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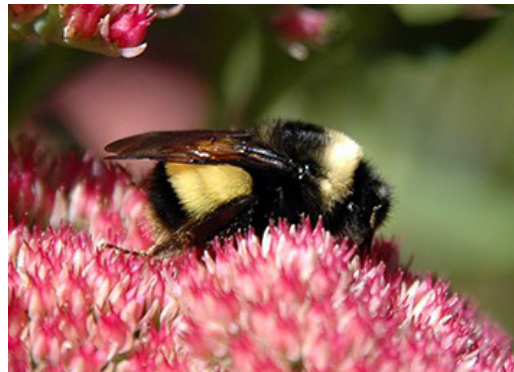


Rusty Patched Bumble Bee (*Bombus affinis*) & Yellow Banded Bumble Bee (*Bombus terricola*)

Landowner Guide



Rusty Patched Bumble Bee
Photo Courtesy of Susan Day



Yellow Banded Bumble Bee
Photo Courtesy of Sandy Gillian

IDENTIFICATION

Both the Rusty Patched Bumblebee (RPBB) and Yellow Banded Bumblebee (YBBB) have entirely black heads. Male and worker RPBBs have a rusty/reddish patch located centrally in the abdomen; YBBBs have yellow bands on the front of the thorax and on the entire second and third abdominal segments.

Historically, both bumblebees were common throughout the eastern United States, but habitat alteration, non-native pathogens associated with managed bee colonies, and widespread pesticide use have drastically reduced their populations. RPBBs now remain in only 5% of their previous range.

The US Fish and Wildlife Service (USFWS) listed the RPBB as federally endangered in 2017. USFWS has not yet listed the YBBB, but in 2019, found that its range and populations are declining.

LIFE HISTORY

RPBBs and YBBBs are both highly social and form annual colonies of a single queen, female workers, and males. Healthy RPBB colonies are large, with up to 1,000 workers, while YBBB colonies are more typical for bumblebees, with 150-430 workers.

Queens emerge from their underground overwintering sites in early spring, then immediately forage for food sources. After finding a suitable nest site and stockpiling pollen and nectar to support egg production, queens lay up to 12 eggs on top of the pollen and nectar stores. As the eggs hatch, the bees assume the tasks of food collection and care of the young, while the queen produces more eggs for workers, males, and new queens. From July to September, new males and queens emerge, disperse (males may move up to five miles), and mate. Fertile queens feed heavily in the fall to build up energy reserves for overwintering, but old queens, workers, and males die before winter.

HABITAT

Habitat for both bumblebee species must contain abundant and prolonged sources of nectar and pollen. The habitat must also include undisturbed nesting sites near pollen and nectar sources, and overwintering sites for fertile queens.

Both species can be found in a wide variety of habitats—prairies, woodlands, riparian areas, wetlands, gardens, parks, bogs, and barrens. Since only minor differences in habitat use exist, RPBB habitat will also benefit YBBB and other native pollinators.

NECTAR AND POLLEN PLANTS

The amount and availability of flowering plants is more important to RPBBs and YBBBs than the species of plants. Both species need a variety of blooming plants from April through September, within a half mile of the colony's nest. Abundant flowers in the spring improve a queen's egg-laying abilities, while abundant flowers in the summer and fall improve the number, size, and fitness of males and new queens. New queens need large amounts of pollen and nectar to create the fat reserves required to survive overwintering.

NESTING HABITAT

Nesting habitat may be a limiting factor for RPBBs and YBBBs. Forest/field edges, forest/grassland edges, and meadow margins are particularly valuable nesting areas, but changes in land use and management have made such sites less common, resulting in high levels of inter-species competition for limited nesting sites.

RPBBs and YBBBs make their nests one to four feet underground, often using abandoned rodent burrows. Successful nests usually occur in undisturbed areas within a half mile of diverse nectar sources.

OVERWINTERING HABITAT

Overwintering sites close to spring-blooming plants are critical for bumblebee queens, who require pollen and nectar upon emergence in the spring; overwintering sites must also be undisturbed from late fall through early spring, while queens are hibernating.

