallberry	<i>Ilex glabra</i>	shrub	feral	n,p	March-June
Mustard	<i>Brassica</i> spp.	ann. or bien. herb	feral	n,p	March-September
Oak	<i>Quercus</i> spp.	tree	feral	p	March-May
Persimmon	<i>Diospyros virginiana</i>	tree	cultivated, feral	n,p	March-June
Plum (cultivated)	<i>Prunus</i> spp.	tree	cultivated	n,p	March-April
Rape (Canola)	<i>Brassica napus</i>	ann. herb.	cultivated oilseed	n,p	March-May
Rattan Vine	<i>Berchemia scandens</i>	shrub	feral	.	March-June
Redbud	<i>Cercis</i> spp.	shrub, tree	feral, ornamental	n,p	March-May
Tupelo	<i>Nyssa</i> spp.	tree	feral	n,p	March-June
Vervain	<i>Verbena</i> spp.	ann. or per. herb	feral, ornamental	n,p	March-October
Alsike Clover	<i>Trifolium hybridum</i>	per. herb	cultivated forage	n,p	April-September
Bindweed	<i>Convolvulus</i> spp.	ann. or per. herb	feral, ornamental, sometimes invasive	n,p	April-September
Buckeye	<i>Aesculus</i> spp.	shrub, tree	feral	n,p	April-May
Buckthorn	<i>Rhamnus</i> spp.	shrub, tree	feral, ornamental	n,p	April-June
Catclaw	<i>Acacia greggii</i>	shrub, tree	feral	n,p	April-July
Coneflower	<i>Rudbeckia</i> spp.	ann., bien, or per. herb	feral, ornamental	n,p	April-September
Corn	<i>Zea maize</i>	ann.	cultivated	p	April-September
Crimson Clover	<i>Trifolium incarnatum</i>	ann. herb	cultivated forage	n,p	April-June
Elderberry	<i>Sambucus</i> spp.	shrub, tree	feral, ornamental	n,p	April-July
Holly	<i>Ilex</i> spp.	shrub, tree	feral, ornamental	n,p	April-June
Honey Locust	<i>Gleditsia triacanthos</i>	tree	feral	n,p	April-June
Honeysuckle	<i>Lonicera</i> spp.	shrub	feral	n,p	April-August
Horsemint (Bee Balm)	<i>Monarda</i> spp.	ann. or per. herb	feral, ornamental	n,p	April-October
Huckleberry	<i>Gaylussacia</i> spp.	shrub	feral	n,p	April-June
Johnson Grass	<i>Sorghum halepense</i>	per.	cultivated forage, feral, sometimes noxious	.	April-November
Marigold	<i>Gaillardia pulchella</i>	ann.	feral, ornamental	n,p	April-October
Mesquite	<i>Prosopis glandulosa</i>	shrub, tree	feral	n,p	April-June
Pear	<i>Pyrus</i> spp.	tree	cultivated, ornamental	n,p	April-May
Pepper Vine	<i>Ampelopsis</i> spp.	vine, shrub	feral	n,p	April-August
Persian Clover	<i>Trifolium resupinatum</i>	ann. herb	.	n,p	April-September
Privet	<i>Ligustrum</i> spp.	shrub	feral, ornamental	n,p	April-July
Red Clover	<i>Trifolium pratense</i>	short-lived per.	cultivated forage	n,p	April-September
Sage	<i>Salvia</i> spp.	ann. or per. herb, shrub	ornamental	n,p	April-May
Sweet Clover (White, Yellow)	<i>Melilotus</i> spp.	bien. herb	cultivated forage	n,p	April-October
Thistles	<i>Cirsium</i> spp.	ann., bien., or per. herb	feral	n,p	April-October
Tickseed	<i>Coreopsis lanceolata</i>	per. herb	feral	n	April-June
Titi (Summer Titi)	<i>Cyrilla racemiflora</i>	shrub	feral	n,p	April-July
Tulip Poplar	<i>Liriodendron tulipifera</i>	tree	feral	n,p	April-June
Vetch	<i>Vicia</i> spp.	ann. or bien. herb	cultivated forage	n,p	April-September
White Clover (White Dutch, Ladino)	<i>Trifolium repens</i>	per.	cultivated forage	n,p	April-October
Yellow Rocket	<i>Barbarea vulgaris</i>	bien. or per. herb	feral, sometimes noxious	n,p	April-June

