**APPENDIX 4-5. Analysis of Non-spray Formulations**

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Most imidacloprid use sites have registered flowable uses (*e.g*., emulsifiable concentrate, wettable powder). Therefore, the methods developed for analyzing terrestrial exposures in this BE focus on flowable uses; however, imidacloprid products also have other formulation types, including seed, granular, bait, and tree injection uses. Additional characterization is provided here for terrestrial exposure and risks associated with these non-spray uses, which may involve contact with or consumption of a more concentrated dose even when the application rate per unit area (*i.e.*, lb a.i./A) is comparable to flowable uses.

Because exposures related to granular and seed uses are readily modeled using current aquatic modeling approaches, these types of uses are incorporated into the aquatic exposure analysis used to help make effects determinations for listed aquatic species (and those that rely on aquatic species). However, due to differences in estimating potential exposures from bait/tree injection uses and flowable uses, bait and tree injection uses are not as easily incorporated into the current modeling approach for assessing terrestrial exposures to listed terrestrial species. As such, exposure from flowable uses are incorporated into the current version of the MAGtool (v2.3) and are used to help make effects determinations for listed terrestrial species (and those that rely on terrestrial species). While the granular/bait uses are not built into the tool, they will still be considered when making effects determinations. In the individual effects determinations output sheets from the MAGtool (**APPENDIX 4.9**), if a terrestrial animal range or critical habitat overlaps with a use site where alternative uses are permitted, it is specified that this use should be given additional consideration by the assessor. Consideration of this additional use outside of the flowable uses already captured in the MAGtool did not result in the alteration of any effects determinations. A discussion of the methods for assessing exposure concentrations resulting from alternative uses for terrestrial species is described below.

# Seed Treatment Uses

Because exposures related to seed treatment uses are readily modeled using our current aquatic modeling approaches, these types of uses are incorporated into the aquatic exposure analysis used to help make effects determinations for listed aquatic species (and those that rely on aquatic species). As demonstrated in **Chapter 3** and **APPENDIX 3-1**, aquatic EECs for foliar and soil treatment (flowable uses) are orders of magnitude greater than aquatic EECs from seed treatments. Therefore, exposures and associated risks from flowable uses are assumed to be protective of seed treatment uses.

In regard to seed treatments, imidacloprid exposure to non-target organisms may also include contact with abraded seed coat dust during planting (*e.g.*, Tapparro *et al*. 2012, Krupke *et al*. 2012). This pathway has been associated with numerous incidents of mortality to foraging honey bees (see **Chapter 2**). The extent to which honey bees are exposed via contact with abraded seed coat dust is influenced by many factors including the physio-chemical properties of the seed coating, seed planting equipment, use of seed lubrication agents (*e.g.*, talc), environmental conditions (wind speed, humidity), and hive location in relation to sowing and prevailing winds. Off-site drift of contaminated seed coat dust can contribute to residues on plants, soil, and surface water to which bees may be exposed through direct contact and ingestion of surface water, pollen, and nectar. Although exposure and effects to bees via exposure to abraded seed coat dust has been documented, these data are highly variable and methods are not currently available to provide reliable estimates for this route of exposure. Therefore, this exposure route was not quantitatively considered in this assessment. Exposure of bees and other non-target insects to imidacloprid via drift of abraded seed coat dust is considered a route of concern. The Agency continues to work with stakeholders to mitigate the potential for adverse effects on bees from this exposure pathway through best management practices and the development of alternative technologies to reduce dust off during planting (*e.g.*, alternative lubricants, equipment modifications). [[1]](#footnote-2) Reductions in seed dust off will also limit exposures of other non-target insects to imidacloprid through this route.

In this BE, risks are identified for terrestrial vertebrate species through consumption of plant matter (*e.g.,* leaves) that have been sprayed with imidacloprid. Residues on sprayed seeds may underpredict exposures to birds and mammals that directly consume treated seeds. In the 2017 ecological risk assessment for the registration review of imidacloprid, EPA concluded that there were risks to birds and mammals from seed treatments, with some exceptions based on animal and seed sizes[[2]](#footnote-3). For all terrestrial vertebrates (birds, amphibians, reptiles, and mammals) that consume seeds, potential exposure and risk from treated seeds is also considered. For those species where a LAA determination was made based on the quantitative analysis using the MAGtool and spray uses, potential exposure to treated seeds would serve as an additional line of evidence supporting that LAA determination. In the individual effects determination output sheets from the MAGtool (**APPENDIX 4.9**), if a terrestrial animal range or critical habitat has overlap with a use site with foliar applications where seed uses are also permitted, it is specified that this use should be given additional consideration by the assessor by referring to this appendix. At the time of this BE, reliable usage information for seed treatment was not available. For this reason, the upper and lower limits used when applying usage information, 100% and 2.5% PCT respectively, were considered when conducting the additional review of the species. An exploratory spatial analysis, discussed in the next section, was conducted to determine where usage information would be most valuable for imidacloprid.

In **Tables 2 and 3** below, the percent overlap of range of all seed-eating birds and mammals with each UDL associated with seed treatment is provided and can be used for further characterization of potential additional risks for these species. **Table 2** displays overlap without any adjustment for usage, or 100% PCT. **Table 3** displays overlap with the lower limit of usage, 2.5% PCT assumed on the crops. The PCT value of 2.5% was selected because it is the lowest usage value ever applied, buffering against uncertainty associated with these surveys and low usage estimates. These two overlaps are used as upper and lower limits in this analysis.

For those species where NLAA determinations were preliminarily made using the MAGtool, indicating that no other uses are expected to impact greater than 1 individual, these determinations were reconsidered for possible impacts due to overlap with use sites that are associated with seed treatment. Preliminary NLAA determinations were made for 3 species of birds and 6 species of mammals (**Table 1**). For all 3 birds and 2 mammals, there was no overlap or low overlap of the agricultural landcover and the species range. Therefore, it is assumed that those 3 species of birds and 2 species of mammals are unlikely to be exposed to imidacloprid via consumption of treated seeds and the determinations remained at NLAA. For the remaining 4 species of mammals, there was some overlap of the species’ ranges and the UDLs as shown below in **Tables 2 and 3**. For the 100% usage assumption, all of these species have overlap with the UDLs, but at the 2.5% usage assumption, 3 of the 4 species show a significant drop in overlap at the lower limit. In addition, when considering the weight of evidence species data gathered for the MAGtool analysis (**APPENDIX 4-2**), although none of these species could be precluded from being on the field, the habitat tended to be salt marshes (Amargosa vole and Florida salt marsh vole) or interior forest (Carolina northern flying squirrel and riparian woodrat). In addition, evaluation of range data for the Carolina northern flying squirrel and Florida salt marsh vole was given a yellow classification, meaning that on review, discrepancies were noted between the Service documentation and the range maps used in the analysis. Although there is uncertainty in likelihood that these areas of overlap will receive applications of imidacloprid treated seeds and in how frequently the species will be on the field, the determinations are changed to LAA based on chronic risks identified previously (USEPA 2017) for seed-eating mammals and potential for exposure, but with the weakest evidence of LAA.

**Table 1. Seed-eating birds and mammals with preliminary NLAA determinations based on MAGtool runs for spray applications of imidacloprid**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Taxon** | **Entity ID** | **Scientific name** | **Common name** | **Final determination** | **Strength of Call** |
| Birds | 73 | *Branta (=Nesochen) sandvicensis* | Hawaiian Goose | NLAA | NA |
| 80 | *Amazona vittata* | Puerto Rican parrot | NLAA | NA |
| 101 | *Columba inornata wetmorei* | Puerto Rican plain pigeon | NLAA | NA |
| Mammals | 28 | *Microtus californicus scirpensis* | Amargosa Vole | LAA | Weakest evidence of LAA |
| 42 | *Glaucomys sabrinus coloratus* | Carolina Northern Flying Squirrel | LAA | Weakest evidence of LAA |
| 43 | *Tamiasciurus hudsonicus grahamensis* | Mount Graham Red Squirrel | NLAA | NA |
| 59 | *Spermophilus brunneus brunneus* | Northern Idaho Ground Squirrel | NLAA | NA |
| 60 | *Microtus pennsylvanicus dukecampbelli* | Florida Salt Marsh Vole | LAA | Weakest evidence of LAA |
| 62 | *Neotoma fuscipes riparia* | Riparian Woodrat | LAA | Weakest evidence of LAA |

NA = not applicable

**Table 2. Seed-eating birds and mammals percent overlap with seed treatment use layers of imidacloprid with no usage data incorporated, 100% PCT assumption. Blue species denotes those evaluated for preliminary NLAA call.**

