Hedgerows, pest control, and pollination services on farms

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Hedgerow Benefits:

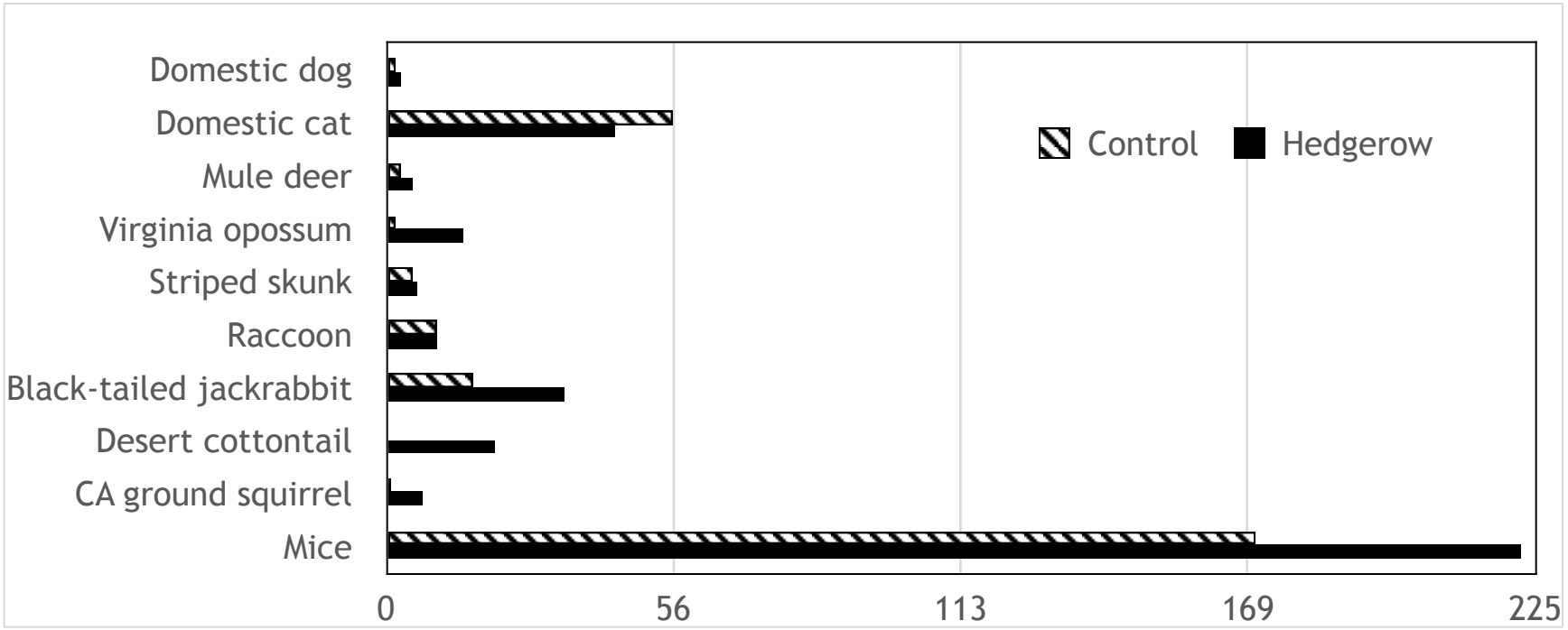
- Enhance biodiversity

Loggerhead shrike

Robin

Goldfinch

Mammals in Hedgerows vs. Conventional Field Edges (walnuts and tomatoes)



Hedgerow Benefits

- Enhance biodiversity
- **Filter traps**

Reduce sediments, pesticides, nutrients, and foodborne pathogens.

Hedgerow Benefits

- Enhance biodiversity
- Filter traps
- **Erosion control (water, wind)**

Deergrass, Colusa Co.

Zamora, Yolo Co.

