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Encouraging Native Pollinators with Plant Diversity

Susan Fluegel, Working Gloves Farm – Moscow, ID
Rural Roots Board Member
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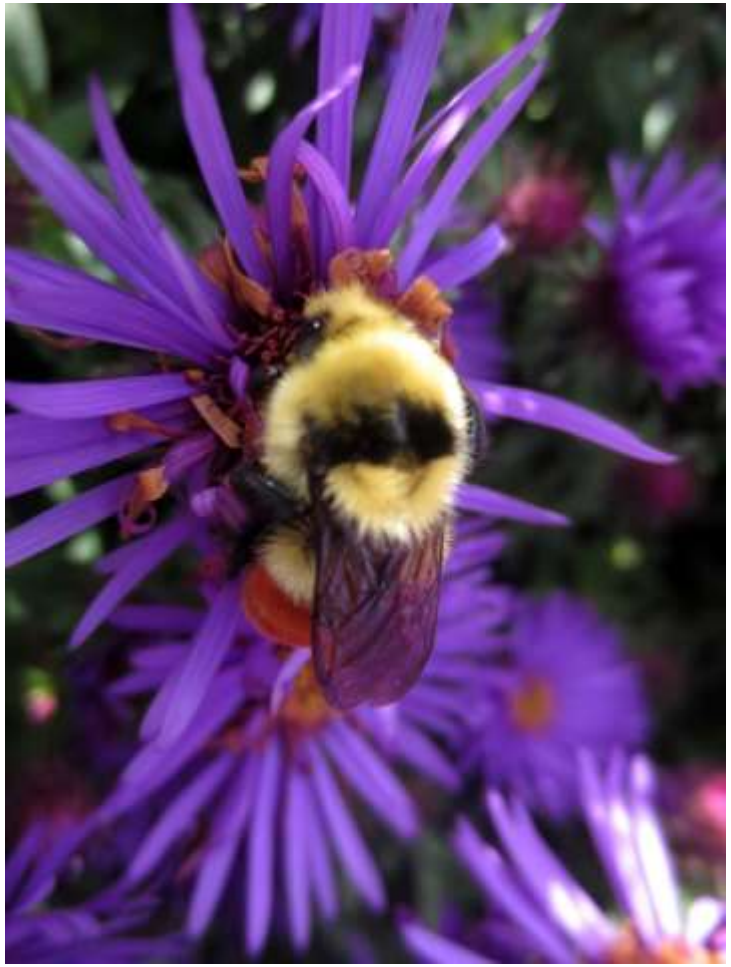
Encouraging Native Pollinators with Plant Diversity

By Susan Fluegel, PHD

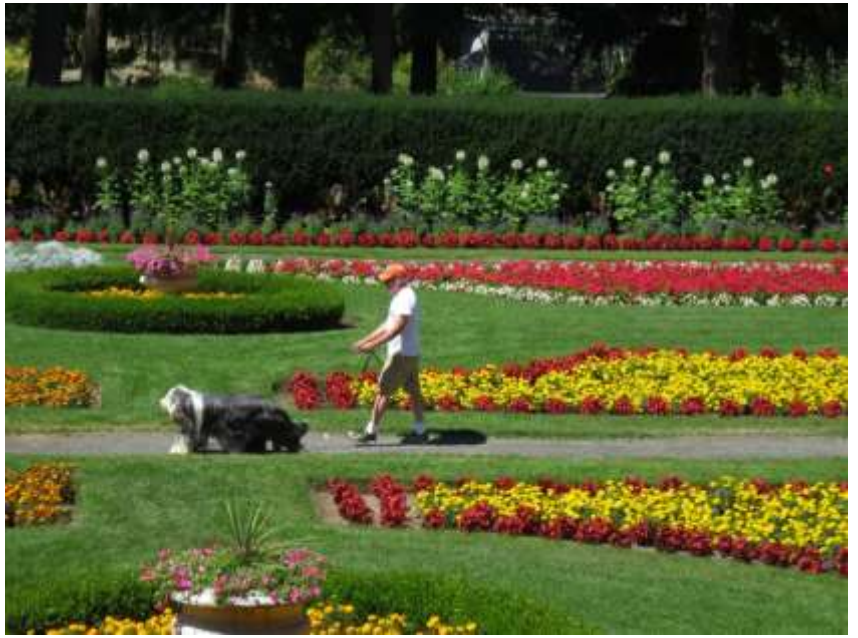
Do you know what a pollinator wants?

- Our ideas about pollinators are wrong
- Garbuzov et al. (2017) revealed that many plants garden centers label ‘bee friendly’ are unattractive to pollinators
  - Researchers compared insect visitations on 74 full bloom plants across 6 garden centers to marjoram
  - Most garden center plants (including those labeled ‘bee friendly’) did not attract very many pollinators compared to marjoram
  - Some unlabeled garden center plants attracted pollinators better
- The majority of the insect-friendly flowers and plants don't belong to bee friendly recommended lists