Common Name	Scientific Name	Type	Availability	Resource (nectar or pollen)	Bloom Dates
Alfalfa	<i>Medicago sativa</i>	per. herb	cultivated forage	n,p	May-October
American Beautyberry (French Mulberry)	<i>Callicarpa americana</i>	shrub	feral, ornamental	n	May-June
Aster	<i>Aster</i> spp.	per. herb	feral	n,p	May-November
Bermuda Grass	<i>Cynodon dactylon</i>	per. grass	cultivated forage	.	May-November
Bitterweed	<i>Helenium amarum</i>	ann.	feral	n,p	May-November
Carpet Grass	<i>Phyla nodiflora</i>	per. herb	feral, groundcover	n	May-frost
Catalpa (Catawba)	<i>Catalpa</i> spp.	tree	feral	n,p	May-June
Chinese Tallow Tree	<i>Sapium sebiferum</i>	tree	ornamental	n	May-June
Grape	<i>Vitis</i> spp.	per. vine	cultivated	n,p	May-July
Palmetto (Cabbage Palm)	<i>Sabal</i> spp.	palm	feral	n,p	May-July
Palmetto (Saw Palmetto)	<i>Serenoa repens</i>	palm	feral	n,p	May-July
Prickly Pear	<i>Opuntia</i> spp.	cacti, tree-like	feral, ornamental	n,p	May-June
Raspberry	<i>Rubus</i> spp.	shrub	feral	n,p	May-June
Smartweed	<i>Polygonum</i> spp.	ann. or per. herb	cultivated, feral, ornamental	n,p	May-November
Sorghum	<i>Sorghum bicolor</i>	ann.	cultivated	p	May-October
Sourwood	<i>Oxydendrum arboreum</i>	tree	feral, ornamental	n,p	May-July
Spanish Needles	<i>Bidens</i> spp.	ann. or per. herb	feral, ornamental	n,p	May-November
Sumac	<i>Rhus</i> spp.	shrub, tree	feral	n,p	May-September
Virginia Creeper	<i>Parthenocissus quinquefolia</i>	vine	feral, ornamental	n,p	May-August
Watermelon	<i>Citrullus lanatus</i>	ann.	cultivated	n,p	May-August
Anise Hyssop	<i>Agastache</i> spp.	per. herb	feral, ornamental	n,p	June-September
Balloon Vine	<i>Cardiospermum halicacabum</i>	ann. or bien. vine	feral, ornamental	.	June-August
Basswood	<i>Tilia</i> spp.	tree	feral	n,p	June-July
Blue Vine	<i>Cynanchum laeve</i>	per. herb	feral	n,p	June-September
Boneset (Joe-Pye Weed)	<i>Eupatorium</i> spp.	per. herb, shrub	feral, ornamental	n,p	June-November
Buckwheat	<i>Fagopyrum esculentum</i>	herb	cultivated	n,p	June-frost
Buttonbush	<i>Cephalanthus</i> spp.	shrub, tree	feral	n,p	June-September
Clethra (Sweet Pepperbush)	<i>Clethra alnifolia</i>	shrub	feral	n,p	June-September
Cotton	<i>Gossypium</i> spp.	ann. herb	cultivated	n,p	June-September
Cowpea	<i>Vigna unguiculata</i>	ann. herb	cultivated	n,p	June-September
Cranberry	<i>Vaccinium macrocarpon</i>	evergreen	cultivated, feral	n,p	June-July
Ironweed	<i>Vernonia</i> spp.	per. herb, shrub, tree	feral, ornamental	n,p	June-October
Lespedeza (Bush Clover)	<i>Lespedeza</i> spp.	per. herb, shrub	feral, ornamental	n,p	June-October
Lima Bean	<i>Phaseolus lunatus</i>	herb	cultivated	n,p	June-July
Loosestrife (Purple Loosestrife)	<i>Lythrum salicaria</i>	per. herb	cultivated, feral	n,p	June-September
Mexican Clover	<i>Richardia scabra</i>	ann. herb	cultivated, feral	n	June-frost
Milkweed	<i>Asclepias</i> spp.	per. herb	feral	n	June-August
Mint	<i>Mentha</i> spp.	per. herb	cultivated, feral, ornamental	n	June-September
Partridge Pea	<i>Cassia fasciculata</i>	ann. herb	feral	n,p	June-October
Prickly Ash	<i>Aralia spinosa</i>	shrub, tree	feral	n	June-August
Star Thistle	<i>Centaurea</i> spp.	ann., bien., or per. herb	feral, ornamental	n,p	June-October
Sunflower	<i>Helianthus</i> spp.	ann. or per. herb	cultivated ornamental and oilseed, feral	n,p	June-November
Vitex (Chaste Tree)	<i>Vitex</i> spp.	shrub, tree	ornamental	n,p	June-July
Broomweed	<i>Gutierrezia texana</i>	per. herb	feral	.	July-October
Goldenrod	<i>Solidago</i> spp.	per. herb	feral	n,p	July-November
Ragweed	<i>Ambrosia</i> spp.	herb	feral, often noxious	p	July-October
Snowvine	<i>Mikania scandens</i>	per. vine	feral	n,p	July-frost
Soybean	<i>Glycine max</i>	ann. herb	cultivated	n,p	July-October
Woodbine	<i>Clematis virginiana</i>	per. herb	feral, ornamental	n,p	July-September