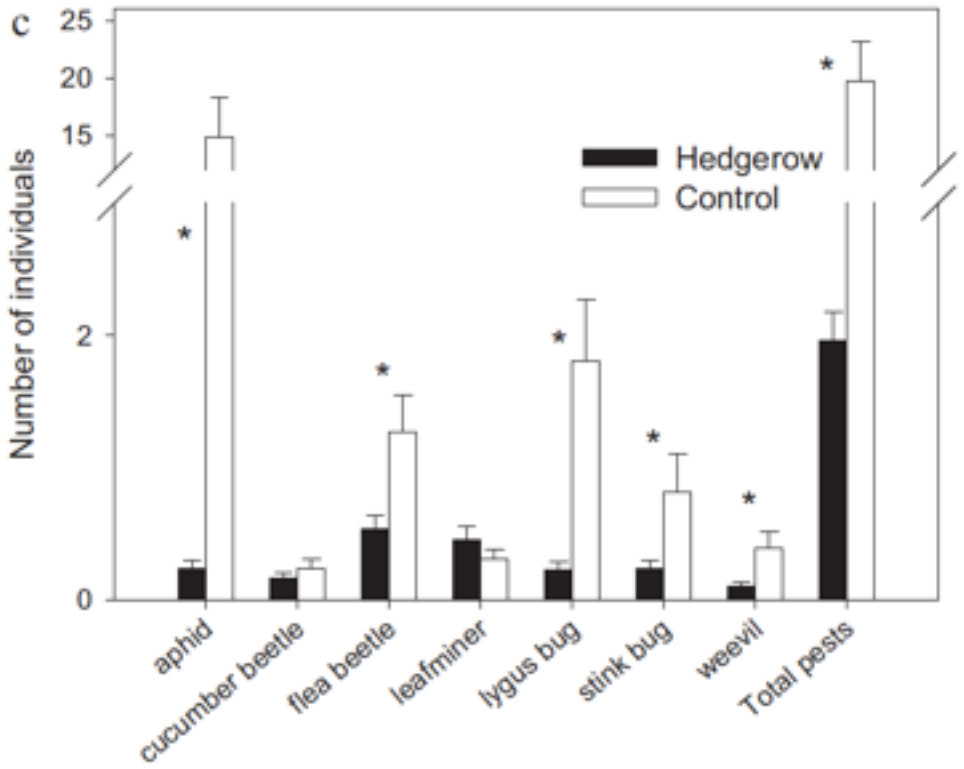
Hedgerow Farms, Winters

Hedgerow Benefits

- Enhance biodiversity
- Filter traps
- Erosion control
- **Weed suppression**

Hedgerow Benefits

- Enhance biodiversity
- Filter traps
- Erosion control
- Weed suppression
- **Pest suppression**



Hedgerow Benefits

- Enhance biodiversity
- Filter traps
- Erosion control
- Weed suppression
- Pest suppression
- **Natural enemies (predators, parasitoids)**

Fresno Co.