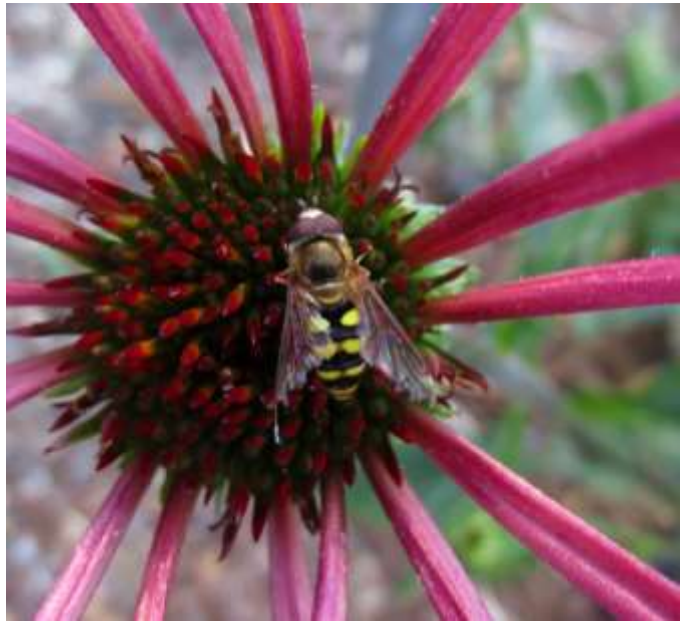
Gardens for pollinators

- What is beautiful color and design to humans may be a wasteland to pollinators
- The garden center studies correlated with similar studies done by Garbuzov et al. 2015 in urban public gardens
  - No insects visited 30% of the flower varieties
  - 77% of plants were either poorly or completely unattractive to pollinators
  - Only 4% of plants were highly attractive to pollinators
- Taking time to select better plants could enhance pollinator habitat by a hundred-fold or more
- There is a new field that merges landscape and pollination ecology (Betts et al. 2019)



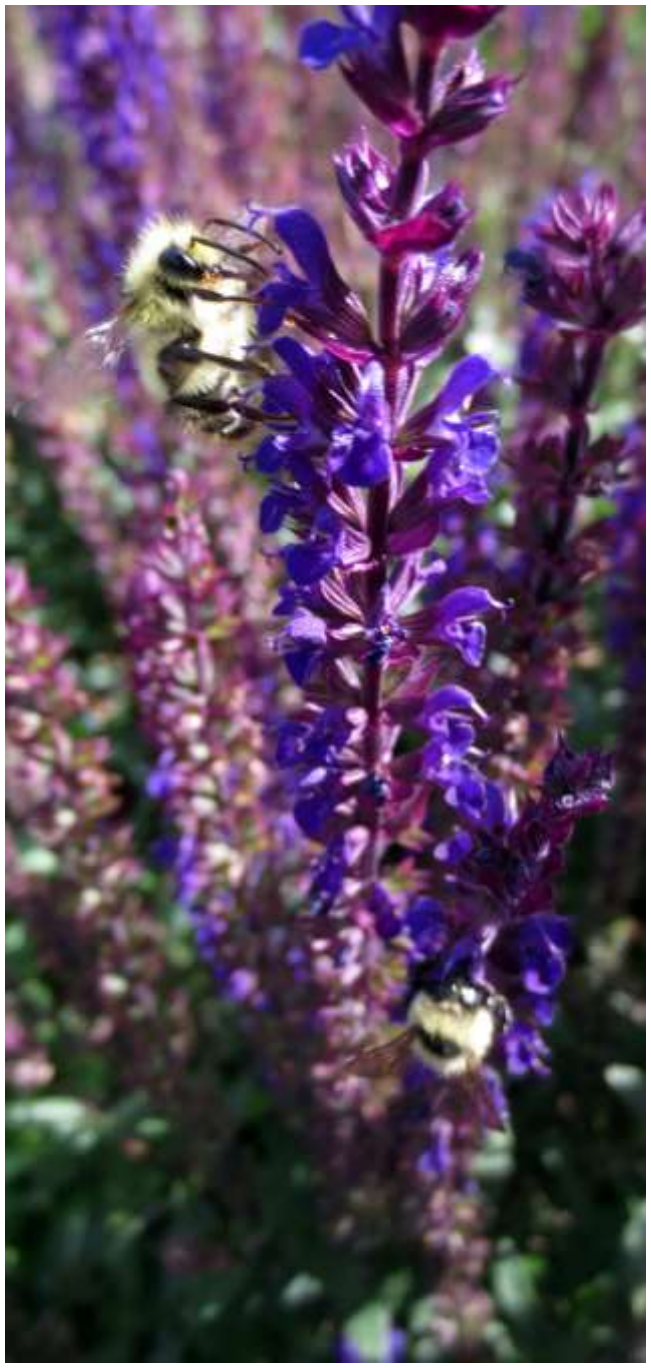
Diversity includes both native and exotic plants

- Pollinators aren’t xenophobic
- Pollinators benefit from a mix of native and non-native plant species
- Research shows that carefully including non-native plants species in a native plant landscaping can increase pollinator habitat (Salisbury et al. 2015)
- Pollinator visits increased with:
  - More flowers
  - At peak blooming seasons
- Landscapes benefit from non-native plants whose blooming time extends or fills in gaps left by flowering natives



Adding non-native plants benefits the whole community

- Exotic plants enhance populations of a community's specialist pollinators and fill vacant coevolutionary niches (Stouffer et al. 2014)
- Communities with exotic plants have greater total, plant, and pollinator richness, and higher values of relative nestedness
- Nestedness is a measure of structure in an ecological system
  - Species-species interaction networks
  - Species distribution across a system
- In California, research shows more diverse native plant communities ALSO contain more non-native species

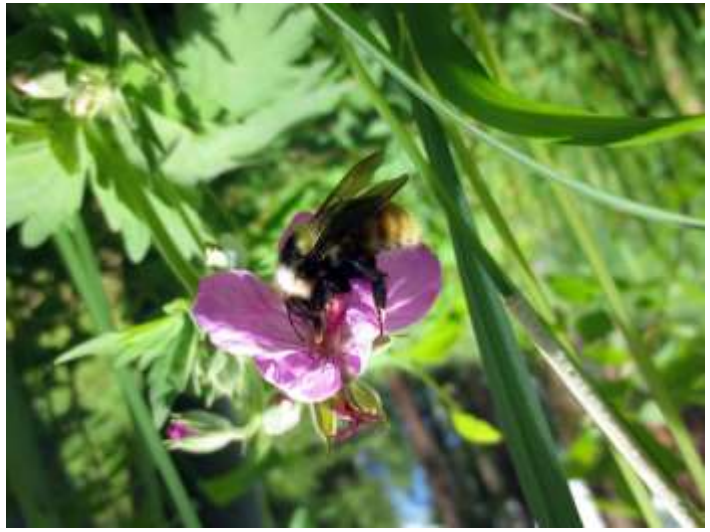


- Red clover test plots in cities were pollinated better when compared to urban areas, this resulted in higher urban seed set (Theodorou et al. 2020)
- Consider pollinator needs when landscape planning in any setting
  - Landscape composition (heterogeneity)
  - Habitat fragmentation has diverse effects (can drive generalization) (Xiao et al. 2016)
  - Small scale habitat features associated with food and nesting
- What drives pollinator richness (bees, wasps, flies, beetles, butterflies)?
  - Local flower richness (rural)
  - Edge density (urban and rural)
  - Residential cover (urban)
  - Habitat diversity (urban and rural)