YBBB queens dig a small, oval burrow in barren soil; the depth of the burrow depends on soil conditions. If she encounters a rock or root while digging, a queen will abandon the current burrow and begin digging another. Very little is known about the nesting requirements of RPBBs.

HABITAT RESTORATION RECOMMENDATIONS

Priority areas in Pennsylvania are low-density woodlands bordering meadows or grasslands, in rural and suburban settings. Preferred sites will be roughly 50% foraging habitat of "meadow" with at least 10 species of flowers blooming at all times from late March through October, roughly 25% nesting habitat of unmowed low-density native grass clumps with bare soil between clumps, and roughly 25% overwintering habitat of unmowed woodland edges with an open understory and at least 10 species of native spring-blooming forbs, shrubs, or trees.

Methods to achieve RPBB and YBBB habitat include:

- 1) Converting ag land adjacent to a forested edge.
 - Herbicide: apply one application to control weeds



*Yellow Banded Bumble Bee Photo
Courtesy of Leif Richardson*

- Seed: plant soil-appropriate seed mix for nectar areas
 - in fall, seed with cover crop of winter rye; in spring, no cover crop needed
 - include at least 10 flowering forbs for each season (spring, summer, fall); also include three bumblebee “superfoods” (see plant list, attached)
 - include native grasses, seeded separately as predominantly grass areas
- 2) Converting forest edge to scrub habitat.
- Thin forest understory: in spring, apply herbicide via stump/stem treatment or cut and remove trees; repeat treatment in fall
 - Seed: plant soil-appropriate seed mix for nectar areas in the following spring as above; exclude native grass patches, which are not required in the forest edge.
- 3) Enhancing existing native meadows or native warm season grass plantings.
- Create bare soil patches: remove grasses and residues to create bare areas in spring
 - Plant: forb plugs to improve and diversify nectar areas
 - include at least 10 flowering forbs for each season (spring, summer, fall); also include three bumblebee “superfoods” (see plant list, attached)

LONG-TERM MAINTENANCE

- 1) Existing RPBB and YBBB Habitat
- Mow less than an third of the existing habitat in any one year, to create a mosaic of patches at different stages of regrowth. Mow at 12 inches off the ground, if possible.
 - Where existing RPBB/YBBB populations occur without fire, do not introduce fire. If site is currently burned, burn less than a third of the existing habitat on a 4- to 6-year rotation, to create a mosaic of patches at different stages of regrowth.
 - Apply herbicides as spot-treatments or stump-treatments, to prevent loss of nectar and larval plants. Limit or prevent drift from nearby crop fields as much as possible.
 - Bumblebees are especially sensitive to pesticides that are applied during colony formation in the spring; implement a 40-foot buffer for standard pesticide applications, and a 125-foot buffer for neonicotinoids.
- 2) Restored/Created RPBB and YBBB Habitat
- Mow as described for existing habitat above, as winter mowing (September 1 – March 31).
 - Use machinery with the smallest footprint possible, to avoid crushing overwintering queens or damaging potential nest sites.
 - Apply herbicides as spot-treatments or stump-treatments to prevent loss of nectar and larval plants. Limit or prevent drift from nearby crop fields as much as possible.
 - Replant nectar and larval plants as needed; thin forest understory as needed.
 - Maintain/replant nectar and larval plants as needed to connect bee colonies within one mile of another colony, to improve long-term persistence of local populations and connect remnant habitats.