| **Taxa** | **Entity ID** | **Common Name** | **Scientific Name** | **CONUS\_Other Crops** | **CONUS\_Cotton** | **CONUS\_Vegetables and Ground Fruit** | **CONUS\_Other Row Crops** | **CONUS\_Other Grains** | **CONUS\_Corn** | **CONUS\_Soybeans** | **CONUS\_Alfalfa** | **CONUS\_Wheat** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Birds | 69 | Hawaiian (=koloa) Duck | Anas wyvilliana | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 73 | Hawaiian goose | Branta (=Nesochen) sandvicensis | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 101 | Puerto Rican plain Pigeon | Columba inornata wetmorei | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 5170 | Friendly Ground-Dove | Gallicolumba stairi | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 6901 | Yellow-billed Cuckoo | Coccyzus americanus | 2.38 | 0.18 | 0.94 | 0.09 | 0.61 | 0.45 | 0.00 | 1.49 | 2.20 |
| Birds | 87 | Micronesian megapode | Megapodius laperouse | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 89 | Masked bobwhite (quail) | Colinus virginianus ridgwayi | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 67 | Whooping crane | Grus americana | 6.63 | 3.06 | 2.61 | 2.15 | 9.54 | 14.29 | 12.52 | 2.29 | 19.96 |
| Birds | 76 | Hawaiian common gallinule | Gallinula galeata sandvicensis | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 110 | Mississippi sandhill crane | Grus canadensis pulla | 0.65 | 0.45 | 0.06 | 0.53 | 0.00 | 0.08 | 0.18 | 0.00 | 0.07 |
| Birds | 121 | Guam rail | Rallus owstoni | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 4679 | Whooping crane | Grus americana | 8.97 | 2.00 | 0.29 | 0.35 | 7.64 | 3.79 | 1.09 | 1.42 | 15.92 |
| Birds | 4889 | Guam rail | Rallus owstoni | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 7342 | Whooping crane | Grus americana | 5.39 | 0.74 | 0.88 | 0.02 | 2.46 | 14.38 | 14.14 | 4.87 | 2.72 |
| Birds | 10124 | Whooping crane | Grus americana | 7.68 | 1.19 | 0.07 | 0.01 | 3.01 | 4.01 | 9.53 | 0.01 | 1.32 |
| Birds | 79 | Palila (honeycreeper) | Loxioides bailleui | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 85 | Cape Sable seaside sparrow | Ammodramus maritimus mirabilis | 0.95 | 0.00 | 1.18 | 0.00 | 0.38 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 116 | San Clemente sage sparrow | Amphispiza belli clementeae | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.00 |
| Birds | 117 | Yellow-shouldered blackbird | Agelaius xanthomus | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 118 | Mariana (=aga) Crow | Corvus kubaryi | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 133 | Florida grasshopper sparrow | Ammodramus savannarum floridanus | 1.73 | 0.00 | 0.90 | 0.02 | 2.45 | 0.03 | 0.00 | 0.00 | 0.00 |
| Birds | 137 | Inyo California towhee | Pipilo crissalis eremophilus | 0.09 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.16 | 0.00 |
| Birds | 140 | Florida scrub-jay | Aphelocoma coerulescens | 2.25 | 0.01 | 0.90 | 0.36 | 3.41 | 0.13 | 0.00 | 0.00 | 0.00 |
| Birds | 145 | Coastal California gnatcatcher | Polioptila californica californica | 0.83 | 0.00 | 0.16 | 0.01 | 0.25 | 0.01 | 0.00 | 0.21 | 1.17 |
| Birds | 1241 | Rota bridled White-eye | Zosterops rotensis | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 4296 | Streaked Horned lark | Eremophila alpestris strigata | 5.57 | 0.00 | 2.41 | 0.23 | 0.55 | 1.08 | 0.00 | 0.16 | 1.38 |
| Birds | 107 | Red-cockaded woodpecker | Picoides borealis | 3.64 | 2.64 | 0.61 | 1.73 | 1.26 | 3.61 | 4.99 | 0.00 | 2.20 |
| Birds | 80 | Puerto Rican parrot | Amazona vittata | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 11319 | Eastern Black rail | Laterallus jamaicensis ssp. jamaicensis | 3.96 | 1.68 | 0.62 | 0.69 | 3.03 | 14.39 | 13.09 | 1.70 | 6.71 |
| Birds | 68 | Hawaiian (='alala) Crow | Corvus hawaiiensis | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 16 | Morro Bay kangaroo rat | Dipodomys heermanni morroensis | 4.29 | 0.00 | 1.31 | 0.04 | 3.14 | 0.06 | 0.00 | 2.27 | 5.15 |
| Mammals | 17 | Salt marsh harvest mouse | Reithrodontomys raviventris | 0.87 | 0.00 | 0.27 | 0.00 | 0.62 | 0.00 | 0.00 | 0.45 | 1.25 |
| Mammals | 2 | Grizzly bear | Ursus arctos horribilis | 4.42 | 0.00 | 0.84 | 0.02 | 4.09 | 0.02 | 0.00 | 0.05 | 0.08 |
| Mammals | 1302 | Grizzly bear | Ursus arctos horribilis | 2.42 | 0.00 | 0.20 | 0.01 | 3.98 | 0.09 | 0.00 | 0.22 | 2.09 |
| Mammals | 20 | Utah prairie dog | Cynomys parvidens | 0.32 | 0.00 | 0.00 | 0.00 | 0.29 | 0.43 | 0.00 | 2.26 | 0.05 |
| Mammals | 28 | Amargosa vole | Microtus californicus scirpensis | 7.96 | 1.69 | 2.64 | 0.52 | 2.78 | 2.34 | 0.00 | 3.24 | 4.48 |
| Mammals | 32 | Key Largo woodrat | Neotoma floridana smalli | 0.01 | 0.00 | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 34 | Choctawhatchee beach mouse | Peromyscus polionotus allophrys | 0.03 | 0.01 | 0.00 | 0.05 | 0.02 | 0.01 | 0.03 | 0.00 | 0.01 |
| Mammals | 35 | Perdido Key beach mouse | Peromyscus polionotus trissyllepsis | 2.07 | 0.80 | 0.03 | 1.22 | 0.23 | 1.38 | 1.93 | 0.00 | 0.52 |
| Mammals | 37 | Fresno kangaroo rat | Dipodomys nitratoides exilis | 19.03 | 8.30 | 10.43 | 0.02 | 7.73 | 9.42 | 0.00 | 13.10 | 17.37 |
| Mammals | 38 | Giant kangaroo rat | Dipodomys ingens | 20.18 | 5.06 | 6.54 | 0.00 | 5.17 | 1.40 | 0.00 | 3.57 | 7.20 |
| Mammals | 39 | Stephens' kangaroo rat | Dipodomys stephensi (incl. D. cascus) | 3.53 | 0.00 | 0.05 | 0.00 | 0.98 | 0.00 | 0.00 | 0.61 | 5.36 |
| Mammals | 40 | Tipton kangaroo rat | Dipodomys nitratoides nitratoides | 27.78 | 9.62 | 7.20 | 0.04 | 10.65 | 10.32 | 0.00 | 11.53 | 18.55 |
| Mammals | 41 | Alabama beach mouse | Peromyscus polionotus ammobates | 1.54 | 0.54 | 0.03 | 0.81 | 0.17 | 0.96 | 1.35 | 0.00 | 0.34 |
| Mammals | 42 | Carolina northern flying squirrel | Glaucomys sabrinus coloratus | 0.55 | 0.00 | 0.19 | 0.02 | 0.06 | 1.16 | 0.56 | 0.03 | 0.21 |
| Mammals | 43 | Mount Graham red squirrel | Tamiasciurus hudsonicus grahamensis | 0.37 | 0.03 | 0.00 | 0.00 | 0.23 | 0.22 | 0.00 | 0.12 | 0.11 |
| Mammals | 50 | Anastasia Island beach mouse | Peromyscus polionotus phasma | 3.00 | 0.00 | 4.13 | 0.09 | 0.29 | 1.21 | 0.00 | 0.00 | 0.00 |
| Mammals | 51 | Pacific pocket mouse | Perognathus longimembris pacificus | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 |
| Mammals | 52 | Preble's meadow jumping mouse | Zapus hudsonius preblei | 4.26 | 0.00 | 0.39 | 0.38 | 1.25 | 1.89 | 0.01 | 2.79 | 4.29 |
| Mammals | 53 | Southeastern beach mouse | Peromyscus polionotus niveiventris | 5.65 | 0.00 | 1.31 | 0.01 | 11.01 | 0.29 | 0.00 | 0.00 | 0.00 |
| Mammals | 59 | Northern Idaho Ground Squirrel | Urocitellus brunneus | 0.08 | 0.00 | 0.02 | 0.00 | 0.05 | 0.01 | 0.00 | 0.60 | 0.01 |
| Mammals | 60 | Florida salt marsh vole | Microtus pennsylvanicus dukecampbelli | 5.37 | 0.16 | 0.26 | 6.46 | 1.50 | 1.13 | 0.06 | 0.00 | 0.00 |
| Mammals | 62 | Riparian woodrat (=San Joaquin Valley) | Neotoma fuscipes riparia | 13.45 | 0.21 | 13.97 | 0.14 | 30.19 | 23.16 | 0.00 | 31.74 | 19.64 |
| Mammals | 63 | San Bernardino Merriam's kangaroo rat | Dipodomys merriami parvus | 1.93 | 0.00 | 0.03 | 0.00 | 0.59 | 0.00 | 0.00 | 0.39 | 3.08 |
| Mammals | 4228 | Penasco least chipmunk | Tamias minimus atristriatus | 0.07 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.04 | 0.00 |
| Mammals | 5210 | New Mexico meadow jumping mouse | Zapus hudsonius luteus | 0.51 | 0.00 | 0.13 | 0.00 | 0.20 | 0.09 | 0.00 | 1.15 | 0.21 |
| Mammals | 10078 | Pacific Marten, Coastal Distinct Population Segment | Martes caurina | 0.90 | 0.00 | 0.37 | 0.00 | 0.93 | 0.02 | 0.00 | 2.29 | 0.68 |

**Table 3. Seed-eating birds and mammals percent overlap with seed treatment use layers of imidacloprid and lower limit usage value of 2.5%. Blue species denotes those evaluated for preliminary NLAA call.**