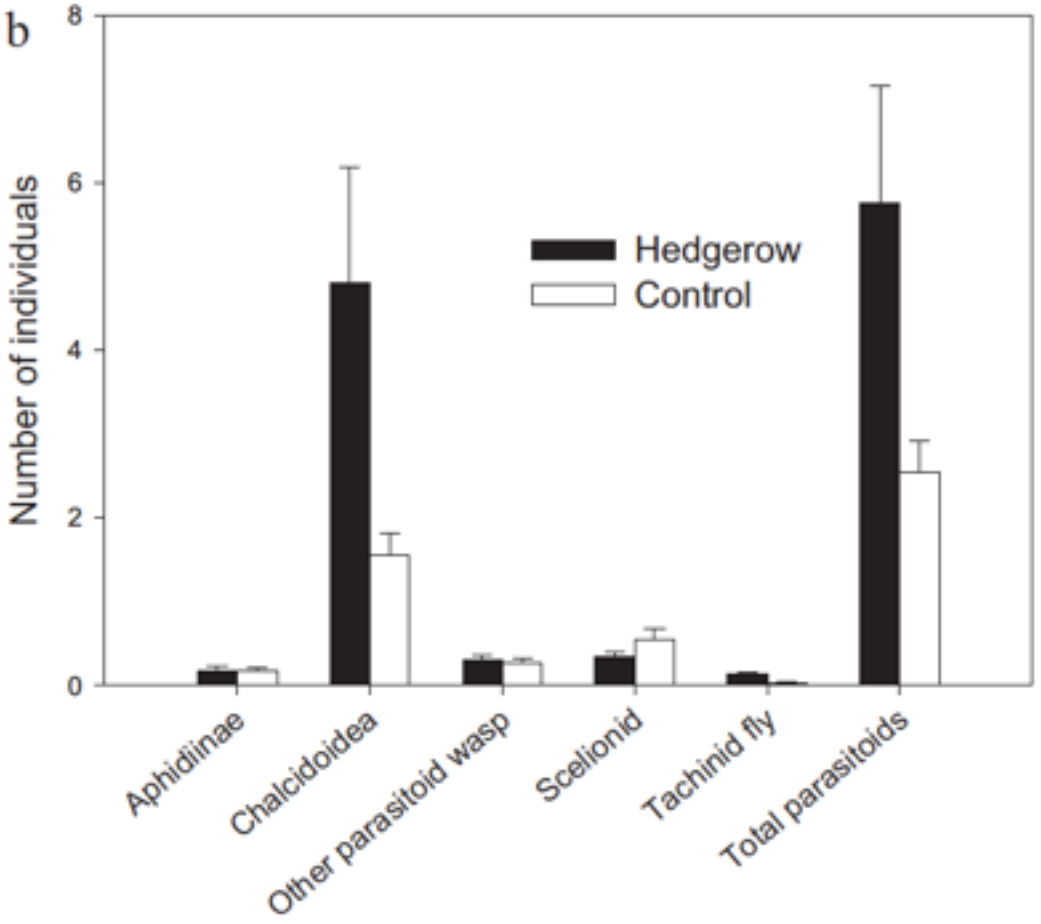
Insect natural enemies depend on floral resources (pollen and nectar)