Common Name	Scientific Name	Type	Availability	Resource (nectar or pollen)	Bloom Dates
Brazilian Pepper Tree	<i>Schinus terebinthifolius</i>	shrub, tree	feral, ornamental, sometimes noxious	.	August-October
Crown-beard	<i>Verbesina</i> spp.	ann. or per. herb, shrub, tree	feral	n,p	August-October
Matchweed (Snakeweed)	<i>Gutierrezia sarothrae</i>	per. herb	feral	n,p	August-October
Prairie clover	<i>Dalea</i> spp.	herb, shrub	feral	n,p	September-October
Baccharis (Groundsel)	<i>Baccharis</i> spp.	shrub	feral, ornamental	n,p	October-November
Strawberry	<i>Fragaria x ananassa</i>	per. herb	cultivated,feral	n,p	December-May

References

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- [\[i\].Robinson, W.S., R. Nowogrodzki, & R.A. Morse. 1989. American Bee Journal 129: 411-423, 477-487](#)
- [\[ii\].Southwick, E.E. & L. Southwick, Jr. 1992. Journal of Economic Entomology 85: 621-633](#)
- [3.Kraus, B. & R.E. Page. 1995. Environmental Entomology 24: 1473-1480](#)
- [4.Loper, G.M. 1995. American Bee Journal 135: 823-824](#)
- [5.Osborne, J.L., I.H. Williams, & S.A. Corbet. 1991. Bee World 72: 99-116](#)
- [6.Banaszak, J. 1992. Agricultural Ecosystems and the Environment 40: 179-192](#)
- [7.Gathmann, A., H.-J. Greiler, & T. Tschardt. 1994. Oecologia 98: 8-14](#)
- [8.Dramstad, W. & G. Fry. 1995. Agricultural Ecosystems and the Environment 53: 123-135](#)
- [9.Butler, C.G. 1965. Proceedings of the Royal Entomological Society of London \(A\) 40: 77-80](#)
- [10.Heinrich, B. 1979. Bumblebee economics. Harvard University Press, Cambridge, Massachusetts](#)
- [11.Bauer, M. & W. Engels. 1992. Apidologie 23: 340-342](#)
- [12.Parrish, J.A.D. & F.A. Bazzaz. 1979. Ecology 60: 597-610](#)
- [13.Fussell, M. & S.A. Corbet. 1992. Journal of Applied Ecology 29: 451-465](#)
- [14.Bowers, M.A. 1985. Ecology 66: 914-927](#)
- [15.Williams, I.H., S.A. Corbet, & J.L. Osborne. 1991. Bee World 72: 170-180](#)
- [16.Ayers, G.S., & J.R. Harman. 1992. In The hive and the honey bee \(J.M. Graham, ed.\), Dadant & Sons, Hamilton, Illinois](#)
- [17.Cane, J.H. 1993. In Proceedings of the Southeast Blueberry Conference. Tifton, Georgia](#)
- [18.Delaplane, K.S. 1993. Honey bees and beekeeping. University of Georgia Cooperative Extension Service Bulletin 1045](#)
- [19.Hortus Third. 1976. Macmillan Publishing Co., New York](#)
- [20.Krewer, G.W., K.S. Delaplane, & P.A. Thomas. 1996. HortScience 31: 750](#)
- [21.Mitchell, T.B. 1962. Bees of the eastern United States. North Carolina Agricultural Experiment Station Bulletin 152](#)

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