

'Design Criteria for Beneficial Insect Habitat' by Dr. Doug. Landis

1. The honest answer is that we really do not know for sure. This is because the level of control you achieve will depend on a host of highly specific factors including: what pest(s) you are trying to control, what natural enemy(s) you are trying to manipulate, and the relative amount of other beneficial insect habitats there are in your landscape (think several square miles around your farm). Moreover, each of these factors will vary within and between growing seasons, making a simple answer impossible.

2. However, when pressed to go out on a limb, my standard answer is: "within the constraints of your particular farming system, creating some beneficial insect habitat close to the target field is better than none at all", and specifically regarding strips, "more of them and closer together is better than fewer and farther apart. Thus, in your case I would suggest that if you can only do one strip you put it down the center of the field (to provide habitat as close as possible to all areas of the field, or even better, take the same ½ acre and split it into multiple (but narrower) strips to divide the field even further.

Strips as narrow as 5' have been successful but more often they 15-20' wide at minimum.

3. To try to provide a bit more nuanced answer I polled several students and post-docs in our Department who are currently working on this general topic. B. Blaauw is studying how much habitat is required, while J. Tuell and M. Woltz are looking at the interaction of habitat strips and landscape context for pollinators and biocontrol agents respectively. Together we could probably cite 100 or more relevant studies, each of which contributes a bit to our current state of understanding. Here we summarize some of the most pertinent findings.

Insect dispersal ability is often positively related to body size, meaning that large insects can generally travel further than small ones.

Thus if a tiny parasitic wasp is the natural enemy that best controls your pest, habitat may need to be VERY close to the target crop. Several successes with habitat management for parasitoids have been in orchards and vineyards where flowering strips can be directly co-mingled with the crop (in the row middles). These perennial crops also have the benefit of greater habitat permanency meaning the beneficials may be able to live year-round in or near the orchard/vineyard. In highly disturbed annual field crops, many studies show that the increase of natural enemies drops off sharply as you get more than about 30 yards away from a habitat strip. However, for certain larger natural enemies, like ladybeetles the effects go much further, up to ¼ mile. Similar effects have been shown for pollinating insects. In other words, many small native species are real homebodies moving only a few tens of yards while large bumble bees may routinely forage up to a mile away.

Finally, the landscape in which you farm is likely to have an overriding impact on the results you achieve. An increasing number of studies show that overall landscape

diversity (i.e. having lots of different crop and non crop habitats in your landscape) is positively associated with increased effectiveness of many beneficial insects. It's not uncommon for landscape effects to be even more important than the specific within-field practices. Think of it this way, if overall the landscape supports a very large and diverse community of beneficial insects, we may get away with some harmful within-field practices (like a pesticide application) as the landscape will rapidly resupply new beneficials to re-colonize the field. However, if the overall landscape contains few resources for beneficials and overall populations are low, even very favorable on- farm practices may not attract sufficient numbers of beneficials to be effective.

So how much diversity is needed in the landscape? This is a focus of intense on-going research. But as a broad generalization, several studies seem to suggest that both pollinator and natural enemy diversity and abundance decline when non-crop habitat falls below 20% in the landscape as a whole. Thus, thinking well beyond your farm boundaries may be necessary.