

## Map Construction for Proactive Resistance Management Project (3 May 2015)

As a reminder, production of chemical use maps have at least 3 purposes in this project: 1) to help with spatial research and understanding of resistance dynamics; 2) to guide and strategically target specific locations for whitefly collections needed in the hypothesis-testing / resistance monitoring; and most immediately 3) **to help teach growers the fundamentals of resistance management and to help guide their self-determined efforts to avoid overuse of any mode of action in space or time.** It is this last objective that is most pressing and requires that decisions be made right away in the next 30 days so that maps can be produced and readied for our outreach program (website, conferences, Extension meetings, and discussions with stakeholders).

To that end, I sent out a list of questions to which some of you responded. More discussion is needed to clarify these responses, which lead to new questions. Until we have consensus and/or greater clarity, I have made the following “command” decisions, indicated in green highlighting, relative to the issues identified.

### Binning of Data for Presentation of Maps

**We will establish one binning schema for each class of chemistry / mode of action.**

For the time being, this is a pragmatic decision. Yves suggests that evolution of resistance may be independent for each “region”. This may in fact be true. However, because we are breaking the state map into 13 bite-sized pieces, there are “regions” that are highly related spatially and indeed overlapping, especially in central AZ. So in the interest in reducing cognitive load on users of these maps, we’ll stick to one binning schema so that they can know that deeper colors in one region will mean the “same” thing in other regions. We could entertain the idea of handling Yuma County, La Paz County, and all of the rest of central AZ separately. [For whitefly collections and planning of other activities, we can produce dynamically binned maps.] However, until we have data that suggests otherwise or unless there is strong dissension on this point, we will proceed with:

**5 major bins plus 1 bin representing scant but non-zero usage by section**

5 colors are likely the maximum number of shades resolvable easily on maps of this type. A 6<sup>th</sup> bin will represent sections that have non-zero usage, but at very low levels. We’ll have to decide what cut-off to use for each chemistry (e.g., less than 1% of maximum? Mean - 2 \* s.d.?). Your input on this would be welcome.

Also, Wayne has the data structured so that we can align the bins as we wish based on percentage of the maximum response. So please give any input here as well. Otherwise, we’ll likely default to a distributed set of bins like:

**81–100%, deepest color**

**61–80%**

**41–60%**

**21–40%**

**1–20%, lightest color**

non-zero to <1%, outlined but unfilled section

Also, Wayne has the data structured so that we can align the bins as we wish based on percentage of the maximum response. So please give any input here as well. Otherwise, we'll likely default to a distributed set of bins like:

We will produce independent maps for pyrethroids, neonicotinoids, pyriproxyfen, buprofezin, keto-enols, and diamides.

We don't have any *a priori* evidence of significant cross-resistances among the classes/MoAs indicated here. We do have evidence of cross-resistance within several of these classes/MoAs. So we will lump all active ingredients within each of these 6 groups. We will indicate all usage of pyrethroids (and not just from applications that contain OPs as well).

We will lump all neonicotinoids even though their proportional presence in the data is variable by mode of application (soil vs. foliar). Same for diamides.

We can change this decision easily if John, Steve or Nilima, in particular, think we should be using acetamiprid or something else as a proxy for understanding spatial patterns of neonicotinoid use.

We will lump all diamides used in all crops, irrespective of their specific efficacy in controlling and therefore selecting for resistance in whiteflies.

Again, we can alter this decision based on further input from John, Steve and Nilima, especially with regards to the inclusion or exclusion of flubendiamide (a lepidopteran-active diamide). But for now, we'll assume that all diamides convey some amount of selection for resistance in whiteflies.

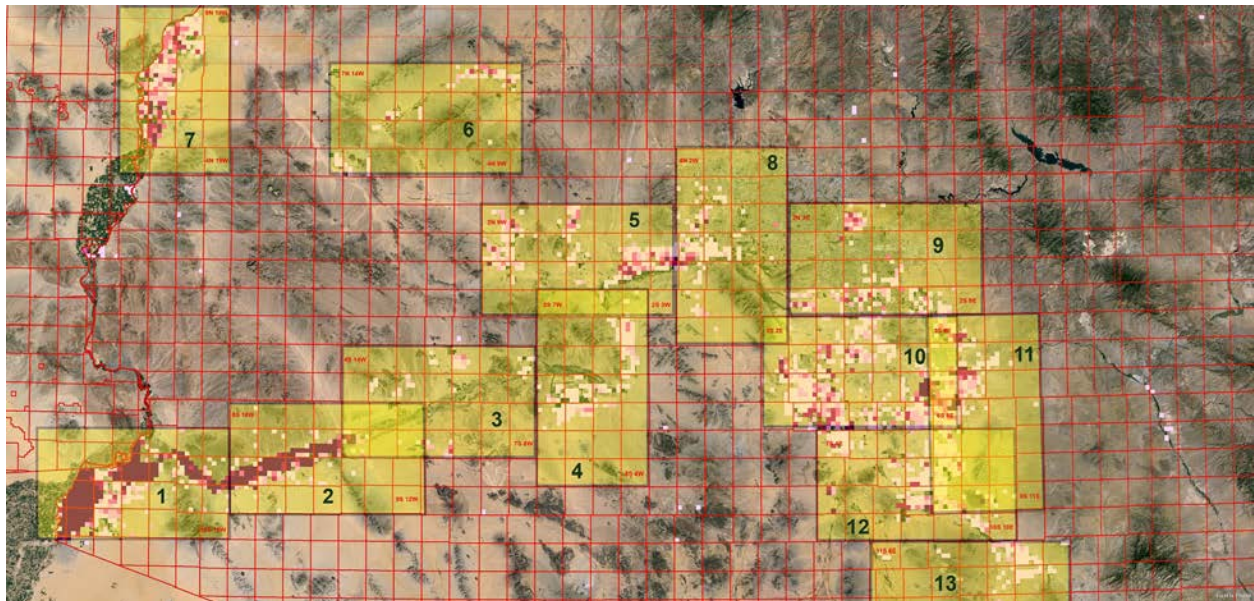


Figure 1. Distribution of scenes to be mapped for each class of chemistry / MoA.