Pollinator efficiency is greater in urban areas

Diversity drives pollinating in agriculture

- Fava bean fields(Raderschall et al. 2021)
  - Landscape crop diversity near fava bean fields enhances bumblebee and honeybee populations
  - Fava beans are self fertile but their yield increases with insect pollination and the percentage of semi-natural habitat nearby
- Highbush blueberry planting (Blaauw and Isaacs 2014)
  - Diverse flower plantings (15 perennial varieties proven attractive to pollinators) increased native bee and syrphid (hoverfly) populations
  - Fruit set, berry weight and mature seeds per berry were significantly greater in fields adjacent to wildflower plantings 3 and 4 years after planting wildflowers



- Want butterflies and moths? Feed their caterpillars
- 90% of caterpillars' food is from only 14% of native plant species AND 5% plants make up 75% of caterpillar food
- Plant these keystone woody and herbaceous species to support Lepidoptera caterpillars in North America (Narango et al. 2020)
  - Top 5 best host woody plants include Quercus (oaks), Salix (willows), Prunus (cherries, plums, peaches), Betula, Populus (poplars, aspen and cottonwoods), Pinus (pines)
  - Best 11 host herbaceous plants include Trifolium (clover), Solidago (goldenrod), Helianthus (sunflower, blanket flower), Solanum (nightshades, horse nettle), Ambrosia (ragweed), Ipomoea (morning glory), Fragaria (strawberry), Plantago (plantains), Lactuca (lettuce), Polygonum (buckwheat), Eupatorium (bone-set, thoroughwort)
- Notice how many of our favorite food plants are on this list!

Add keystone species for butterflies

Planting keystone species works

- For woody plants:
  - 20 randomly selected woody plants, support just 38% of Lepidoptera and 13% of plant/caterpillar interactions are supported
  - If 10 of the selected 20 species are keystone plants, 71% of Lepidoptera and 40% of plant/caterpillar interactions are supported
- For herbaceous plants:
  - Planting 20 plants with no keystone species supported just 13% of potential Lepidoptera species and 2% of potential plant/caterpillar interactions
  - Planting 10 keystone species supported 42% of Lepidoptera and 10% of interactions
- Check out an interactive website that allows you to find what plants are best for butterflies in your area: https://www.nwf.org/NativePlantFinder
- This is still in beta testing

Energy efficiency determines flower preference in bees

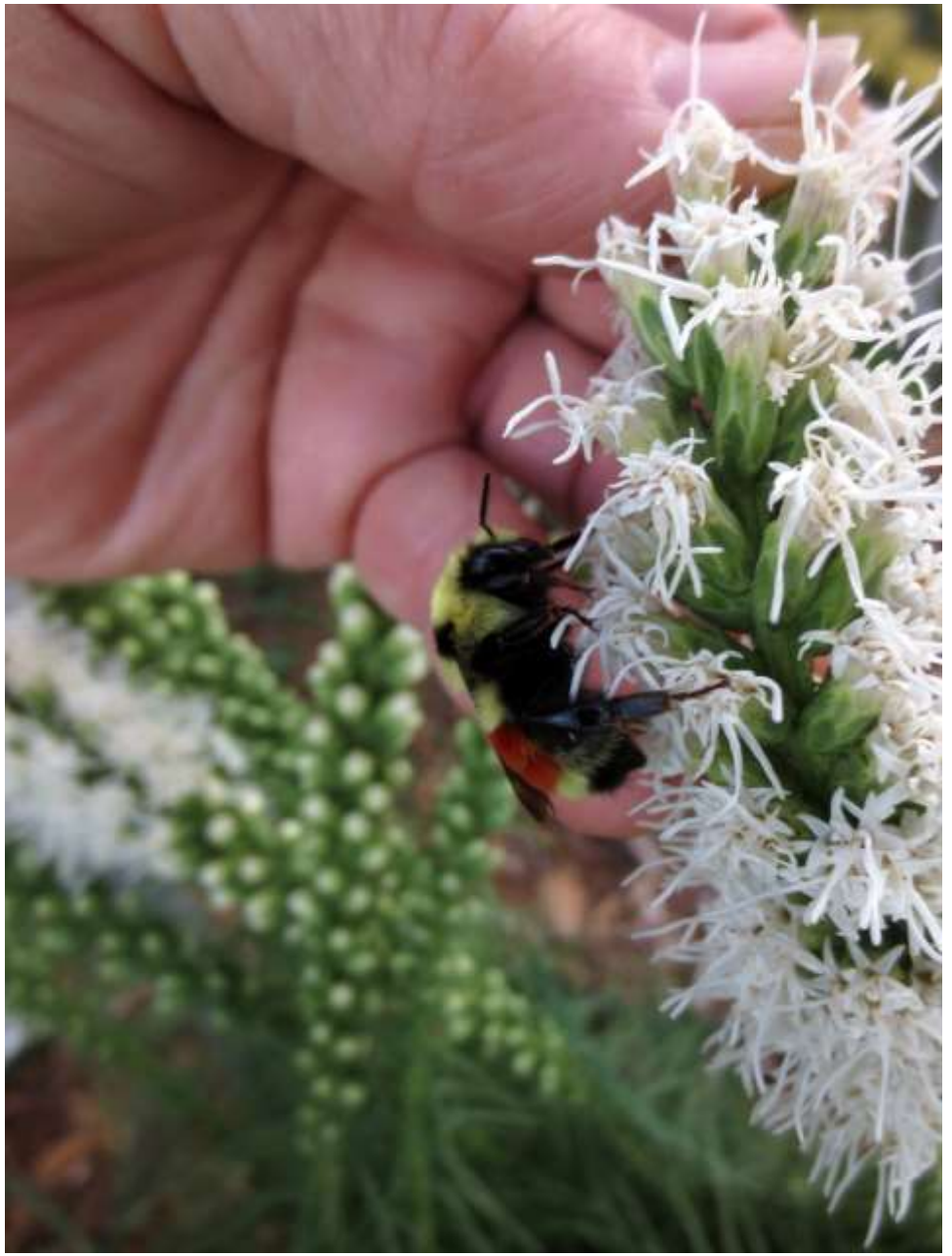
- After watching and weighing over 1,000 bees, Balfour et al. 2021 determined that energy efficiency is a key factor in flower selection
- Bee foraging energy efficiency is determined by bee bodyweight and the rate at which they visit flowers
- The number of flowers a bee visits per minute, determines how much nectar (energy) she collects
  - Heavier bumblebees visit flowers 2-3 times faster than lighter honeybees
  - About ½ of the pollen/nectar energy they gather is used up by foraging
- Morphology of flower blooms influences pollinator choice
- Bumblebees also switch flowers depending on which are in full bloom at the time (Cole et al. 2020)