| **Taxa** | **Entity ID** | **Common Name** | **Scientific Name** | **CONUS\_Other Crops** | **CONUS\_Cotton** | **CONUS\_Vegetables and Ground Fruit** | **CONUS\_Other Row Crops** | **CONUS\_Other Grains** | **CONUS\_Corn** | **CONUS\_Soybeans** | **CONUS\_Alfalfa** | **CONUS\_Wheat** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Birds | 69 | Hawaiian (=koloa) Duck | Anas wyvilliana | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 73 | Hawaiian goose | Branta (=Nesochen) sandvicensis | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 101 | Puerto Rican plain Pigeon | Columba inornata wetmorei | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 5170 | Friendly Ground-Dove | Gallicolumba stairi | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 6901 | Yellow-billed Cuckoo | Coccyzus americanus | 0.01 | 0.03 | 0.04 | 0.01 | 0.07 | 0.04 | 0.00 | 0.00 | 0.14 |
| Birds | 87 | Micronesian megapode | Megapodius laperouse | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 89 | Masked bobwhite (quail) | Colinus virginianus ridgwayi | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 67 | Whooping crane | Grus americana | 0.07 | 0.10 | 0.06 | 0.06 | 0.31 | 0.49 | 0.42 | 0.00 | 0.67 |
| Birds | 76 | Hawaiian common gallinule | Gallinula galeata sandvicensis | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 110 | Mississippi sandhill crane | Grus canadensis pulla | 0.00 | 0.45 | 0.06 | 0.52 | 0.00 | 0.08 | 0.18 | 0.00 | 0.00 |
| Birds | 121 | Guam rail | Rallus owstoni | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 4679 | Whooping crane | Grus americana | 0.09 | 0.46 | 0.02 | 0.02 | 0.57 | 0.37 | 0.06 | 0.00 | 0.70 |
| Birds | 4889 | Guam rail | Rallus owstoni | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 7342 | Whooping crane | Grus americana | 0.00 | 0.02 | 0.06 | 0.00 | 0.05 | 0.73 | 0.64 | 0.00 | 0.18 |
| Birds | 10124 | Whooping crane | Grus americana | 0.00 | 0.03 | 0.00 | 0.00 | 0.00 | 0.10 | 0.24 | 0.00 | 0.03 |
| Birds | 79 | Palila (honeycreeper) | Loxioides bailleui | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 85 | Cape Sable seaside sparrow | Ammodramus maritimus mirabilis | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 116 | San Clemente sage sparrow | Amphispiza belli clementeae | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 117 | Yellow-shouldered blackbird | Agelaius xanthomus | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 118 | Mariana (=aga) Crow | Corvus kubaryi | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 133 | Florida grasshopper sparrow | Ammodramus savannarum floridanus | 0.00 | 0.00 | 0.04 | 0.01 | 0.00 | 0.02 | 0.00 | 0.00 | 0.00 |
| Birds | 137 | Inyo California towhee | Pipilo crissalis eremophilus | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 140 | Florida scrub-jay | Aphelocoma coerulescens | 0.00 | 0.01 | 0.01 | 0.06 | 0.00 | 0.02 | 0.00 | 0.00 | 0.00 |
| Birds | 145 | Coastal California gnatcatcher | Polioptila californica californica | 0.01 | 0.00 | 0.16 | 0.00 | 0.21 | 0.01 | 0.00 | 0.00 | 1.07 |
| Birds | 1241 | Rota bridled White-eye | Zosterops rotensis | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 4296 | Streaked Horned lark | Eremophila alpestris strigata | 0.01 | 0.00 | 0.30 | 0.01 | 0.17 | 0.14 | 0.00 | 0.00 | 0.45 |
| Birds | 107 | Red-cockaded woodpecker | Picoides borealis | 0.01 | 0.15 | 0.01 | 0.08 | 0.04 | 0.24 | 0.31 | 0.00 | 0.12 |
| Birds | 80 | Puerto Rican parrot | Amazona vittata | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 11319 | Eastern Black rail | Laterallus jamaicensis ssp. jamaicensis | 0.01 | 0.05 | 0.01 | 0.02 | 0.07 | 0.37 | 0.34 | 0.00 | 0.17 |
| Birds | 68 | Hawaiian (='alala) Crow | Corvus hawaiiensis | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 2 | Grizzly bear | Ursus arctos horribilis | 0.44 | 0.00 | 0.26 | 0.01 | 0.39 | 0.04 | 0.00 | 0.00 | 0.98 |
| Mammals | 1302 | Grizzly bear | Ursus arctos horribilis | 0.00 | 0.00 | 0.26 | 0.00 | 0.34 | 0.00 | 0.00 | 0.00 | 0.52 |
| Mammals | 16 | Morro Bay kangaroo rat | Dipodomys heermanni morroensis | 0.00 | 0.00 | 0.84 | 0.02 | 4.09 | 0.02 | 0.00 | 0.00 | 0.08 |
| Mammals | 17 | Salt marsh harvest mouse | Reithrodontomys raviventris | 0.04 | 0.00 | 0.20 | 0.01 | 3.49 | 0.09 | 0.00 | 0.00 | 1.94 |
| Mammals | 20 | Utah prairie dog | Cynomys parvidens | 0.00 | 0.00 | 0.00 | 0.00 | 0.10 | 0.09 | 0.00 | 0.00 | 0.05 |
| Mammals | 28 | Amargosa vole | Microtus californicus scirpensis | 0.00 | 0.04 | 0.05 | 0.02 | 0.09 | 0.07 | 0.00 | 0.00 | 0.14 |
| Mammals | 32 | Key Largo woodrat | Neotoma floridana smalli | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 34 | Choctawhatchee beach mouse | Peromyscus polionotus allophrys | 0.00 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 |
| Mammals | 35 | Perdido Key beach mouse | Peromyscus polionotus trissyllepsis | 0.00 | 0.80 | 0.03 | 1.22 | 0.23 | 1.38 | 1.93 | 0.00 | 0.52 |
| Mammals | 37 | Fresno kangaroo rat | Dipodomys nitratoides exilis | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 38 | Giant kangaroo rat | Dipodomys ingens | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 39 | Stephens' kangaroo rat | Dipodomys stephensi (incl. D. cascus) | 0.04 | 0.00 | 0.05 | 0.00 | 0.98 | 0.00 | 0.00 | 0.00 | 5.36 |
| Mammals | 40 | Tipton kangaroo rat | Dipodomys nitratoides nitratoides | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 41 | Alabama beach mouse | Peromyscus polionotus ammobates | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 42 | Carolina northern flying squirrel | Glaucomys sabrinus coloratus | 0.08 | 0.00 | 0.02 | 0.00 | 0.05 | 1.16 | 0.51 | 0.00 | 0.17 |
| Mammals | 43 | Mount Graham red squirrel | Tamiasciurus hudsonicus grahamensis | 0.00 | 0.03 | 0.00 | 0.00 | 0.23 | 0.22 | 0.00 | 0.00 | 0.11 |
| Mammals | 50 | Anastasia Island beach mouse | Peromyscus polionotus phasma | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 51 | Pacific pocket mouse | Perognathus longimembris pacificus | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 52 | Preble's meadow jumping mouse | Zapus hudsonius preblei | 0.14 | 0.00 | 0.02 | 0.03 | 0.20 | 0.19 | 0.00 | 0.00 | 0.39 |
| Mammals | 53 | Southeastern beach mouse | Peromyscus polionotus niveiventris | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 59 | Northern Idaho Ground Squirrel | Urocitellus brunneus | 0.00 | 0.00 | 0.02 | 0.00 | 0.04 | 0.00 | 0.00 | 0.00 | 0.01 |
| Mammals | 60 | Florida salt marsh vole | Microtus pennsylvanicus dukecampbelli | 0.00 | 0.00 | 0.26 | 1.78 | 0.01 | 0.74 | 0.00 | 0.00 | 0.00 |
| Mammals | 62 | Riparian woodrat (=San Joaquin Valley) | Neotoma fuscipes riparia | 0.00 | 0.00 | 13.97 | 0.04 | 30.19 | 23.16 | 0.00 | 0.00 | 19.64 |
| Mammals | 63 | San Bernardino Merriam's kangaroo rat | Dipodomys merriami parvus | 0.02 | 0.00 | 0.03 | 0.00 | 0.59 | 0.00 | 0.00 | 0.00 | 3.08 |
| Mammals | 4228 | Penasco least chipmunk | Tamias minimus atristriatus | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 5210 | New Mexico meadow jumping mouse | Zapus hudsonius luteus | 0.11 | 0.00 | 0.02 | 0.00 | 0.19 | 0.06 | 0.00 | 0.00 | 0.19 |
| Mammals | 10078 | Pacific Marten, Coastal Distinct Population Segment | Martes caurina | 0.00 | 0.00 | 0.29 | 0.00 | 0.53 | 0.02 | 0.00 | 0.00 | 0.68 |

The same analysis was conducted for the percent overlap of critical habitat of all seed-eating birds and mammals with each UDL associated with seed treatment and is provided below (**Tables 4-6**). As was done for species range, species where NLAA determinations were preliminarily made using the MAGtool for critical habitat were reconsidered for possible impacts due to overlap with use sites that are associated with seed treatment. Preliminary NLAA determinations were made for 1 species of birds and 2 species of mammals (**Table 4**). For all of these species, there was no overlap or low overlap of the agricultural landcover and the species range. Therefore, it is assumed that those species are unlikely to be exposed to imidacloprid via consumption of treated seeds and the determinations remained at NLAA.

**Table 4. Seed-eating birds and mammals with preliminary NLAA determinations for critical habitat based on MAGtool runs for spray applications of imidacloprid**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Taxon** | **Entity ID** | **Scientific name** | **Common name** | **Final determination** | **Strength of Call** |
| Birds | 137 | *Pipilo crissalis eremophilus* | Inyo California towhee | NLAA | NA |
| Mammals | 28 | *Microtus californicus scirpensis* | Amargosa Vole | NLAA | NA |
| 43 | *Tamiasciurus hudsonicus grahamensis* | Mount Graham Red Squirrel | NLAA | NA |

NA = not applicable

**Table 5. Seed-eating birds and mammals percent overlap of critical habitat with seed treatment use layers of imidacloprid with no usage data incorporated, 100% PCT assumption. Blue species denotes those evaluated for preliminary NLAA call.**

| **Taxa** | **Entity ID** | **Common Name** | **Scientific Name** | **CONUS\_Other Crops** | **CONUS\_Cotton** | **CONUS\_Vegetables and Ground Fruit** | **CONUS\_Other Row Crops** | **CONUS\_Other Grains** | **CONUS\_Corn** | **CONUS\_Soybeans** | **CONUS\_Alfalfa** | **CONUS\_Wheat** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Birds | 69 | Hawaiian (=koloa) Duck | *Anas wyvilliana* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 73 | Hawaiian goose | *Branta (=Nesochen) sandvicensis* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 101 | Puerto Rican plain Pigeon | *Columba inornata wetmorei* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 5170 | Friendly Ground-Dove | *Gallicolumba stairi* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 6901 | Yellow-billed Cuckoo | *Coccyzus americanus* | 5.10 | 0.59 | 0.75 | 0.03 | 0.31 | 0.20 | 0.00 | 2.54 | 0.58 |
| Birds | 87 | Micronesian megapode | *Megapodius laperouse* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 89 | Masked bobwhite (quail) | *Colinus virginianus ridgwayi* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 67 | Whooping crane | *Grus americana* | 0.62 | 0.06 | 0.44 | 0.00 | 0.93 | 12.28 | 7.33 | 1.37 | 1.04 |
| Birds | 76 | Hawaiian common gallinule | *Gallinula galeata sandvicensis* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 110 | Mississippi sandhill crane | *Grus canadensis pulla* | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.03 | 0.00 | 0.00 |
| Birds | 121 | Guam rail | *Rallus owstoni* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 4679 | Whooping crane | *Grus americana* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 4889 | Guam rail | *Rallus owstoni* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 7342 | Whooping crane | *Grus americana* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 10124 | Whooping crane | *Grus americana* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 79 | Palila (honeycreeper) | *Loxioides bailleui* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 85 | Cape Sable seaside sparrow | *Ammodramus maritimus mirabilis* | 0.17 | 0.00 | 0.09 | 0.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 116 | San Clemente sage sparrow | *Amphispiza belli clementeae* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 117 | Yellow-shouldered blackbird | *Agelaius xanthomus* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 118 | Mariana (=aga) Crow | *Corvus kubaryi* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 133 | Florida grasshopper sparrow | *Ammodramus savannarum floridanus* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 137 | Inyo California towhee | *Pipilo crissalis eremophilus* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 140 | Florida scrub-jay | *Aphelocoma coerulescens* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 145 | Coastal California gnatcatcher | *Polioptila californica californica* | 0.25 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.06 |
| Birds | 1241 | Rota bridled White-eye | *Zosterops rotensis* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 4296 | Streaked Horned lark | *Eremophila alpestris strigata* | 22.07 | 0.00 | 3.60 | 0.13 | 2.83 | 1.94 | 0.00 | 0.22 | 3.42 |
| Birds | 107 | Red-cockaded woodpecker | *Picoides borealis* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 80 | Puerto Rican parrot | *Amazona vittata* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 11319 | Eastern Black rail | *Laterallus jamaicensis ssp. jamaicensis* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 68 | Hawaiian (='alala) Crow | *Corvus hawaiiensis* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 16 | Morro Bay kangaroo rat | *Dipodomys heermanni morroensis* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 17 | Salt marsh harvest mouse | *Reithrodontomys raviventris* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 2 | Grizzly bear | *Ursus arctos horribilis* | 2.17 | 0.00 | 0.00 | 0.00 | 0.67 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 1302 | Grizzly bear | *Ursus arctos horribilis* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 20 | Utah prairie dog | *Cynomys parvidens* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 28 | Amargosa vole | *Microtus californicus scirpensis* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 32 | Key Largo woodrat | *Neotoma floridana smalli* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 34 | Choctawhatchee beach mouse | *Peromyscus polionotus allophrys* | 0.02 | 0.00 | 0.00 | 0.02 | 0.02 | 0.00 | 0.02 | 0.00 | 0.01 |
| Mammals | 35 | Perdido Key beach mouse | *Peromyscus polionotus trissyllepsis* | 0.16 | 0.05 | 0.00 | 0.24 | 0.00 | 0.04 | 0.01 | 0.00 | 0.01 |
| Mammals | 37 | Fresno kangaroo rat | *Dipodomys nitratoides exilis* | 22.43 | 0.00 | 0.17 | 0.00 | 3.71 | 0.02 | 0.00 | 2.05 | 11.55 |
| Mammals | 38 | Giant kangaroo rat | *Dipodomys ingens* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 39 | Stephens' kangaroo rat | *Dipodomys stephensi (incl. D. cascus)* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 40 | Tipton kangaroo rat | *Dipodomys nitratoides nitratoides* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 41 | Alabama beach mouse | *Peromyscus polionotus ammobates* | 1.52 | 0.21 | 0.26 | 0.21 | 0.31 | 0.51 | 0.73 | 0.00 | 0.01 |
| Mammals | 42 | Carolina northern flying squirrel | *Glaucomys sabrinus coloratus* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 43 | Mount Graham red squirrel | *Tamiasciurus hudsonicus grahamensis* | 0.00 | 0.00 | 0.00 | 0.00 | 0.05 | 0.07 | 0.00 | 0.01 | 0.01 |
| Mammals | 50 | Anastasia Island beach mouse | *Peromyscus polionotus phasma* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 51 | Pacific pocket mouse | *Perognathus longimembris pacificus* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 52 | Preble's meadow jumping mouse | *Zapus hudsonius preblei* | 0.04 | 0.00 | 0.00 | 0.00 | 0.04 | 0.03 | 0.00 | 1.25 | 0.01 |
| Mammals | 53 | Southeastern beach mouse | *Peromyscus polionotus niveiventris* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 59 | Northern Idaho Ground Squirrel | *Urocitellus brunneus* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 60 | Florida salt marsh vole | *Microtus pennsylvanicus dukecampbelli* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 62 | Riparian woodrat (=San Joaquin Valley) | *Neotoma fuscipes riparia* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 63 | San Bernardino Merriam's kangaroo rat | *Dipodomys merriami parvus* | 1.49 | 0.00 | 0.01 | 0.00 | 0.59 | 0.00 | 0.00 | 0.23 | 2.48 |
| Mammals | 4228 | Penasco least chipmunk | *Tamias minimus atristriatus* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 5210 | New Mexico meadow jumping mouse | *Zapus hudsonius luteus* | 0.18 | 0.00 | 0.00 | 0.00 | 0.02 | 0.11 | 0.00 | 1.91 | 0.01 |
| Mammals | 10078 | Pacific Marten, Coastal Distinct Population Segment | *Martes caurina* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**Table 6. Seed-eating birds and mammals percent overlap of critical habitat with seed treatment use layers of imidacloprid and lower limit usage value of 2.5%. Blue species denotes those evaluated for preliminary NLAA call.**

