Pollinator & Beneficial Insect Habitat

One of the biggest stories in the agricultural press during the past several years has been the decline of domesticated honey bee populations all over the United States. Wild bee populations are also in decline due to loss of habitat, and this poses risks for agricultural crops that depend on bees for pollination. Insect pollination results in $26.9 billion in crop value per year. (1; *see Pollinator & Beneficial Insect Services text box*).

A key strategy to counter declines in pollinators is to plant and maintain habitats that promote and protect them by providing nectar and pollen, shelter, and protection from agricultural chemicals (2). Pollinator habitats can attract domestic honeybees, but also wild bees and other wild beneficial insect species. These beneficial species include many different wasps, beetles, lacewings, predatory mites, and more. Beneficial insects prey upon the kinds of insects that damage crops, so keeping them around can help reduce pesticide applications. Wild beneficial insects protect an estimated $4.5 billion per year in crop value by reducing insect pest damage (3).

Habitat Costs

These calculations are based on research on prairie strips within cropped fields (the STRIPS project) at the Neal Smith National Wildlife Refuge near Prairie City, IA.

Average cost of establishment of habitat:

- Site preparation including tillage and herbicide application: $86/acre
- Seeding including seed purchase, planting, and packing soil: $218/acre
- Mowing three times in first year: $90/acre

Total establishment cost: $394/acre (round up to $400/acre)

Establishment cost spread over 15-year lifetime = $400 per acre/15 years = $27/acre/year

Annual management and maintenance costs:

- Management average = 2% of establishment cost: $8/acre/year
- Mowing once/year = $30/acre/year
- Baling once/year = $11/acre/year

Total annual management+maintenance = $49/acre/year (round up to $50/acre/year)

Reference:

The Cost of Prairie Conservation Strips. August 2013. Leopold Center for Sustainable Agriculture, Iowa State University. www.leopold.iastate.edu/sites/default/files/pubs-and-papers/2013-08-cost-prairie-conservation-strips.pdf (accessed 8/21/13).

Pollinator habitat is recognized as critically important by the USDA, and programs are available that offer cost-share for habitat establishment as well as annual contract payments (4). Privately funded cost-sharing and contracts are also available in some areas (5).

Pollinator and beneficial insect habitats can sometimes use marginal or poor cropland. In those cases, the loss of income from corn or soybeans will be less than it would be on prime cropland. There can be benefits to having pollinator/beneficial insect habitat right within prime cropland areas, however. Having beneficial insects living close to crops can reduce damage from insect pests. If the crop is dependent on insect pollination, it makes sense to have pollinators nearby. There are also potential soil and water quality benefits. Research in Iowa shows that strategically placing narrow strips of native prairie species within crop fields, on as little as 10% of the crop field acreage, can reduce sediment movement by 95% and water runoff by 60%. The strips, which provide prime habitat for pollinators and other beneficial insects, also provide greater soil and water conservation benefits than expected from the size of the strips (6).

If pollinator/beneficial insect habitat is something you want to see on your land in the future, then you can work pollinator habitat acreage into your farm transition plan. Federal, state, or private programs can support the cost of habitat creation and offset the loss of crop income from those acres. Rental agreements, leases, or sale terms should specify the boundaries of any established habitat planting and forbid damage to that area. See “Considerations for Landowners” in the Agroforestry section for more ideas for the farm transition plan. The points to consider are quite similar for agroforestry and habitat plantings.

Pollinator/Beneficial Insect Habitat			
	- Column	**+ Column**	
Qualitative Benefits of the Practice	**Cost of Implementation and Potential Income Loss**	**Potential Income Gain and Reduced/Avoided Costs**	**Your Judgment: Value Per Acre of This Practice on Your Land**
Pollinators are critical to productivity of many fruit, vegetable, seed, and nut crops Beneficial insects prey on other harmful insects, reducing crop damage Possible reduced insecticide application to crops Pollinator/beneficial insect habitat contributes to species diversity on the farm; attracts birds and other wildlife Reduced soil erosion and water runoff from habitat strips strategically located on 10% of crop fields.	Establishment cost spread over 15 years: $27/acre of habitat/year *(See Habitat Costs text box)* Management and maintenance cost for habitat: $50/acre/year *(See Habitat Costs text box)* Loss of net income from cash crop on the pollinator habitat acres: $230/acre/year. *(See Cash Grain Profitability Calculation text box in Crop Rotation section).* Reduce this number if planting on less-productive acres. $30/acre/year cost for the acreage of the habitat, for extra time and hassle in field operations (tillage, spraying, and harvesting) to maneuver around the area. (7)	Full funding for habitat establishment through public or private programs (5,6) $150/acre/year contract payment for acres in pollinator habitat (5) Benefit to society: $29/acre/year from pollination services. This applies to **total farm acres**, not just acres in pollinator habitat. *(See Pollinator & Beneficial Insect Services text box)* $5/acre/year in crop protection services from beneficial insects. This applies to **total farm acres**, not just acres in pollinator habitat. *(See Pollinator & Beneficial Insect Services text box)* $8.20/acre/year gain in fertilizer value of soil by saving 95% of 4.1 tons/acre/year from soil erosion if	Potential income gain and costs avoided: + Potential income loss and costs to pay: - Your judgment on value to your farm of qualitative benefits: + Value to society or environment: + Add up the total net value per acre per year: Multiply by a time frame (5 years? 10 years?) Total value over time:

The numbers in this table are broad estimates, and you should adjust them for your farm's conditions.		habitat is on 10% of cropland acres. This amount applies to **total farm acres**. *(See Value of Saving Soil text box in the Crop Rotation section).* Benefit to society: approximately $19/acre/year gain in water quality value of soil by saving 95% of 4.1 tons/acre/year of soil from erosion if habitat is on 10% of cropland acres. This amount applies to **total farm acres**. *(See Value of Saving Soil text box in the Crop Rotation section).*	

References:

(1) **Insect Pollinated Crops, Insect Pollinators and US Agriculture: Trend Analysis of Aggregrate Data for the Period 1992-2009.** May 2012. Nicholas Calderone. PLoS-ONE 7(5): e37235. http://dx.doi.org/10.1371/journal.pone.0037235

(2) Pollinators. Conservation Marketplace Midwest.
http://conservationmarketplace.org/case-studies/pollinators/ (accessed 8/21/13).