More pollinator research is needed

- Due to the many misconceptions about pollinator plant and habitat preferences more research is needed
- My mom, Jane Fluegel, and I received a WSARE grant to research whether plant architecture (plant shape and form) and/or plant genetic diversity influenced pollinator abundance and/or diversity
  - I was curious if plant overall shape and form would make more of a difference than plant genetics in pollinator plots
  - I also wanted to look at pollinator numbers, pollinator diversity, care and hardiness of flowers
- I used time-lapse cameras to film plants for two growing seasons and spent my winter watching, identifying, and counting pollinators
- I am recommending easy-care plants that actually attracted pollinators from our research plus adding which pollinators they attracted over 2 years

Easy-care plants for the PNW

- All were almost totally deer-proof on our farm
- All are proven super pollinator attractors
- All but gaillardia are hardy to zone 3 and survived huge temperature swings
- All are fairly drought tolerant after first year
- A combination of these plants will attract all families of native pollinators and some beneficial insects
- Included some nativars: cultivars derived from native plants
- There are other great pollinator plants for the PNW: I am just recommending the ones I have personally tested

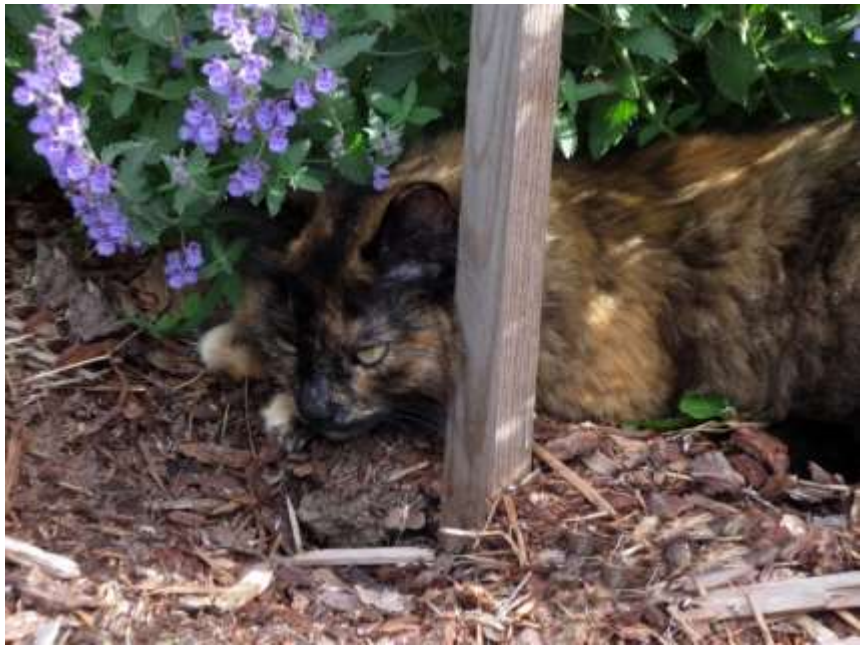


Basic Planting Tips

- Kill perennial weeds before planting pollinator plots
  - I used billboard tarps (can use plastic) held down with concrete blocks
  - Water first, cover with tarp or plastic (dark color looks less conspicuous)
  - Heat kills weeds
  - Easier to eliminate weeds first for organic planting
  - Please don’t spray pollinator plots unless you want to eliminate pollinators!
- Plant in patches of 3-7 plants; incorporate mixed plant species
- Don’t plant late starting plants like gaillardia by the catmint or other robust early growing plants; the catmint will take over
- Mulch around plants but leave some areas bare for bee habitat (or compost some areas) – I left some areas bare outside my mulched experiment plot
- Consider drip irrigation if possible