| **Taxa** | **Entity ID** | **Common Name** | **Scientific Name** | **CONUS\_Other Crops** | **CONUS\_Cotton** | **CONUS\_Vegetables and Ground Fruit** | **CONUS\_Other Row Crops** | **CONUS\_Other Grains** | **CONUS\_Corn** | **CONUS\_Soybeans** | **CONUS\_Alfalfa** | **CONUS\_Wheat** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Birds | 69 | Hawaiian (=koloa) Duck | *Anas wyvilliana* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 73 | Hawaiian goose | *Branta (=Nesochen) sandvicensis* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 101 | Puerto Rican plain Pigeon | *Columba inornata wetmorei* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 5170 | Friendly Ground-Dove | *Gallicolumba stairi* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 6901 | Yellow-billed Cuckoo | *Coccyzus americanus* | 0.37 | 0.57 | 0.67 | 0.02 | 0.24 | 0.20 | 0.00 | 0.00 | 0.56 |
| Birds | 87 | Micronesian megapode | *Megapodius laperouse* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 89 | Masked bobwhite (quail) | *Colinus virginianus ridgwayi* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 67 | Whooping crane | *Grus americana* | 0.00 | 0.01 | 0.44 | 0.00 | 0.86 | 12.27 | 7.30 | 0.00 | 1.04 |
| Birds | 76 | Hawaiian common gallinule | *Gallinula galeata sandvicensis* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 110 | Mississippi sandhill crane | *Grus canadensis pulla* | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.03 | 0.00 | 0.00 |
| Birds | 121 | Guam rail | *Rallus owstoni* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 4679 | Whooping crane | *Grus americana* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 4889 | Guam rail | *Rallus owstoni* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 7342 | Whooping crane | *Grus americana* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 10124 | Whooping crane | *Grus americana* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 79 | Palila (honeycreeper) | *Loxioides bailleui* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 85 | Cape Sable seaside sparrow | *Ammodramus maritimus mirabilis* | 0.00 | 0.00 | 0.09 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 116 | San Clemente sage sparrow | *Amphispiza belli clementeae* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 117 | Yellow-shouldered blackbird | *Agelaius xanthomus* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 118 | Mariana (=aga) Crow | *Corvus kubaryi* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 133 | Florida grasshopper sparrow | *Ammodramus savannarum floridanus* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 137 | Inyo California towhee | *Pipilo crissalis eremophilus* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 140 | Florida scrub-jay | *Aphelocoma coerulescens* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 145 | Coastal California gnatcatcher | *Polioptila californica californica* | 0.18 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.06 |
| Birds | 1241 | Rota bridled White-eye | *Zosterops rotensis* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 4296 | Streaked Horned lark | *Eremophila alpestris strigata* | 7.03 | 0.00 | 3.60 | 0.11 | 2.83 | 1.89 | 0.00 | 0.00 | 3.42 |
| Birds | 107 | Red-cockaded woodpecker | *Picoides borealis* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 80 | Puerto Rican parrot | *Amazona vittata* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 11319 | Eastern Black rail | *Laterallus jamaicensis ssp. jamaicensis* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Birds | 68 | Hawaiian (='alala) Crow | *Corvus hawaiiensis* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 2 | Grizzly bear | *Ursus arctos horribilis* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 1302 | Grizzly bear | *Ursus arctos horribilis* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 16 | Morro Bay kangaroo rat | *Dipodomys heermanni morroensis* | 0.00 | 0.00 | 0.00 | 0.00 | 0.67 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 17 | Salt marsh harvest mouse | *Reithrodontomys raviventris* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 20 | Utah prairie dog | *Cynomys parvidens* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 28 | Amargosa vole | *Microtus californicus scirpensis* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 32 | Key Largo woodrat | *Neotoma floridana smalli* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 34 | Choctawhatchee beach mouse | *Peromyscus polionotus allophrys* | 0.00 | 0.00 | 0.00 | 0.02 | 0.02 | 0.00 | 0.02 | 0.00 | 0.00 |
| Mammals | 35 | Perdido Key beach mouse | *Peromyscus polionotus trissyllepsis* | 0.00 | 0.05 | 0.00 | 0.24 | 0.00 | 0.04 | 0.01 | 0.00 | 0.01 |
| Mammals | 37 | Fresno kangaroo rat | *Dipodomys nitratoides exilis* | 0.00 | 0.00 | 0.17 | 0.00 | 3.71 | 0.02 | 0.00 | 0.00 | 11.55 |
| Mammals | 38 | Giant kangaroo rat | *Dipodomys ingens* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 39 | Stephens' kangaroo rat | *Dipodomys stephensi (incl. D. cascus)* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 40 | Tipton kangaroo rat | *Dipodomys nitratoides nitratoides* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 41 | Alabama beach mouse | *Peromyscus polionotus ammobates* | 0.00 | 0.21 | 0.26 | 0.21 | 0.31 | 0.51 | 0.73 | 0.00 | 0.01 |
| Mammals | 42 | Carolina northern flying squirrel | *Glaucomys sabrinus coloratus* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 43 | Mount Graham red squirrel | *Tamiasciurus hudsonicus grahamensis* | 0.00 | 0.00 | 0.00 | 0.00 | 0.05 | 0.07 | 0.00 | 0.00 | 0.01 |
| Mammals | 50 | Anastasia Island beach mouse | *Peromyscus polionotus phasma* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 51 | Pacific pocket mouse | *Perognathus longimembris pacificus* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 52 | Preble's meadow jumping mouse | *Zapus hudsonius preblei* | 0.00 | 0.00 | 0.00 | 0.00 | 0.04 | 0.03 | 0.00 | 0.00 | 0.01 |
| Mammals | 53 | Southeastern beach mouse | *Peromyscus polionotus niveiventris* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 59 | Northern Idaho Ground Squirrel | *Urocitellus brunneus* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 60 | Florida salt marsh vole | *Microtus pennsylvanicus dukecampbelli* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 62 | Riparian woodrat (=San Joaquin Valley) | *Neotoma fuscipes riparia* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 63 | San Bernardino Merriam's kangaroo rat | *Dipodomys merriami parvus* | 1.06 | 0.00 | 0.01 | 0.00 | 0.59 | 0.00 | 0.00 | 0.00 | 2.48 |
| Mammals | 4228 | Penasco least chipmunk | *Tamias minimus atristriatus* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Mammals | 5210 | New Mexico meadow jumping mouse | *Zapus hudsonius luteus* | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.11 | 0.00 | 0.00 | 0.00 |
| Mammals | 10078 | Pacific Marten, Coastal Distinct Population Segment | *Martes caurina* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

*Exploratory Spatial Analysis to determine where seed treatment usage would be informative*

Seed treatment applications with imidacloprid are generally considered to be widespread in terms of the number of registered crops (and land areas in which they are grown), and the percentage of those crops planted with treated seed. However, quantitative seed treatment usage data are difficult to obtain due to the complexities of capturing this usage information from growers. While verifiable quantitative usage data that indicate the total pounds, active ingredient used to treat seed or the location and the number of acres planted with treated seed are not currently available, applications of imidacloprid to seed and seed pieces may be generally characterized as commonly used on a wide variety of crop seeds and seed pieces for planting based on extension recommendations and other information. Given this difficulty in obtaining quantitative usage information, an exploratory spatial analysis was conducted to identify areas of the country where seed treatment usage data would be the most beneficial and informative.

By reviewing the locations of seed-eating animals, and the locations of registered seed treatment crops for imidacloprid, it is possible to identify the areas of the country where usage information would be the most valuable. For imidacloprid there are a total of 39 seed treatment crops that are associated with 9 Use Data Layers (UDL) all of which are agricultural (see **APPENDIX 1-5** for additionalinformation on the UDLs). These include Corn, Cotton, Soybean, Wheat, Vegetable and Ground Fruit, Other Crops, Other Row Crops, Alfalfa, and Other Grains UDLs (**Figure 1**). The complete crosswalk for all 9 UDL classes can be found in **Table 7**.

|  |  |
| --- | --- |
| **Reclass Value** | **UDL General Classes** |
| 110 | Alfalfa/agricultural grasses |
| 10 | Corn |
| 14 | Corn/soybeans |
| 15 | Corn/wheat |
| 18 | Corn/grains |
| 20 | Cotton |
| 25 | Cotton/wheat |
| 26 | Cotton/vegetables |
| 30 | Rice |
| 40 | Soybeans |
| 42 | Soybeans/cotton |
| 45 | Soybeans/wheat |
| 48 | Soybeans/grains |
| 50 | Wheat |
| 56 | Wheat/vegetables |
| 58 | Wheat/grains |
| 60 | Vegetables and ground fruit |
| 61 | (ground fruit) |
| 68 | Vegetables/grains |
| 80 | Other grains |

Figure 1. Summary of Use Data Layer Classes for seed treatment of imidacloprid

*These classes are not mutually exclusive to one another and are further reclassified into 13 national agricultural UDL classes. 10 UDLs are used to map imidacloprid labelled seed treatment uses.*