Rusty Patched Bumble Bee Photo Courtesy of Larry Reis

COMMON NAME	SPECIES	PERIOD	RANGE IN PA
Forbs			
Yellow Giant Hyssop ^{1,2}	<i>Agastache nepetoides</i>	SuAu	Southern and NJ border counties
White Snakeroot	<i>Ageratina altissima</i>	SuAu	Throughout
Eastern Goatsbeard	<i>Aruncus dioicus</i>	Su	South Central to Southwest counties
Field Thistle ¹	<i>Cirsium discolor</i>	SuAu	All but Erie Basin and Upper Allegheny River Basin
Tall Thistle ¹	<i>Cirsium altissimum</i>	SuAu	Southwest and Southeast counties
Swamp Thistle ¹	<i>Cirsium muticum</i>	SuAu	All but Susquehanna Basin
Pasture Thistle ¹	<i>Cirsium pumilum</i>	SuAu	All but lower Susquehanna Basin
Boneset ¹	<i>Eupatorium perfoliatum</i>	SuAu	Throughout
Trumpetweed ¹	<i>Eutrochium fistulosum</i>	SuAu	Throughout
Spotted Joe Pye Weed ^{1,2}	<i>Eutrochium maculatum</i>	SuAu	All but South Central and Southwest
Sweet Scented Joe Pye Weed ^{1,2}	<i>Eutrochium purpureum</i>	SuAu	Throughout
Wild Geranium	<i>Geranium maculatum</i>	Sp	Throughout
Spotted Geranium	<i>Geranium maculatum</i>	Sp	Throughout
Thin-Leaved Sunflower ²	<i>Helianthus decapetalus</i>	SuAu	Throughout
Woodland Sunflower ²	<i>Helianthus divaricatus</i>	SuAu	Throughout
Jewelweed	<i>Impatiens capensis</i>	Su	Throughout
Dense Blazing-Star	<i>Liatris spicata</i>	Su	Southeast Counties
Bee Balm/Wild Bergamot ^{1,2}	<i>Monarda fistulosa</i>	Su	Throughout
Wild Blue Phlox	<i>Phlox divaricata</i>	Sp	All but Northeast Counties
Creeping Phlox	<i>Phlox stolonifera</i>	Sp	Appalachian Ridge Counties
Mayapple	<i>Podophyllum peltatum</i>	Sp	Throughout
Mountain Mint ¹	<i>Pycnanthemum virginianum</i>	Su	All but Northern Tier except Erie County
Bloodroot	<i>Sanguinaria canadensis</i>	Sp	All but Upper Allegheny Basin
Atlantic Goldenrod ^{1,2}	<i>Solidago argute</i>	Au	Throughout
White Goldenrod ^{1,2}	<i>Solidago bicolor</i>	Au	Throughout
Wreath Goldenrod ^{1,2}	<i>Solidago caesia</i>	Au	Throughout
Canada Goldenrod ^{1,2}	<i>Solidago canadensis</i>	Au	Throughout
Zigzag Goldenrod ^{1,2}	<i>Solidago flexicaulis</i>	Au	All but Central counties
Giant Goldenrod ^{1,2}	<i>Solidago gigantean</i>	Au	Throughout
Early Goldenrod ^{1,2}	<i>Solidago juncea</i>	SuAu	Throughout
Gray Goldenrod ^{1,2}	<i>Solidago nemoralis</i>	Au	Throughout
Roundleaf Goldenrod ^{1,2}	<i>Solidago patula</i>	Au	All but Susquehanna Basin
Downy Goldenrod ^{1,2}	<i>Solidago puberula</i>	Au	Central and Eastern counties
Wrinkle Leaf Goldenrod ^{1,2}	<i>Solidago rugosa</i>	Au	Throughout
Common Blue Wood Aster ^{1,2}	<i>Symphyotrichum cordifolium</i>	Au	Throughout