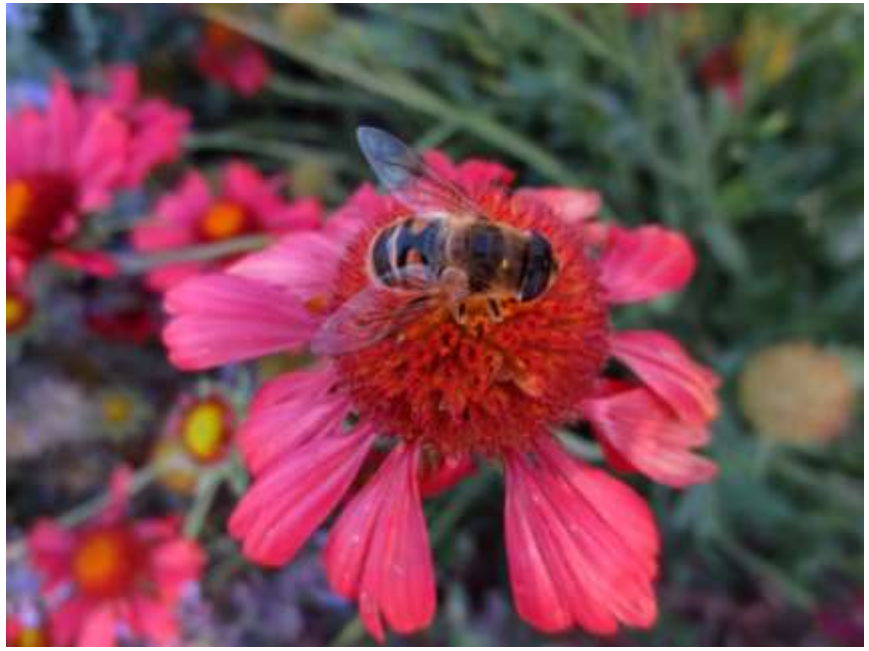
Recommended Plants

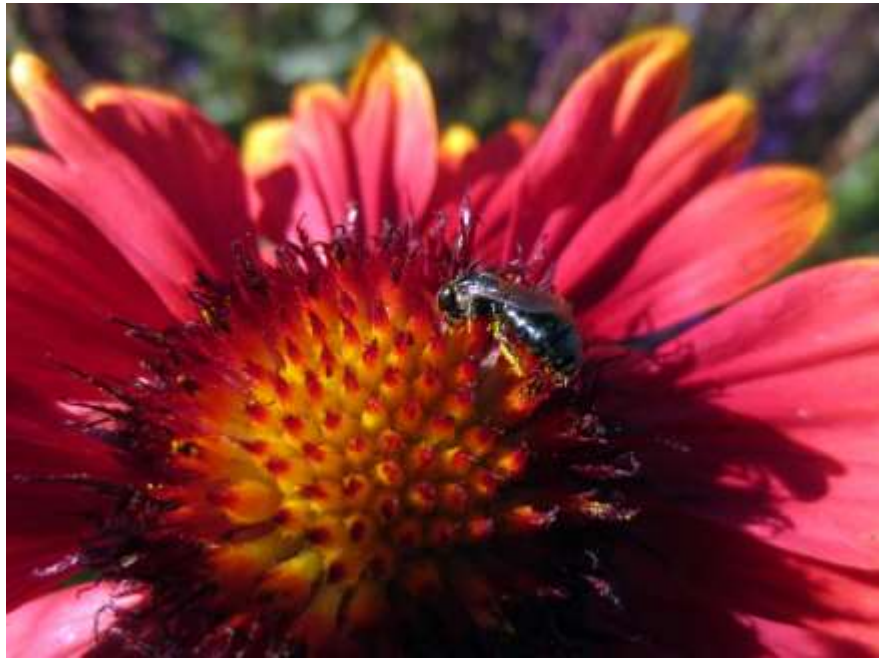
- Salvia ‘Caradonna’ and Salvia nemorosa 'East Friesland'
  - Supports bumblebees, native solitary bees and native wasps
  - Very tidy plant blooms from spring to first hard fall frost
  - Blue blooms are naturally elegant and gorgeous enough for a formal garden (Caradonna darker blue)
  - Attracted attention by pollinators and people alike
- Catmint Nepata x faassenii ‘Walker’s Low’
  - Beloved by big bumblebees, honeybees, solitary bees, cats, and butterflies
  - Grows into a tidy blue mound
  - Blooms from early spring until first hard frost late fall if given a dose of supplemental water in midsummer
- Both catmint and salvia support pollinators all season long and look great together – see photo



Recommended Plants

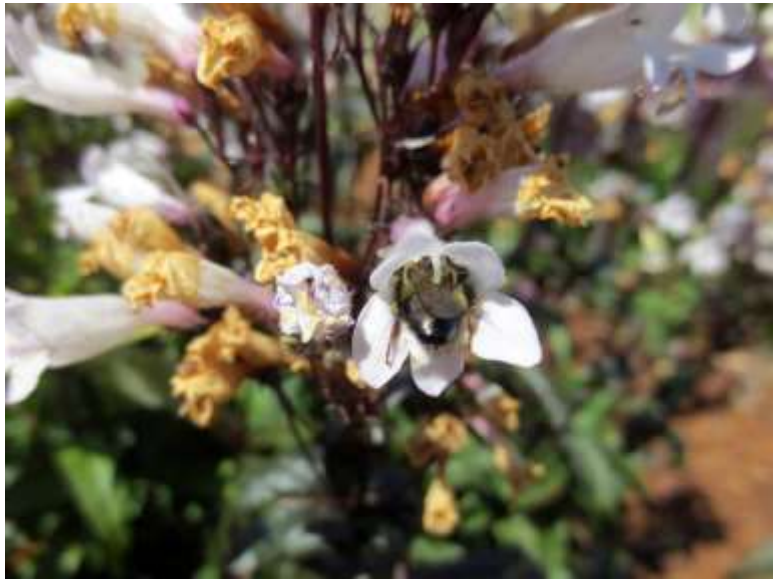
- Gaillardia ‘Burgundy’ (plant in sheltered areas)
  - Navitar – a developed native (blanket flower)
  - Keystone support plant for lepidoptera caterpillars (butterflies)
  - Attracts loads of Medium bumblebees, honeybees, solitary native bees, butterflies
  - Had some winter kill the second year (cold with no snow cover) but some survived
  - Some varieties are not cold tolerant at all – be careful and don’t trust labels
  - Takes time to come out of winter – can look dead in meantime
  - Beautiful red blooms through summer and into fall