***Table 1.***

**Corn:** 10, 14, 15, 18

**Cotton:** 20, 25, 26, 42

**Rice**: 30

**Soybeans**: 40, 42, 45, 48, 14

**Wheat:** 50, 56, 58, 15, 25, 45

**Vegetables & Ground Fruit**: 60, 61, 68, 26, 56

**Other Grains**: 80, 18, 48, 58

**Other Row Crops:** 90

**Other Crops:** 100

**Alfalfa/agricultural grasses:** 110

Table 7. Crosswalk of imidacloprid seed treatment uses across crop sources

| **Label Use**  **(source - SUUM Table 2)** | **Name in Census** | **UDL** |
| --- | --- | --- |
| Barley | BARLEY | Other grains |
| Beans | BEANS, SNAP; BEANS, GREEN, LIMA; | Vegetables and ground fruit |
| Borage | FIELD CROPS, OTHER | Vegetables and ground fruit |
| Broccoli | VEGETABLES, OTHER | Vegetables and ground fruit |
| Broccoli | BROCCOLI | Vegetables and ground fruit |
| Buckwheat | BUCKWHEAT | Other grains |
| Canola/Rape | CANOLA | Other grains |
| Carrots | CARROTS | Vegetables and ground fruit |
| Corn, field | CORN, GRAIN; CORN, SILAGE | Corn |
| Corn, pop | POPCORN, SHELLED | Vegetables and ground fruit |
| Corn, sweet | SWEET CORN | Vegetables and ground fruit |
| Corn, traditional | CORN, TRADITIONAL OR INDIAN | Vegetables and ground fruit |
| Cotton | COTTON | Cotton |
| Crambe | FIELD CROPS, OTHER | Other grains |
| Flax | FLAXSEED | Other grains |
| Leek | ONIONS, GREEN | Vegetables and ground fruit |
| Millet | MILLET, PROSO | Other grains |
| Mustard | CABBAGE, MUSTARD | Vegetables and ground fruit |
| Mustard | GREENS, MUSTARD | Vegetables and ground fruit |
| Mustard | MUSTARD, SEED | Other row crops |
| Oats | OATS | Other grains |
| Onion | ONIONS, GREEN; ONIONS, DRY | Vegetables and ground fruit |
| Peanuts | PEANUTS | Other row crops |
| Peas | PEAS, AUSTRIAN WINTER; PEAS, CHINESE (SUGAR & SNOW); PEAS, GREEN, (EXCL SOUTHERN); PEAS, GREEN, SOUTHERN (COWPEAS) | Vegetables and ground fruit |
| Potato | POTATOES | Vegetables and ground fruit |
| Canola/Rape | RAPESEED | Other grains |
| Rye | RYE | Other grains |
| Safflower | SAFFLOWER | Other grains |
| Scallion | ONIONS, GREEN | Vegetables and ground fruit |
| Sorghum | SORGHUM, GRAIN; SORGHUM, SILAGE; SORGHUM, SYRUP | Other grains |
| Soybean | SOYBEANS | Soybeans |
| Sugar beets | SUGARBEETS | Other row crops |
| Sunflower | SUNFLOWER | Other row crops |
| Switch Grass grown for biofuel | SWITCHGRASS | Alfalfa |
| Teosinte | FIELD CROPS, OTHER | Other row crops |
| Triticale | TRITICALE | Other grains |
| Wheat | WHEAT | Wheat |
| Dry Pea/Beans | BEANS, DRY EDIBLE, (EXCL LIMA); BEANS, DRY EDIBLE, LIMA; PEAS, DRY EDIBLE; PEAS, DRY, SOUTHERN (COWPEAS); BEANS, DRY EDIBLE, (EXCL CHICKPEAS & LIMA) | Vegetables and ground fruit |

For UDLs that represent single crops, Corn, Cotton, Alfalfa, Soybean and Wheat, there are no geographically specific areas where the crops are likely to be grown based on registered uses. The exception is for Cotton UDLs, which are known to be grown predominantly in the south. **Figure 2** shows the states where cotton is known to be commercially grown.

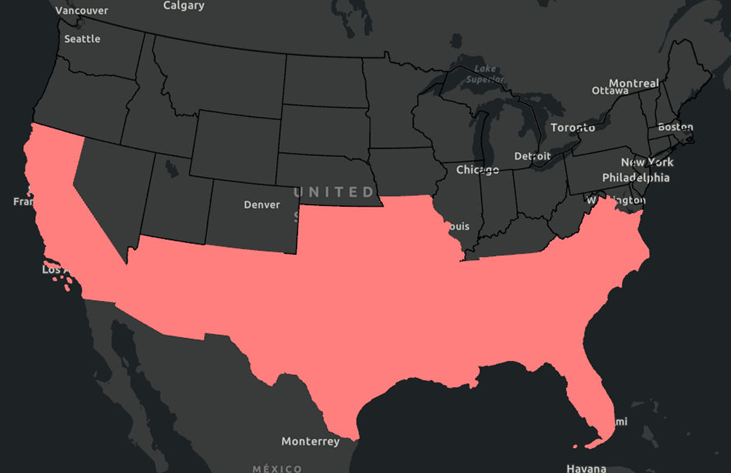


Figure 2. States where cotton is grown (in red)

However, for the UDLs that contain multiple crops and spatial patterns based on where the registered crops are likely to be grown, these may be present. **Figure 3** identifies the number of registered to non-registered crops found in each of the UDLs. This graph indicates that all Vegetables and Ground Fruit, Other Row Crops, Other Crops and Other Grains UDLs include a number of un-registered crops.

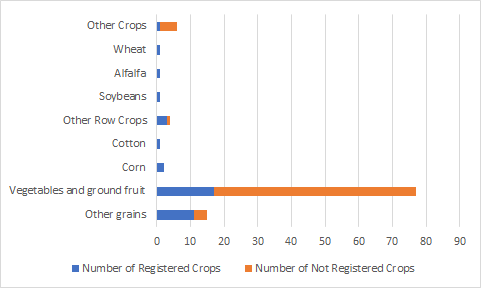
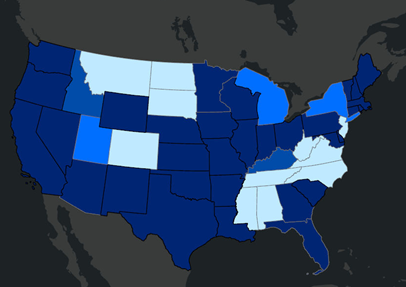
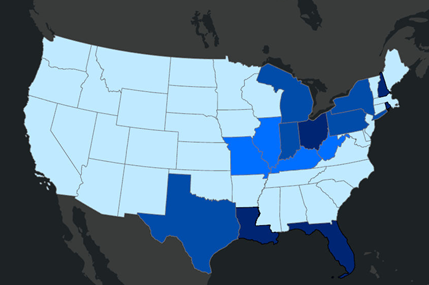
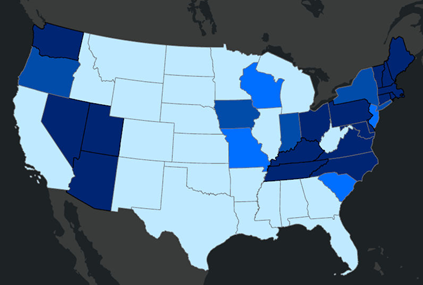


Figure 3. The number of registered to unregistered seed treatment crops found in each UDL group

Using the 2017 Census of Agriculture to identify where the registered crops are likely to be located, areas of the country are highlighted to show locations where registered seed treatment crops are more likely to be grown. In **Figure 4** the maps represent where the registered seed treatment Other Crops, Other Grains, Other Row Crops, and Vegetables and Ground Fruit are grown. The gradient represents the area of registered seed treatment crops relative to the total area of all crops in the UDL for the state. In the maps below the lighter the color the higher this ratio and the more likely a registered seed treatment crop would be grown in the state.







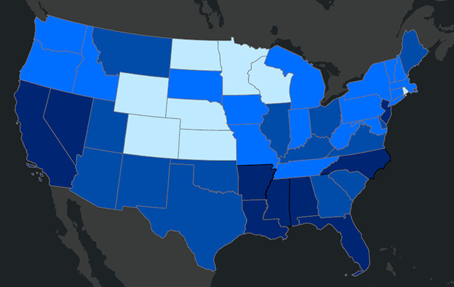


Figure 4. Ratio of the area of registered seed treatment crops to the total area of the crops found in the UDLs from top to bottom: Other Crops, Other Grains, Other Row Crops, and Vegetables and Ground Fruit. Lighter blue colors are associated with a higher ratio of registered seed treatment crops relative to the total area of crops.

There are several notable patterns when considering these UDL groups. Across the UDLs there are a high number of registered seed treatment crops which occur most frequently in the more central states of the continental U.S. Colorado is the only state that contains all the UDLs that have registered seed treatment uses. The seed treatment uses for Other Grains and Other Row crops are widespread. Alabama, Mississippi, and Georgia all have higher ratios of registered seed treatment uses across these 4 UDLs.

When combining the ratios for 4 of the UDLS (Other Crops, Other Grains, Other Row Crops, and Vegetables and Ground Fruit), the areas where the registered seed treatment crops are likely to be present decreases (**Figure 5**). Colorado, Alabama, Mississippi, Montana, and Michigan all have higher combined ratios of registered seed treatment uses. For this reason, these locations would be the most beneficial when identifying quantitative usage data.

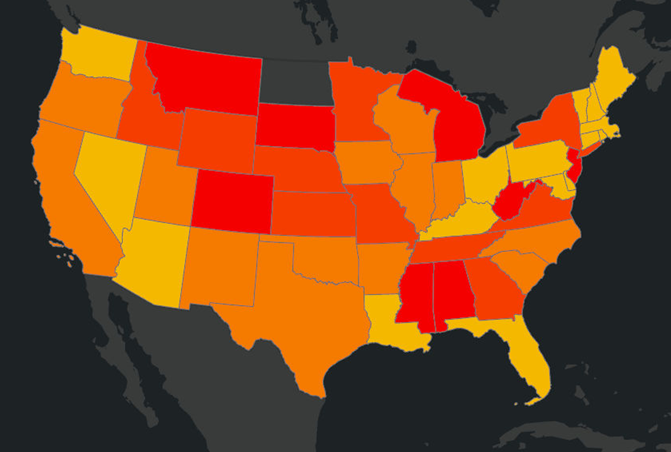


Figure 5. Combined ratio of the area of registered seed treatment crops to the total area of the crops found for Other Crops, Other Grains, Other Row Crops, and Vegetables and Ground Fruit. Yellow indicates a lower ratio and red indicates a higher ratio of registered crops for seed treatment uses.

To further identify the areas where usage information would be the most valuable, the location of seed-eating birds and mammals can be overlaid on the map (**Figure 6**). In **Figure 6,** the gradient of the combined ratio of registered Vegetables and Ground Fruit and Other Grains remains the same, with seed-eating birds in the green gradient and seed-eating mammals in a purple gradient. The gradient on the species location represents the number of species found in that location, the darker the color the higher the number of seed-eating species present. To help identify the most informative locations for obtaining usage data, only areas with two or more seed-eating animals are presented in the map.

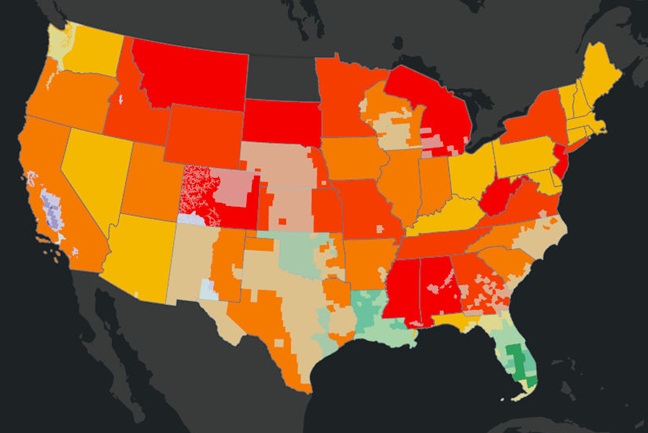


Figure 6. Combined ratio of the area of registered seed treatment crops to the total area of the crops found for Other Crops, Other Grains, Other Row Crops, and Vegetables and Ground Fruit crops with seed-eating birds and mammals.

When considering the location of the seed-eating species in conjunction with the UDLs with registered seed treatment uses, there are several notable locations. First, both Florida and Louisiana have a number of seed-eating animals but do not have a high ratio for registered seed treatment crops. Areas where a large area of both seed-eating species and registered seed treatment crops occur include Georgia, Alabama, Colorado, Michigan. The areas in which better defined seed treatment data would the most useful in developing a more refined analysis for possible exposure of treated seeds to vulnerable populations would be Colorado, Michigan, and Georgia. Based on this generalized analysis using limited data these areas would warrant a more refined analysis. These lists of states identify where usage information across all of the crops with registered seed treatment would be potentially the most beneficial, however, the states may change if specific crops are targeted.