Syrphid fly adult, larva

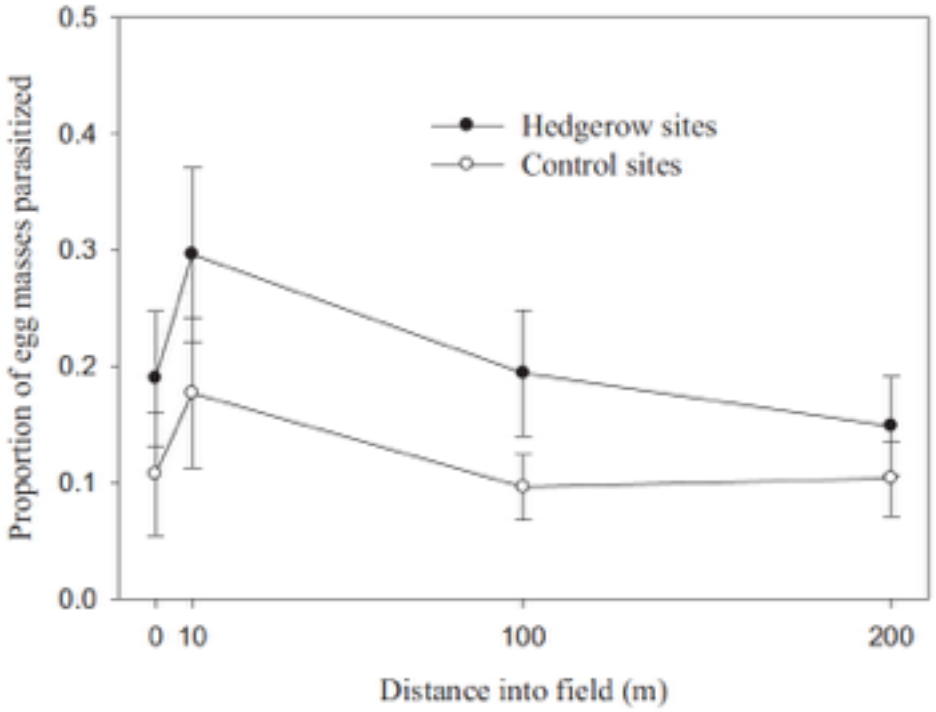
Green lacewing adult, larva

Parasitoid wasp adult, larva

Hedgerows have higher numbers of natural enemies



Hedgerows export natural enemies into adjacent crops for better pest contr



Hedgerow Economics

- Fewer insecticides applied for insect control in hedgerow fields.
- 4/8 control tomato fields sprayed versus 1/8 hedgerow fields sprayed.
- Savings of $260/field/year.

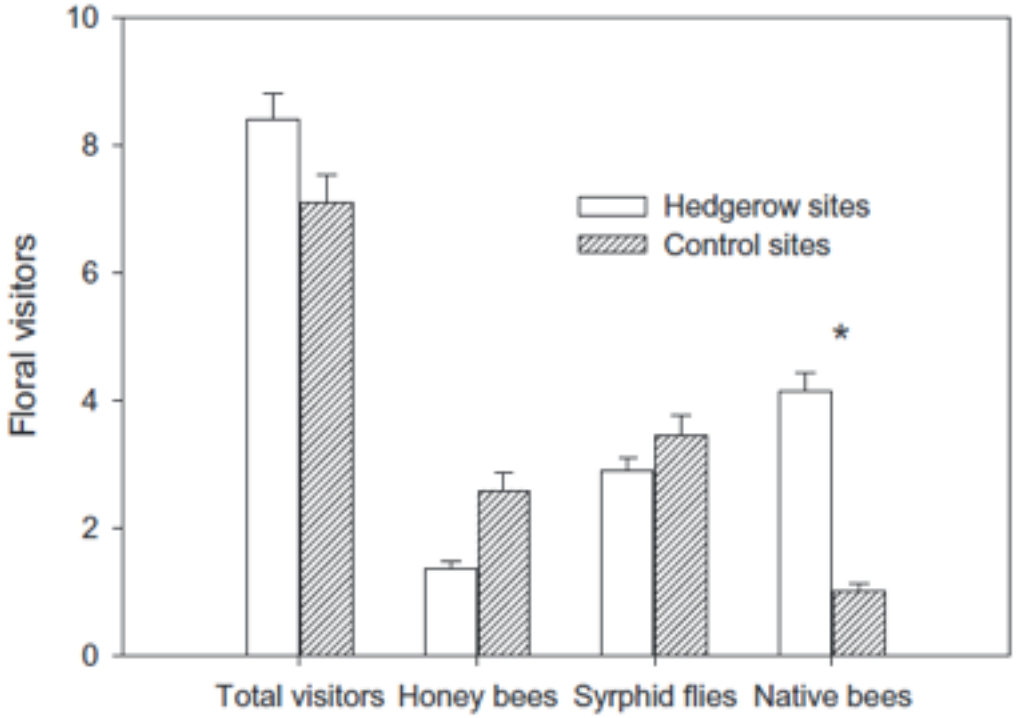
Hedgerow Benefits

- Enhance biodiversity
- Filter traps
- Erosion control
- Weed suppression
- Pest suppression
- Natural enemies (predators of pests)
- **Pollinators (native bees, honey bees)**

Native bees need food, nesting habitat, and protection from pesticides.

- About 70% of native bees nest underground.
- About 30% are cavity nesters (nest in hollow stems or old logs).