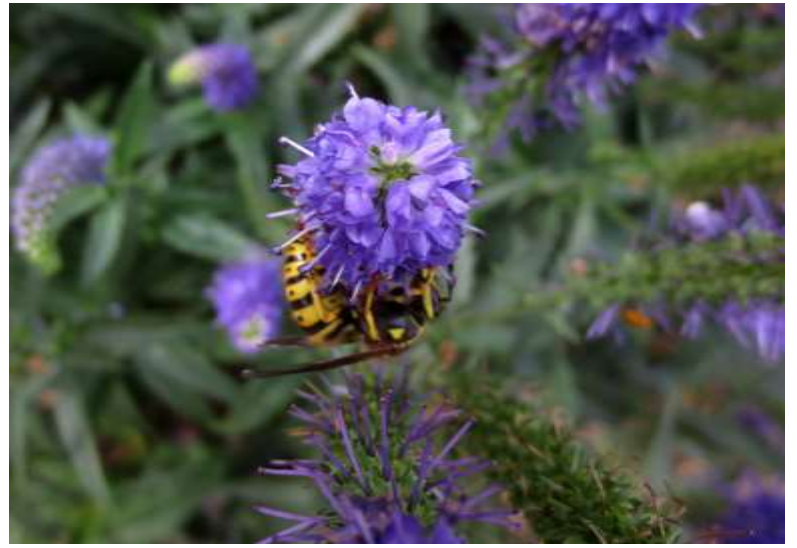
Recommended Plants

- Shasta daisy Leucanthemum x superbum ‘Alaska’
  - Great choice for supporting less visible smaller pollinators
  - Attracts solitary bees, flies, natural predators like spiders, butterflies
  - This hybrid is messy and reseeds easily; offspring will vary in appearance
  - Blooms in giant striking white waves in summer
- Penstemon digitalis 'Husker's Red’
  - Late spring-early summer blooms attract tons of bumble bees and solitary bees
  - This beautiful nativar blooms before many other flowers
  - Great for photographing bee butts
  - Striking white flowers with red foliage



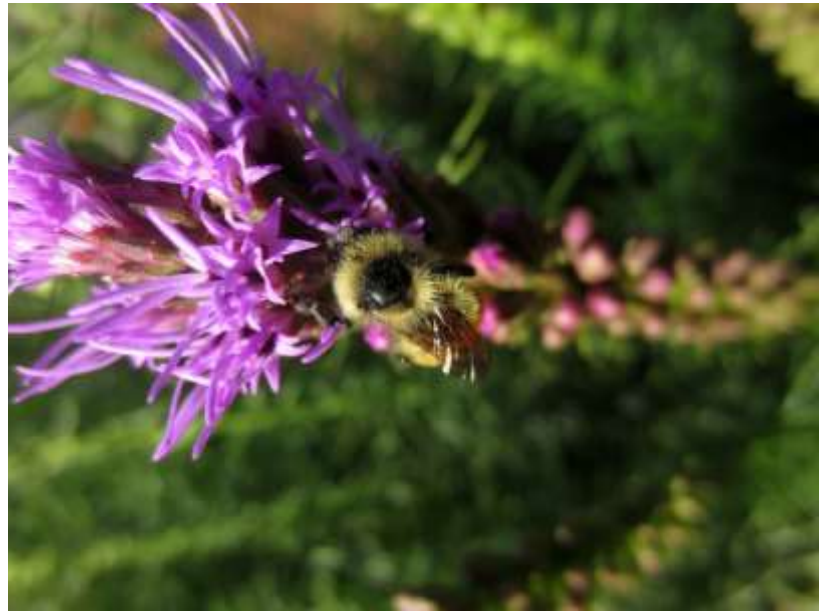
Recommended Plants

- Yarrow ‘Terracotta’ and ‘Red Velvet’
  - Supports solitary native bees, flies, butterflies, various natural predators (damsel fly, lacewing, ambush bug, spider etc.)
  - Show stopping plants with masses of bright colored blooms in mid-summer
  - ‘Terracotta’ has wonderful grey green foliage
  - Another tough as nails nativar
- Veronica longifolia 'Allord’
  - Attracts bumblebees, solitary bees, wasps, flies, natural enemies
  - Neat growth habit takes almost no care
  - Beautiful blue flower spikes are covered with busy insects during summer
  - I counted over 250 pollinators in ½ hour mid-summer



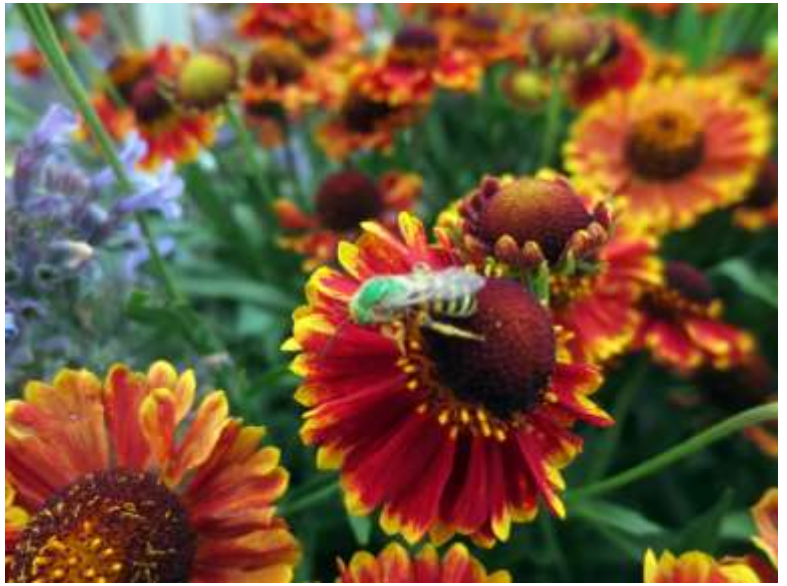
Recommended Plants

- Campanula glomerate 'Superba’
  - Early summer blooms attracts bumblebees and solitary bees
  - Pretty blue bellflower is not invasive in our climate
- Liatris spicata 'Floristan Violet’ and 'Floristan White’
  - Late summer bloom spikes attracts loads of bumblebees and solitary bees
  - The interesting plant growth structure with outstanding bloom color will attract many compliments
  - Blazing star from the Aster family is a nativar with a bulb