**Figure 7** presents combined total ratio of all registered seed treatment crops. Areas where a large area of registered seed treatment crops occur include New Jersey, North Carolina, West Virginia, Virginia, South Carolina, Tennessee, Georgia, Missouri, Arkansas, Florida, Alabama, Texas, Oklahoma, Kansas, Nebraska, New Mexico, Colorado, California, Montana, North Dakota, South Dakota and Wyoming.

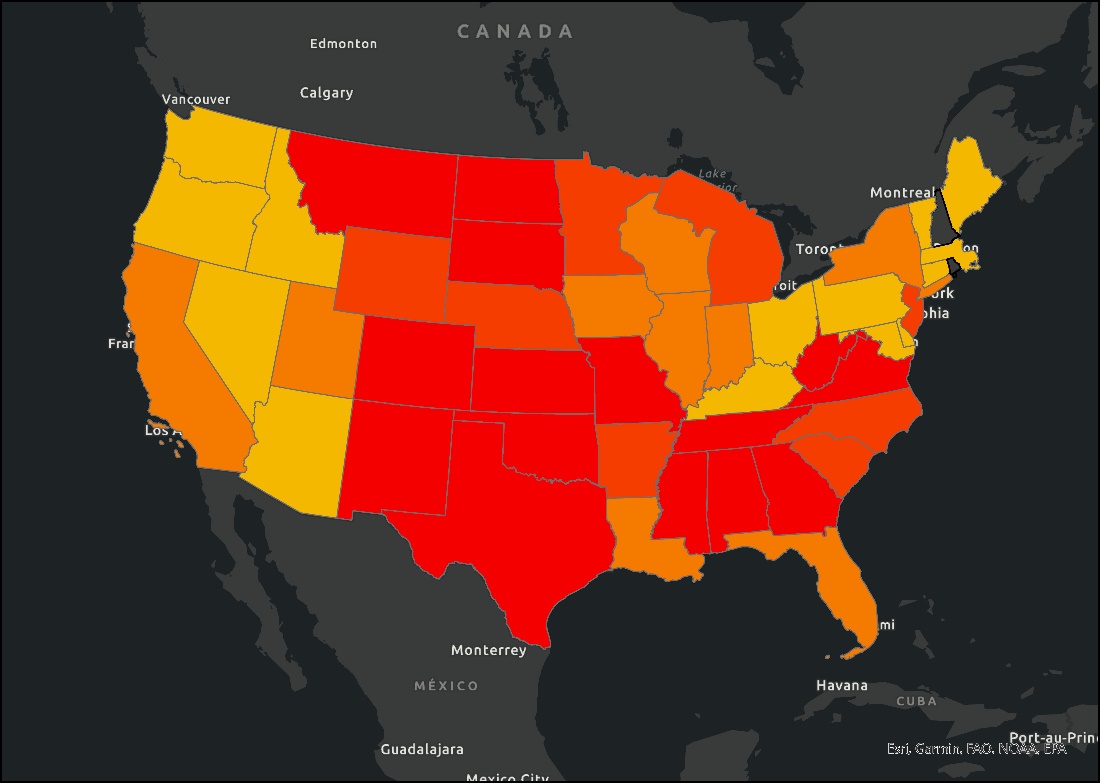
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Figure 7. Combined ratio of the area of registered seed treatment crops to the total area of the crops found for all seed treatment UDLs

**Figure 8** was created by summing the combined ratio of both bird and mammal seed-eating species counts by state. This creates a generic combined index value. The combined index illustrates the areas in which there is relatively higher overlap of species and higher proportions of registered seed treatment used. The higher combined ratios are in red.

When all seed-eating species and all registered seed treatment crops were summed to create the combined index, states such as Colorado and Alabama remained as areas of interest, while other states such as Texas, California, and Florida became more relevant areas based on the number of listed species present within the state (**Figure 8**). The top two states would be Colorado and Alabama given their persistence as areas of interest throughout this analysis, due to the number of seed eaters in these locations and the high ratio of registered crops area.

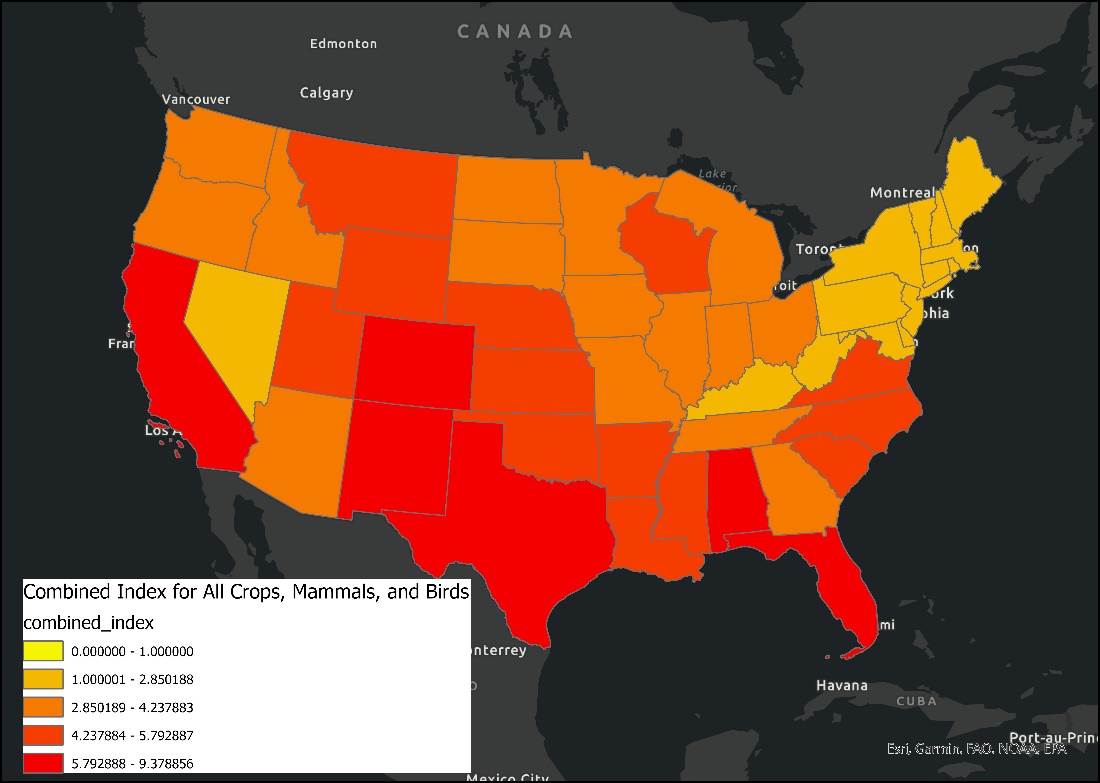


Figure 8. National-level combined ratio species count index calculated using both all the ratios of registered seed treatment crops to the total area of the crops and bird and mammal seed-eaters counts

# Granule Uses

For terrestrial organisms, the primary route of exposure to granules is assumed to be via ingestion by vertebrates, and via ingestion and contact by invertebrates. Spray drift is not expected from these types of uses; therefore, potential terrestrial exposures are assumed to be limited to the sites of application. **Table 8** shows registered agricultural granular uses of imidacloprid. **Table 9** shows registered residential granular uses of imidacloprid. More detailed information on specific use sites is in **APPENDIX 1-3**. Imidacloprid also has other flowable registrations for these use sites. Therefore, the granular uses do not represent a different use footprint than the one being captured by the flowable uses. For the agricultural uses (brassica (cole) vegetables, fruiting vegetables, and lettuce) the application rates are the same as for the liquid formulation use. For residential and other developed uses, the MAGTool assessment included a single application of 0.5 lb ai/A for turf flowable use. This is the maximum yearly rate allowable for imidacloprid and should be protective of any granular use rate.

Table 8. Ground soil application methods/timing for granular formulations (application rates are the same as for liquid formulations)

| **Crop/Crop group/subgroup** | ***Method*** |
| --- | --- |
| Brassica (cole)/fruiting vegetables | ***(a)*** In a narrow 2” band centered on the plant row 1 to 2” below the seed depth during bedding <14 days before planting;  ***(b)*** In furrow application at or below seed level during planting; or  ***(c)*** As a side-dress placed 2-4” at the side of each row and incorporated at a depth of >1” after the plants are established |
| Lettuce (head & leaf; direct seeded or transplanted) | ***(a)*** In a narrow 2” band centered on the plant row 1 to 2” below the seed depth during bedding <14 days before planting;  ***(b)*** In furrow application at or below seed level during planting; |
| Registered product; ADMIRE 2.5 Granular, Reg. No. 3125-423, 2.5% Imidacloprid alone MSR= Maximum Single rate in lb. a.i/A/Year = 0.38 | |

Table 9. Summary of non-agricultural granular/tablet soil-applied imidacloprid (IMI) formulations

| ***Product Name*** | ***EPA Reg. No.*** | ***IMI %*** |
| --- | --- | --- |
| 0.15% Imidacloprid + 0.05% Beta-Cyfluthrin Granular Insecticide | 72155-31 | 0.150% |
| ALLECTUS® 0.15 G Plus Turf Fertilizer Insecticide | 432-1419 | 0.083% |
| ALLECTUS® GC Granular Insecticide | 432-1416 | 0.200% |
| ALLECTUS® G Insecticide | 432-1407 | 0.200% |
| Allectus 0.15 GC Plus Turf Fertilizer Insecticide | 432-1428 | 0.083% |
| ALLECTUS® 0.18 G PLUS TURF FERTILIZER Insecticide | 432-1418 | 0.100% |
| Allectus 0.18 GC Plus Turf Fertilizer Insecticide | 432-1426 | 0.100% |
| Allectus 0.225 GC Plus Turf Fertilizer Insecticide | 432-1427 | 0.125% |
| Allectus 0.225 G Plus Turf Fertilizer Insecticide | 432-1417 | 0.125% |
| Bayer Advanced 2-in-1 Rose & Flower Care Ready-to-use Granules III | 72155-95 | 0.220% |
| Bayer Advanced All-in -one Rose & Flower Care Ready-to-use G | 72155-94 | 0.110% |
| Bayer Advanced 12-Month Tree & Shrub Protect & Feed Ready-To-Use Granules II | 72155-96 | 0.550% |
| IMI 0.22 G T&O Insecticide | 53883-226 | 0.220% |
| IMI 0.3 G Lawn and Ornamental Insecticide | 53883-219 | 0.300% |
| IMI 1% G Insecticide | 53883-227 | 1.000% |
| IMI 0.5 G Insecticide | 53883-199 | 0.500% |
| IMI O.22G RTS GRANULES Ready-to-Spread | 53883-256 | 0.220% |
| IMI Termite G (0.5%) | 53883-198 | 0.500% |
| IMI-Lambda G insect Granules | 53883-230 | 0.500% |
| Imidacloprid 0.2% Insecticide plus Turf Fertilizer | 1381-223 | 0.200% |
| Imidacloprid 0.5 G - Turf Insecticide | 1381-224 | 0.500% |
| IMID-BIFEN 0.15 LAWN + FERTILIZER Insecticide | 42750-156 | 0.083% |
| IMID-BIFEN 0.225 LAWN + FERTILIZER Insecticide | 42750-162 | 0.125% |
| IMID-BIFEN 0.36 GC Insecticide | 42750-161 | 0.200% |
| ImiBloc 0.5 G Termiticide Insecticide | 70506-143 | 0.500% |
| LADA 0.5G Turf and Ornamental Insecticide | 83100-14 | 0.500% |
| LADA 1.0 G Nursery Insecticide | 83100-17 | 1.000% |
| LADA 2.S G Ornamental Insecticide | 83100-16 | 2.500% |
| LADATM O.5G Termiticide | 83100-15 | 0.500% |
| Lawn Insect Control 2 | 279-3339 | 0.200% |
| LPI IMIDACLOPRID 1.0 G | 34704-962 | 1.000% |
| MALICE® 0.2 Plus Turf Fertilizer | 34704-979 | 0.200% |
| Mallet®5 G Tree and Shrub Insecticide | 228-567 | 5.000% |
| Mallet®5 G Turf & Ornamentals Insecticide | 228-566 | 5.000% |
| Marathon 1% G Insecticide | 59807-15 | 1.000% |
| Merit® 0.35 Plus Turf Fertilizer | 432-1355 | 0.350% |
| Merit® 0.45 Plus Turf Fertilizer | 432-1356 | 0.450% |
| Merit® 0.2 Granular Insecticide | 72155-44 | 0.200% |
| Merit® 0.3 G Insecticide | 432-1450 | 0.300% |
| Merit® 0.22 G Plant Treatment | 432-1456 | 0.220% |
| Merit® 0.25 Plus Lawn and Garden Fertilizer | 72155-36 | 0.250% |
| Merit® 1 G Greenhouse and Nursery Insecticide | 432-1329 | 1.000% |
| Merit® 1.1 %Insecticide | 432-1472 | 1.100% |
| Merit® FXT Tablet insecticide | 432-1457 | 20.00% |
| Pro-Mate® Merit® 0.2% With Turf Fertilizer | 5905-591 | 0.200% |
| QUALI-PRO® IMIDACLOPRID 0.5G INSECTICIDE | 66222-200 | 0.500% |
| QUALI-PRO® IMIDACLOPRID 1G Nursery & Greenhouse Insecticide | 66222-201 | 1.000% |
| The Andersons 0.077% Bifenthrin + 0.155% Imidacloprid Granular Insecticide | 9198-239 | 0.155% |
| The Andersons 0.2% Imidacloprid Insecticide + Fertilizer | 9198-236 | 0.200% |
| TURFTHOR 2.5 G insecticide for turf-grass & landscape ornamentals | 83923-9 | 2.500% |
| TURFTHOR 0.5 G insecticide for turf-grass & landscape ornamentals | 83923-10 | 0.500% |
| Pursell PM with Imidacloprid & Fertilizer | 8660-252 | 0.011% |
| Merit® 0.005% PM Plus Fertilizer | 72155-10 | 0.005% |