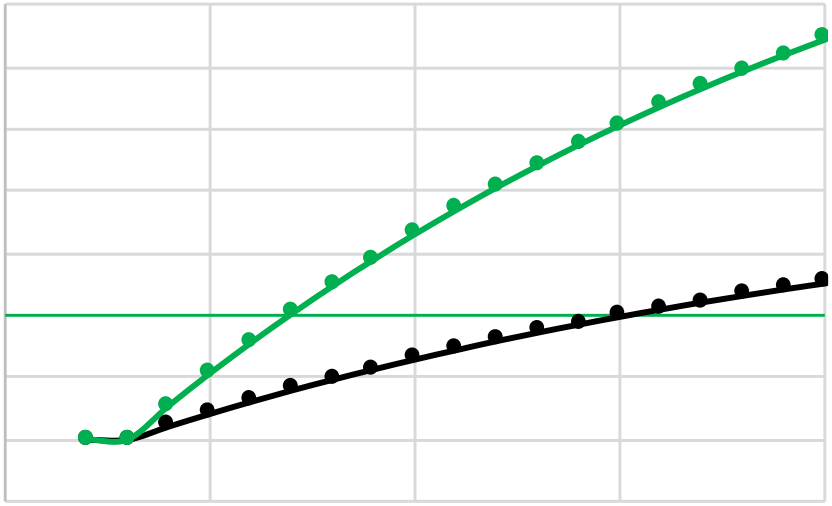
Native bee numbers greater in adjacent crops with hedgerows



Pollination from enhanced bee visitation, using canola as model crop:

➢ 21% seed increase with native bees (excluding honey bees).

➢ $400 profit every 3-years



Impacts on a 40 acre field, 1000 ft long hedgerow

Long RF, K Garbach, and L Morandin. 2017. Hedgerow benefits align with food production and sustainability goals. California Agriculture 71(3):117-119.

Sacramento Valley

England

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http://ccpestmanagement.ucanr.edu/Hedgerows/

Peer-reviewed Publications on Hedgerows, 1998-2018

http://ccpestmanagement.ucanr.edu/Hedgerows/

Long RF, A Corbett, C Lamb, et al. 1998. Movement of beneficial insects from flowering plants to associated crops. California Agriculture. 52(5): 23-26.

Ehler, LE, CG, Pease, RF Long. 2002. Farmscape ecology of a native stink bug in the Sacramento Valley. Fremontia. 30(3-4):59-61.

Long RF and J Anderson. 2010. Establishing hedgerows on farms in California. UC ANR publication number 8390, http://ucanr.org/pubs.cfm.

Morandin L, RF Long, CG Pease, et al. 2011. Hedgerows enhance beneficial insects on farms in California's Central Valley. California Agriculture. Vol. 65(4):197-201.

Morandin LA, RF Long, C Kremen. 2014. Hedgerows enhance beneficial insects on adjacent tomato fields in an intensive agricultural landscape. J. Ag, Ecosystems, & Environ. Vol. 189:164-170.

Morandin LA, RF Long, and C Kremen. 2016. Pest control and pollination cost benefit analysis of hedgerow restoration in a simplified agricultural landscape. J. Economic Entomology, 109(3): 1020-7.

Garbach K and R Long. 2017. Determinants of field edge habitat restoration on farms in California's Sacramento Valley. J. of Environmental Management, Vol 189:134-141.

Long RF, K Garbach, and L Morandin. 2017. Hedgerow benefits align with food production and sustainability goals. California Agriculture 71(3):117-119.

Sellers LA, RF Long, MT Jay-Russell, et al. 2018. Impact of field-edge habitat on mammalian wildlife abundance, distribution, and vectored foodborne pathogens in adjacent crops. Crop Protection. In Revision.

Sellers LA, RF Long, MT Jay-Russell, *et al.* *In Press.* Impact of field-edge habitat on mammalian wildlife abundance, distribution, and vectored foodborne pathogens in adjacent crops. Crop Protection.

"This paper is particularly poignant right now when the Food Safety Modernization Act (FSMA) is calling for farmers to implement co-management of wildlife and agriculture, instead of clear cutting wild habitat around their crops.

The paper provides support for this ruling, showing that the presence of hedgerows does increase wildlife diversity, but does not increase wildlife intrusion into the fields and more importantly, does not increase the prevalence of animals carrying foodborne pathogens."

Anonymous reviewer