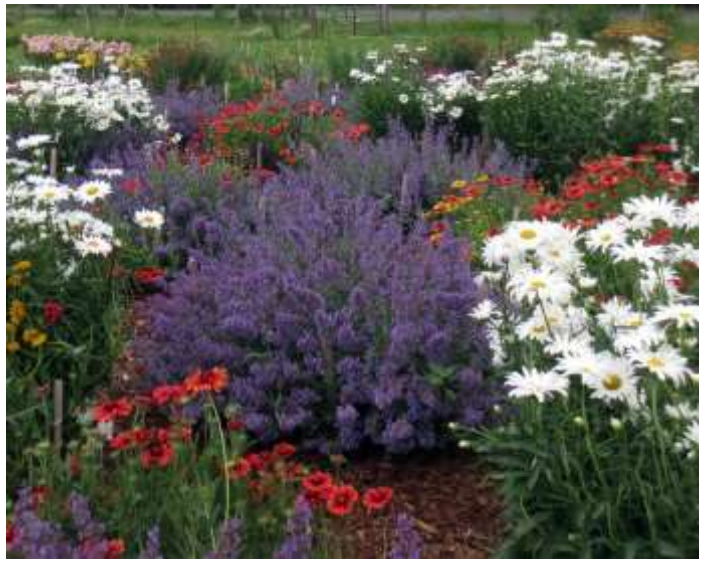
Recommended Plants

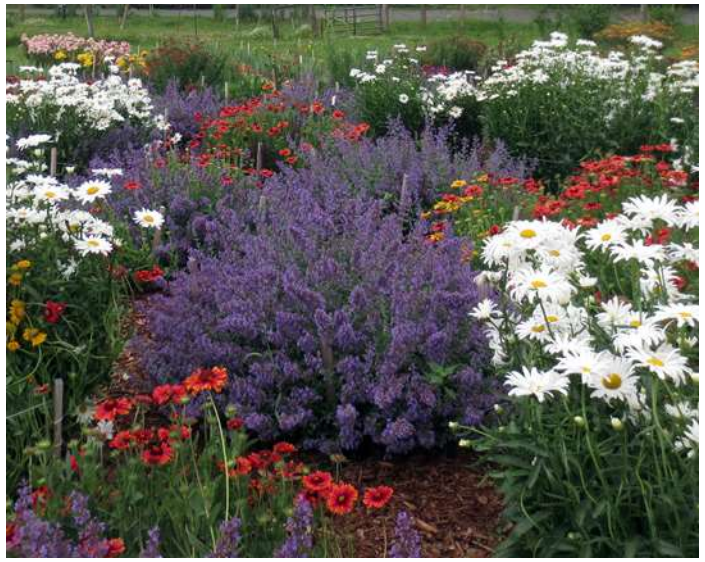
- Echinacea 'Hot Summer’
  - Interesting nativar that does very good if it likes where it is planted and dies if it doesn’t (care is not a factor, it is low maintenance)
  - Sadly, only the plant knows what it likes
  - Increase odds by making sure roots are not wet and soil well draining
  - Blooms are almost fake looking and attract fat bumblebees and solitary bees
  - Other echinacea varieties would be safer choice
- Helenium autumnale Mariachi 'Bandera’
  - Brings all the pollinators in due to late fall hot red, orange and yellow blooms
  - Compact mound is covered with flowers and insects and survives medium frosts
  - I counted over 250 pollinators in ½ hour in October
  - This nativar attracts solitary bees, medium bumble bees, and wasps



Best bet for pollinators

- My research found that catmint plus gaillardia, shasta and/or salvia greatly increased pollinator number and diversity compared to catmint alone
- Plant either catmint ‘Walker Low’ or salvia ‘Caradonna’ for blooms from early spring to late fall
- Spring
  - Bonus: put in flowering bulbs and/or trees for early pollinators
  - Add late spring flowers (like ‘Husker Red’)
- Mid-summer flowers supplement catmint and salvia when first blooms fade and they start to grow second set of blooms
  - Gaillardia in town or sheltered areas
  - Shasta
  - Campanula 'Superba’
- Add late summer flowers like liatris to perk up pollinators
- Make sure to include late fall cold resistant flowers like helenium or asters