For non-target taxa, the primary routes of exposure from the granular uses of imidacloprid are assumed to be via ingestion of contaminated plants that uptake imidacloprid from the soil. For ground-dwelling species, there may also be contact with or ingestion of soil or granules. For application rates that are lower for the granular use than the flowable uses, the soil concentrations from the granular use are expected to be lower than the concentrations from the flowable uses. It is anticipated that the residue concentrations in plants from the granular use will not be higher than the residues on plants from flowable uses (assuming similar application rates). Therefore, the estimated exposures from the flowable uses will be used to evaluate exposures from the granular uses where possible.

For terrestrial vertebrates, another route of exposure is expected to be to birds found on the site of application that may ingest the granules, which are clay-based, as grit. Other taxa may also eat soil or have incidental soil ingestion; however, the probability of incidental ingestion for other vertebrates is assumed to be lower. The risk exposure estimates calculated for direct bird consumption are used as a proxy for the exposure of other terrestrial vertebrates.

The imidacloprid granular products currently registered for uses on developed areas have a maximum rate of 5% a.i. (not including the one tablet formulation). To explore potential exposures to birds, the number of imidacloprid granules (5% a.i. products) that birds of different sizes would need to ingest to exceed the acute, mortality threshold (LD50 = 17 mg/kg-bw) is calculated using T-REX (see **Table 10**). This analysis will be protective of birds eating granules in agriculture uses because these products have a lower % a.i. as well as the requirement for burying the granulates to a depth >1 inch. Based on this analysis, which used an estimated single granule weight of 10 mg, 20-g, 100-g, and 1,000-g birds would need to ingest 1, 4, and 44 granules, respectively, to exceed the mortality threshold.

**Table 10. T-REX Inputs and Outputs for Imidacloprid Granular Exposure Estimates for Birds (5% a.i. products)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Input/Output** | **20 g Bird** | | **100 g Bird** | **1,000 g Bird** | |
| Weight of bird (kg) | 0.02 | | 0.10 | 1.0 | |
| Adjusted threshold, mg/kg-bw1, 2 | 12.3 | | 15.6 | 22.0 | |
| mg a.i. needed to achieve the adjusted threshold for bird of assessed weight | 0.25 | | 1.6 | 22 | |
| Fraction of a.i. in formulated product | 0.05 | | | | |
| Weight of 1 granule (mg, estimation) | 10 | | | | |
| mg a.i./granule | 0.5 | | | | |
| No. of granules needed to exceed mortality threshold (5% a.i.) | 1 | 4 | | | 44 |

1 Based on the LD50 mortality of 17 mg a.i./kg-bw (MRID 44457401).

2 Values were adjusted in the T-REX tool’s LD50 ft2 tab.

For those species where an LAA determination was made based on the quantitative analysis using the MAGtool and spray uses, potential exposure to granules would serve as an additional line of evidence supporting that LAA determination. In the individual effects determination output sheets from the MAGtool (**APPENDIX 4.9**), if a terrestrial animal range or critical habitat has overlap with a use site with foliar applications where granular uses are also permitted, it is specified that this use should be given additional consideration by the assessor by referring to this appendix.

For those species where NLAA determinations were preliminarily made using the MAGtool, indicating that no other uses are expected to impact greater than 1 individual, these determinations were reconsidered for possible impacts due to overlap with use sites that are associated with granular use. Preliminary NLAA determinations were made for species range and critical habitat as shown in **Table 11** and **Table 12** below. Consideration was given to the degree of overlap of species range or critical habitat with UDLs that are associated with granular use sites (primarily CONUS\_Developed and CONUS\_Open Space Developed), species habitat, life history, dietary items and the number of granules identified to exceed thresholds in determining whether potential impacts could occur based on granular use. For 5 species ranges and 1 critical habitat, the determinations are changed to LAA with weakest evidence based on these factors as shown below.

**Table 11. Terrestrial animals with preliminary NLAA determinations based on MAGtool runs for spray applications of imidacloprid**

| **Taxon** | **Entity ID** | **Scientific name** | **Common name** | **Final determination** | **Strength of Call** |
| --- | --- | --- | --- | --- | --- |
| Birds | 66 | *Gymnogyps californianus* | California condor | NLAA | NA |
| 96 | *Sterna antillarum browni* | California least tern | NLAA | NA |
| 124 | *Mycteria americana* | Wood stork | NLAA | NA |
| 130 | *Charadrius melodus* | Piping Plover | NLAA | NA |
| 134 | *Sterna antillarum* | Least tern | NLAA | NA |
| 134 | *Sterna antillarum* | Least tern | NLAA | NA |
| Mammals | 8 | *Puma (=Felis) concolor coryi* | Florida panther | NLAA | NA |
| 18 | *Panthera onca* | Jaguar | NLAA | NA |
| 43 | *Tamiasciurus hudsonicus grahamensis* | Mount Graham red squirrel | NLAA | NA |
| 49 | *Aplodontia rufa nigra* | Point Arena mountain beaver | LAA | Weakest evidence of LAA |
| 59 | *Urocitellus brunneus* | Northern Idaho Ground Squirrel | NLAA | NA |
| 3194 | *Thomomys mazama glacialis* | Roy Prairie pocket gopher | LAA | Weakest evidence of LAA |
| 8683 | *Thomomys mazama pugetensis* | Olympia pocket gopher | LAA | Weakest evidence of LAA |
| 8684 | *Thomomys mazama tumuli* | Tenino pocket gopher | LAA | Weakest evidence of LAA |
| 8685 | *Thomomys mazama yelmensis* | Yelm pocket gopher | LAA | Weakest evidence of LAA |
| 8962 | *Pteropus mariannus mariannus* | Mariana fruit Bat (=Mariana flying fox) | NLAA | NA |
| Reptiles | 167 | *Nerodia clarkii taeniata* | Atlantic salt marsh snake | NLAA | NA |
| 185 | *Gopherus agassizii* | Desert tortoise | NLAA | NA |
| 187 | *Thamnophis gigas* | Giant garter snake | NLAA | NA |

**Table 12. Terrestrial animals with preliminary NLAA determinations for critical habitat based on MAGtool runs for spray applications of imidacloprid**

| **Taxon** | **Entity ID** | **Scientific name** | **Common name** | **Final determination** | **Strength of Call** |
| --- | --- | --- | --- | --- | --- |
| Birds | 66 | *Gymnogyps californianus* | California condor | NLAA | NA |
| 119 | *Halcyon cinnamomina cinnamomina* | Guam Micronesian kingfisher | NLAA | NA |
| Mammals | 28 | *Microtus californicus scirpensis* | Amargosa vole | NLAA | NA |
| 33 | *Rangifer tarandus caribou* | Woodland caribou | NLAA | NA |
| 43 | *Tamiasciurus hudsonicus grahamensis* | Mount Graham red squirrel | NLAA | NA |
| 56 | *Ovis canadensis nelsoni* | Peninsular bighorn sheep | NLAA | NA |
| 8683 | *Thomomys mazama pugetensis* | Olympia pocket gopher | LAA | Weakest evidence of LAA |
| 8684 | *Thomomys mazama tumuli* | Tenino pocket gopher | NLAA | NA |
| 8685 | *Thomomys mazama yelmensis* | Yelm pocket gopher | NLAA | NA |
| 8962 | *Pteropus mariannus mariannus* | Mariana fruit Bat (=Mariana flying fox) | NLAA | NA |
| Reptiles | 162 | *Anolis roosevelti* | Culebra Island giant anole | NLAA | NA |
| 166 | *Crotalus willardi obscurus* | Mona boa | NLAA | NA |
| 185 | *Gopherus agassizii* | Mona ground Iguana | NLAA | NA |
| 3271 | *Thamnophis rufipunctatus* | New Mexican ridge-nosed rattlesnake | NLAA | NA |

# Bait Uses

For terrestrial organisms, the primary route of exposure to baits is assumed to be via ingestion by vertebrates, and via ingestion and contact by invertebrates. Spray drift is not expected from these types of uses; therefore, potential terrestrial exposures are assumed to be limited to the sites of application. Imidacloprid is formulated alone or with other active ingredients as baits, pellets and blocks for use patterns summarized in **Table 13.** More detailed information on specific use sites is in **APPENDIX 1-3**. Imidacloprid also has other flowable registrations for these use sites. Therefore, for imidacloprid the bait uses do not represent a different use footprint than the ones being captured by the flowable uses.