(3) **The Economic Value of Ecological Services Provided by Insects.** 2006. John Losey and Mace Vaughan. BioScience 56(4):311-323. http://dx.doi.org/10.1641/0006-3568(2006)56[311:TEVOES]2.0.CO;2

(4) **Using Farm Bill Programs for Pollinator Conservation, Technical Note No. 78. August 2008. Mace Vaughan and Mark Skinner.** The Xerces Society, USDA-NRCS, and San Francisco State University.
www.xerces.org/wp-content/uploads/2009/04/using-farmbill-programs-for-pollinator-conservation.pdf (accessed 8/21/13).

(5) **Pollinator Habitat Project with General Mills**. April 2012. Linda Meschke. Conservation Marketplace Midwest.
www.gberba.org/Tech%20Page/TechHandouts2012/Technical%20-%20Handout%20-%202012%20-%205%20-%20CMM%20-%20Pollinator%20Habitat%20Project%20with%20General%20Mills(May12).pdf (accessed 8/21/13).

(6) **A Landowner's Guide to Prairie Conservation Strips.** The Leopold Center for Sustainable Agriculture, Iowa State University.
www.leopold.iastate.edu/sites/default/files/pubs-and-papers/2013-08-landowners-guide-prairie-conservation-strips.pdf (accessed 8/21/13).

(7) **Economic and Environmental Costs and Benefits of Living Snow Fences: Safety, Mobility, and Transportation Authority Benefits, Farmer Costs, and Carbon Impacts**. February 2012. Gary Wyatt, University of Minnesota Extension; Minnesota Department of Transportation Research Services.
www.lrrb.org/media/reports/201203.pdf (accessed 8/12/13).

Further Resources:

Alternative Pollinators: Native Bees. 2010. Eric Mader, Mace Vaughan, Matthew Shepherd and Scott Hoffman Black. The Xerces Society for Invertebrate Conservation and National Center for Appropriate Technology.
https://attra.ncat.org/attra-pub/summaries/summary.php?pub=75.
This publication provides information and resources on how to plan for, protect and create habitat for native bees in agricultural settings.

Pollinator Conservation. Center for Urban Ecology and Sustainability, Department of Entomology, University of Minnesota.
www.entomology.umn.edu/cues/pollinators/plants.html (accessed 8/26/13).

Pollinator & Beneficial Insect Services

Analysis of pollinator services based on 2009 crop yields shows that in the United States, domestic and wild bees and other insect pollinators were responsible for:

- $15.1 billion per year in crop value from crops directly dependent on insect pollination (mainly fruits, vegetables, and nuts)
- $11.8 billion per year in crop value from crops indirectly dependent on insect pollination (forage crops and other crops planted from seed that is produced via insect pollination)

Total annual value of insect pollination services to United States agriculture: $26.9 billion (1)

- Total acres in farms in United States in 2009: 919.8 million acres (2)
- Value of pollination services per acre of farmland in the U.S.:
- $26.9 billion / 919.8 million acres = $29.25/acre of farmland; rounded down to $29/acre

Value of crop protection services from beneficial insects: $4.5 billion per year (3)

- Value of crop protection services per acre of farmland in the U.S.:
- $4.5 billion / 919.8 million acres = $4.89/acre of farmland; rounded up to $5/acre

continued on next page …

Pollinator & Beneficial Insect Services, continued (pg. 2)

A couple of things to note:

- These values for pollinator services and for crop protection services are calculated on total United States farm acreage, so you should multiple the $/acre figure by the total number of acres of your farm to calculate your farm's share of the total benefit to the U.S. farm economy from pollinator services.

- Actual benefits to the farm from pollinator services or crop protection services will depend on amount of pollinator habitat established and where it lies in relation to crop fields (4).

References:

(1) **Insect Pollinated Crops, Insect Pollinators and US Agriculture: Trend Analysis of Aggregrate Data for the Period 1992-2009.** May 2012. Nicholas Calderone. PLoS-ONE. 7(5):e37235. http://dx.doi.org/10.1371/journal.pone.0037235 .

(2) **Farms, Land in Farms, and Livestock Operations 2009 Summary**. February 2010. National Agricultural Statistics Service (NASS), USDA. http://usda01.library.cornell.edu/usda/nass/FarmLandIn//2000s/2009/FarmLandIn-02-12-2009.pdf (accessed 8/21/13).

(3) **The Economic Value of Ecological Services Provided by Insects**. 2006. John Losey and Mace Vaughan. BioScience 56(4):311-323. http://dx.doi.org/10.1641/0006-3568(2006)56[311:TEVOES]2.0.CO;2

(4) **Alternative Pollinators: Native Bees. 2010.** Eric Mader, Mace Vaughan, Matthew Shepherd and Scott Hoffman Black. The Xerces Society for Invertebrate Conservation and National Center for Appropriate Technology. https://attra.ncat.org/attra-pub/summaries/summary.php?pub=75