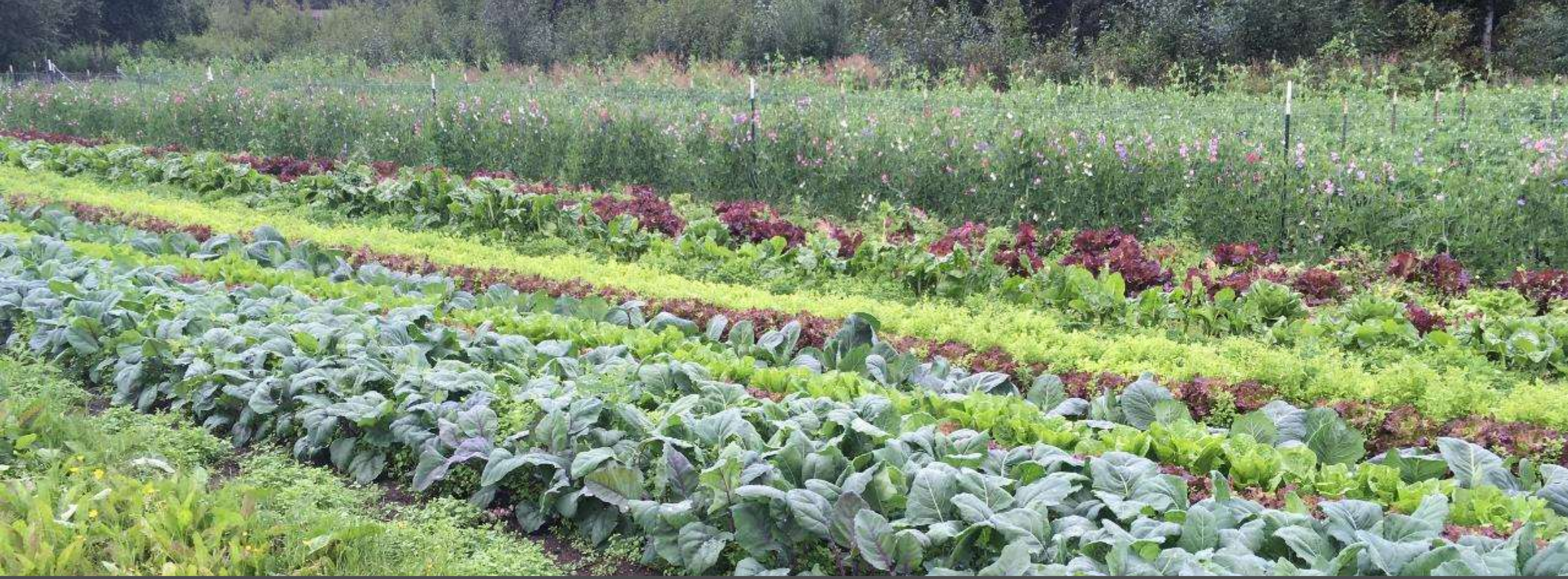
Other considerations for pollinator habitat

- Add a watering source
- Consider nesting areas
  - 70% of native bees nest in dirt patches and create burrows in soil (this could be in a path or garden area)
  - Beware of using too much mulch; use compost to control weeds and allow bee nesting
  - Add planters with soil for bees
  - 30% of bees nest in cavities
  - Leave piles of logs and sticks
  - Make rock piles
- Don’t spray pesticides
- Leave dandelions in your lawn (bonus: replace some of lawn with pollinator plants)
- If properly planted caring for plants can be less time consuming than caring for grass

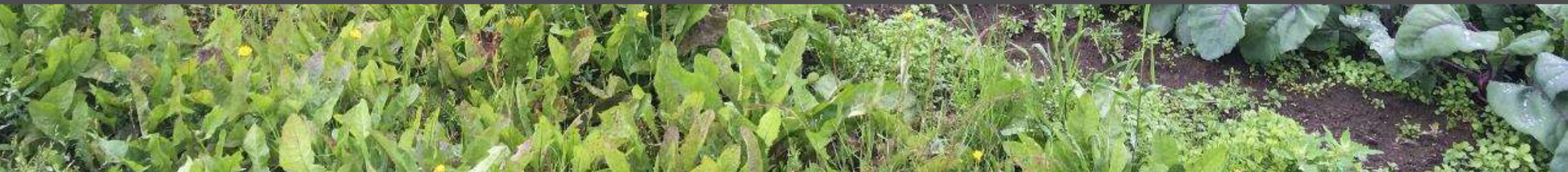
Any Questions

References

- Betts, M.G., Hadley, A.S. & Kormann, U. The landscape ecology of pollination. Landscape Ecol 34, 961–966 (2019). https://doi.org/10.1007/s10980-019-00845-4
- Blaauw BR and Isaacs. Flower plantings increase wild bee abundance and the pollination services provided to a pollination-dependent crop. J applied Ecology. 2014. https://doi.org/10.1111/1365-2664.12257
- Jerry S Cole, Rodney B Siegel, Helen L Loffland, Erin A Elsey, Morgan W Tingley, Matthew Johnson, Plant Selection by Bumble Bees (Hymenoptera: Apidae) in Montane Riparian Habitat of California, Environmental Entomology, Volume 49, Issue 1, February 2020, Pages 220–229, https://doi.org/10.1093/ee/nvz159
- Garbuzov M, Samuelson EEW, Ratnieks FLW. Survey of insect visitation of ornamental flowers in Southover Grange garden, Lewes, UK. Insect Science 2015;22:700-705
- Garbuzov M, Alton K, Ratnieks FLW. 2017. Most ornamental plants on sale in garden centres are unattractive to flower-visiting insects. PeerJ 5:e3066 https://doi.org/10.7717/peerj.3066
- Narango, D.L., Tallamy, D.W. and Shropshire, K.J. Few keystone plant genera support the majority of Lepidoptera species. Nat Commun 11, 5751 (2020). https://doi.org/10.1038/s41467-020-19565-4
- Raderschall CA, Bommarco R, Lindström SAM, Lundin O. Landscape crop diversity and semi-natural habitat affect crop pollinators, pollination benefit and yield, Agriculture, Ecosystems & Environment, Volume 306, 2021 https://doi.org/10.1016/j.agee.2020.107189.
- Salisbury A, Armitage J, Bostock H, Perry J, Tatchell M, and Thompson K (2015). Enhancing gardens as habitats for flower-visiting aerial insects (pollinators): should we plant native or exotic species?. Journal of Applied Ecology, 52(5), 1156-1164.
- Stouffer DB, Cirtwill AR, Bascompte J, Bartomeus I. How exotic plants integrate into pollination networks. J Ecol. 2014 Nov;102(6):1442-1450. doi: 10.1111/1365-2745.12310. Epub 2014 Sep 18. PMID: 25558089; PMCID: PMC4277853.
- Xiao, Y., Li, X., Cao, Y. et al. The diverse effects of habitat fragmentation on plant–pollinator interactions. Plant Ecol 217, 857–868 (2016). https://doi.org/10.1007/s11258-016-0608-7



Questions?



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