White Panicle Aster ^{1,2}	<i>Symphyotrichum lanceolatum</i>	Au	Throughout
Calico Aster ^{1,2}	<i>Symphyotrichum lateriflorum</i>	Au	Throughout
New England Aster ^{1,2}	<i>Symphyotrichum novae-angliae</i>	Au	Throughout
Late Purple Aster ^{1,2}	<i>Symphyotrichum patens</i>	Au	Eastern counties
Hairy White Oldfield Aster ^{1,2}	<i>Symphyotrichum pilosum</i>	Au	Throughout
Purplestem Aster ^{1,2}	<i>Symphyotrichum puniceum</i>	Au	Throughout
Foamflower	<i>Tiarella cordifolia</i>	Sp	All but Southeast and South Central
Culver's Root	<i>Veronicastrum virginicum</i>	Su	All but North Central, Erie, Susquehanna, and Wayne
Shrubs			
Gray Alder	<i>Alnus incana</i>	Sp	All but Southeast and Southwest
Hazel Alder	<i>Alnus serrulata</i>	Sp	All but Northern most counties, excluding Erie and Wayne
New Jersey Tea	<i>Ceanothus americanus</i>	Su	Throughout
Buttonbush	<i>Cephalanthus occidentalis</i>	Su	All but extreme North Central
Silky Dogwood	<i>Cornus amomum</i>	Sp	Throughout
Dwarf Bush Honeysuckle	<i>Diervilla lonicera</i>	Su	Throughout
American Black Current ¹	<i>Ribes americanum</i>	Sp	All but Southwest and North Central
Eastern Prickly Gooseberry ¹	<i>Ribes cynosbati</i>	Sp	All but Southeast and South Central
Appalachian Gooseberry ¹	<i>Ribes rotundifolium</i>	Sp	All but Southwest and Northeast
Carolina Rose ¹	<i>Rosa carolina</i>	Su	Throughout
Swamp Rose ¹	<i>Rosa palustris</i>	Su	Throughout
Virginia Rose ¹	<i>Rosa virginiana</i>	Su	Southeast and Northeast
Blackberries/Raspberries ¹	<i>Rubus spp.</i>	Su	Throughout
Common Elderberry	<i>Sambucus nigra canadensis</i>	Su	Throughout
White Meadowsweet ¹	<i>Spiraea alba</i>	SuAu	Throughout
Steeplebush ¹	<i>Spiraea tomentosa</i>	SuAu	All but South Central and Southwest
Lowbush Blueberry ^{1,2}	<i>Vaccinium angustifolium</i>	Su	Throughout
Highbush Blueberry ^{1,2}	<i>Vaccinium corymbosum</i>	Su	Throughout
Trees			
Box Elder	<i>Acer negundo</i>	Sp	Throughout
Red Maple	<i>Acer rubrum</i>	Sp	Throughout
Silver Maple	<i>Acer saccharinum</i>	Sp	Throughout
Sugar Maple	<i>Acer saccharum</i>	Sp	Throughout
Ohio Buckeye ¹	<i>Aesculus glabra</i>	Sp	Southwest
Common Serviceberry	<i>Amelanchier arborea</i>	Sp	Throughout

Hackberry	<i>Celtis occidentalis</i>	Sp	All but Erie Basin and Upper Allegheny River Basin
Redbud	<i>Cercis canadensis</i>	Sp	Southern Counties
Flowering Dogwood	<i>Cornus florida</i>	Sp	Throughout
Cucumber Tree	<i>Magnolia acuminata</i>	Sp	All but counties bordering NJ and lower Susquehanna River
Big Tooth Aspen	<i>Populus grandidentata</i>	Sp	Throughout
Quaking Aspen	<i>Populus tremuloides</i>	Sp	All except Southwest
American Plum ¹	<i>Prunus americana</i>	Sp	All but Northeast
Pin Cherry ¹	<i>Prunus pensylvanica</i>	Sp	All but Southwest
Black Cherry ¹	<i>Prunus serotina</i>	Sp	Throughout
Chokecherry ¹	<i>Prunus virginiana</i>	Sp	Throughout
Black Willow	<i>Salix nigra</i>	Sp	Throughout
Silky Willow	<i>Salix sericea</i>	Sp	Throughout
Sassafras	<i>Sassafras albidum</i>	Sp	Throughout
Basswood	<i>Tilia americana</i>	Su	Throughout
¹ RPBB and/or YBBB observed on plants in this genus (Williams et al. 2014); natives within genus selected			
² Bumble bee superfood based on nectar and pollen quantity or immune boosting benefits (USFWS 2018b; Xerces 2017)			



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