Table 13. Summary of the application parameters/procedures for bait & pellets

| ***Use Pattern*** | ***Formulation; Purpose; Where Can Be Used; and Application Rate & Procedure*** | ***Applicable UDLs*** |
| --- | --- | --- |
| **Rodents Plus Infesting Flees Control** | **Formulations:**  ***(1) Kaput DOOM Smacker Bait*** (**72500-19**; 0.02% IMI + 0.005% Bromadiolone); ***(2)*** ***Novel Commensal Rodent Pellet #2:*** (**72500-13**; 0.020% IMI + 0.025% Warfarin***); (3) Kapuf®-D Combo Bait Blocks*** (**72500-18**; 0.020% IMI + 0.005% Diphacinone); ***(4) Kaput® Combo Bait® Mini Blocks*** (**72500-14**; 0.02% IMI + 0.02% Warfarin); and ***(5)*** ***KAPUT® RODENT FLEA CONTROL BAIT*** (**72500-17**; 0.025% IMI)  **Purpose for all formulations:** To kill Norway Rats, Roof Rats and House Mice & their infesting fleas (***IMI + Rodenticide***) Or just rodents’ fleas alone (***IMI alone***)  **Where/When to Use for all formulations:** Indoors or within 50 ft. around homes and other residential buildings, industrial/agricultural buildings and similar man-made structures; ships, trains and aircrafts  **Application Procedure:**  ***(1) Kaput DOOM Smacker Bait:*** Placed in bait stations with the use of tamper-resistant bait stations indoors. Bait is placed in these stations and fresh bait is added for 10-days or as required. Maximum of 2 blocks for house mice Or 16 blocks for Norway/roof rats (block= one Oz)/station with stations placed 8 Or 15 ft. apart, respectively; (***2) Novel Commensal Rodent Pellet #2:*** Placed in bait; ***(3) Kapuf®-D Combo Bait Blocks***: Placed in bait; ***(4) Kaput® Combo Bait® Mini Blocks:*** Placed in bait; ***(5)*** ***KAPUT® RODENT FLEA CONTROL BAIT:*** Placed in bait  **Application Rate:**  ***(1) Kaput DOOM Smacker Bait:***  **(a) Norway/Roof Rats:** Maximum16 Oz bait= 1 lb. bait Contains 1 lb. bait x 0.0002 lb. IMI=  **0.000200 lb. IMI a.i/Bait station**  **(b) House Mice:** Maximum2 Oz bait= 0.125 lb. bait Contains 0.125 lb. bait x 0.0002 lb. IMI=  **0.000025 lb. IMI a.i/Bait station** | **Developed;  Inside structures: Exposure to wildlife not expected** |
| **Flies Control** | **Formulations:**  ***(1) QuickBaytTM Disposable Fly Bait Strip*** (**11556-140**; 0.5% IMI + 0.1% Z-9-tricosene;  ***(2)*** ***Window Fly Killer*** (Inside window sticker; **43419-2**; 4.3% IMI + 0.21% Z-9 tricosene;  ***(3) PRE-EMPT® FLY BAIT*** (**432-1375**; Granular 0.50% IMI + 0.10% Z-9-Tricosene; and  **(4) *QuickBayt® Fly Bait*** (**11556-137**; 0.5% IMI + 0.10% Z-9-Tricosene    **Purpose/Where/When to Use:**  ***Product (1):*** for fly control inside homes  ***Product 2:*** for fly control in/around commercial livestock facilities (dairy, meat, and poultry processing plants), in/around agricultural production facilities (poultry houses, feedlots and dairies), in/around stables/kennels, and around commercial facilities.  ***Product (3):*** for fly control outside structures, in/around agricultural production facilities and around commercial facilities  ***Product (4):*** For the control of nuisance flies scattered in/around livestock facilities, stables, walkways of caged layer houses; and in bait stations inside Swine confinement buildings, and Dairy barns and milking parlors  Apply at the start of the season before fly populations have reached their peak  **Application Procedure: *Product 1:*** Place Bait strips on areas where the flies present; ***Product 2:*** Place strips on inside windows; and ***Products 3 & 4:*** Applied scatter, in bait stations and as paint-on  **Application Rate**  ***(1) QuickBaytTM Disposable Fly Bait Strip:*** One strip “ a.i per strip not specified)/250 sq. ft. in 8 weeks when needed;  ***(2)*** ***Window Fly Killer:*** One bait strip (0.00000008265 lb. IMI a.i)/Window. every 6 months;  ***(3) PRE-EMPT® FLY BAIT:* Scatter rate:** **0.00196875 lb. IMI a.i/1,000 sq. ft.** repeat as needed every 7 days; and  ***(4)* *QuickBayt® Fly Bait:*** **Scatter rate:** **0.001875 lb. IMI a.i/1,000 sq. ft.** Label did not specify repeated applications (As per registrant the 52 applications/year). **Maximum rate= 0.0858 lb. a.i/A/year** (registrant value= 0.023?) | **Developed** |
| **CA**  **Ground Squirrels Control** | **Formulation:** ***Kaput Field Rodent Bait B*** (**72500-11**; 0.025% IMI + 0.0025% Diphacinone)  **Purpose:** To kill California ground squirrels and reduce fleas that infest the squirrel  **Where/When to Use:** In parks, golf courses, fruit tree orchards (dormant season only), non-crop rights-of-way and other non-crop areas. Apply when squirrels are readily accepting grains  ***Application Procedure:***  Manually scatter 0.15625 lb. of bait on ground or in modified bait stations (inverted "T" with "elbows" or platform station) near each active burrow. Area treated around burrow may not be >50 sq. ft. Maximum number of applications= 4 with a minimum interval of 2 days  ***Application Rate (lb. IMI a.i/Burrow):***  Maximum0.15625 lb. of Bait x 4 applications= 0.0000390625 lb. IMI a.i x 4=  **0.00015625 lb. IMI a.i/ *Burrow*** @ 2-day intervals | **Developed; Open Space Developed; Other Orchards; Other Row Crops** |
| **Formulation:** ***Kaput Ground Squirrel Bait*** (**72500-24**; 0.0250% IMI + 0.0025% Diphacinone)  **Purpose:** To kill California ground squirrels and reduce fleas that infest the squirrel  **Where/When to Use:** Around buildings including areas such as yards and flower gardens. Assume that it will be applied when squirrels are readily accepting grains  **Application Procedure:** Apply at locations where the bait will be readily accessible to CA ground squirrels (near active burrows) in secured, tamper-resistant bait stations at a minimum of 20 ft. apart. Use a maximum of 4 lbs. per bait station. Ensure that an uninterrupted supply of bait is always available for at least 15 days, or until there no longer are any signs of feeding.  ***Application Rate:***  4 lbs. bait x 0.025%= **0.0010 lb. IMI a.i/ *Bait Station***  *(****Note:*** *rate without consideration of the required replenishment of bait during the 15 days period)* |  |
| **Cats and Dogs**  **Neck Collar** | **Formulations:** PNR1427 Insecticide (**11556-155**; Slow-release water resistant neck collar; 10% IMI + 4.5% Flumethrin)  **Purpose:** 8-month prevention and treatment of ticks, fleas, and lice on cats and dogs  **Where/When to Use:** Neck collar when needed  **Application Rate:** **Cannot be calculated** | **Exposure to wildlife not expected** |
| **Household Insects Control: Ants** | **Formulations:** ***Imidacloprid Ant Killer Station*** (**72155-67**; liquid pre-filled spill resistant bait station; 0.005% IMI)  **Purpose:** To kill wide variety/common household ants  **Where/When to Use:** Indoors/outdoors when/where ants are present. **Indoors:** Attics, basements, bathrooms, closets, dining rooms kitchens, pantries and storage areas. **Outdoors:** Directly over ant nests/trails or where ants have been seen entering the building.  **Application Procedure: Place bait station** upright by ant trails or near areas where ants have been  Seen (did not specify how many stations/sq. ft.)  **Application Rate: Cannot be calculated** | **Developed** |
| **Household Insects Control: Others** | **Formulations:** ***Imidacloprid Granular Bait*** (**73079-14**; 0.5% IMI)  **Purpose:** To kill ants (excluding carpenter, fire, pharaoh and harvester), roaches, crickets, mole crickets, silverfish, firebrats, and earwigs  **Where/When to Use:** Indoors/outdoors structures, including homes, apartments, commercial, industrial, municipal, institutional, research, recreational, health care, educational, daycare, hospitality and agricultural buildings and other man-made structures, garages, transport vehicles, sewers, animal research facilities, and food service, storage, handling and processing establishments. Turf sites include lawns, landscape beds, ornamental turf, parks, playing fields, rights-of-way, golf course greens and tee boxes, homes, and greenhouses  **Application Procedure: Outdoors:** Use a hand-shaker, duster or mechanical spreader to apply in a band 1-3 ft around the perimeter of the building, edges of sidewalks, patios and driveways and under decks mulch beds, flowerbeds, fruit and vegetable gardens, compost heaps, wood piles, trees, stumps and trash areas and For ants, around trees and stumps, in tree cavities, in and around firewood piles, around landscaping stones and in mulch beds, Turf areas, and along ledges inside sewers and around manhole covers. **Indoor Application:** Apply in tamper-resistant bait stations in the presence of children or by hand shaker or duster in crack, crevice or void and around many places where the insects may hide.  **Application Rate: Perimeter Outdoors/Sewer: 0.003125 lb. IMI a.i/1,000 sq. ft.**, **Turf: 0.00255 lb. IMI a.i/1,000 sq. ft.**, **Indoors: 0.00156 lb. IMI a.i/1,000 sq. ft**., Re-apply in 7 days (Maximum No. of applications not stated) | **Developed; Open Space Developed; Field Nurseries**  **Inside structures: Exposure to wildlife not expected** |

Overall, the bait use rates for imidacloprid are comparable to the application rates for other flowable uses on these sites. The maximum single bait application use rate is 0.136 lb a.i./acre per application for residential and commercial buildings; the maximum annual application rate is not specified on this label. The maximum, annual, label-specified application rate for bait uses of imidacloprid is 0.0858 lb a.i./A for use in residential and commercial buildings. These rates are well below maximum single flowable application rates of 0.5 lbs a.i./A for residential lawns, ornamental lawns, and turf, and 0.25 lbs a.i./A per application or 0.5 lbs a.i./A per year for orchard crops (see **APPENDIX 1-3**). Imidacloprid bait inside buildings or other man-made structures and pet collars represent an incomplete exposure pathway for non-target wildlife; therefore, endangered species are not expected to be exposed.

For terrestrial invertebrates, the primary routes of exposure from the bait uses of imidacloprid are assumed to be via ingestion or contact with bait. This approach is consistent with EFED’s risk assessment method for bees[[3]](#footnote-4). Therefore, for terrestrial invertebrates, the estimated exposures from the flowable uses will be used to evaluate exposures from the bait uses where possible. For terrestrial vertebrates, the primary route of exposure is expected to also be through ingestion or contact with bait stations or granular bait spread in an area. This type of exposure is similar to the uses described above with direct contact and consumption of treated seed and other granular uses. Flowable uses as well as considerations for seed and other granular uses will be protective of bait use.

In several bait uses, imidacloprid is co-formulated with a rodenticide. The function of imidacloprid in these cases is to kill fleas and other invertebrates which infest the vertebrate target. Therefore, for these uses the primary concern for non-target invertebrate taxa is not imidacloprid but its co-formulation. The exposure effects were evaluated for these combo products as part of the USFWS’s Biological Opinion for Kaput in 2012. Out of the species considered in that analysis, 5 of species needed additional conservation measures to preclude adverse effects. These species were: Chiricahua leopard frog, the grizzly bear, jaguar, New Mexico ridge-nosed rattlesnake, Mexican spotted owl, Preble’s Meadow jumping mouse. The Black footed ferret, Mexican gray wolf, Northern aplomado falcon also had additional species-specific conservation measures. These additional mitigations were listed and implemented through the EPA’s Bulletins Live! Two Application. These mitigations prohibit the use of these combo baits in areas where these species might be located or impose additional restrictions on the type of timing of these products.

# Tree Injection Uses

Imidacloprid is registered for tree injection uses with ornamentals and forestry. The maximum rates for tree injection applications of these chemicals are included in **Table 14**. Overall, the tree injection use rates for imidacloprid are comparable to the application rates for other flowable uses on these sites. However, because the chemical is injected directly into the tree or the root system there is possibly higher residues inside the tree than for other foliar uses. Tree injection use sites are contained within the Managed Forests, Christmas Trees or Field Nurseries UDLs therefore, these uses do not represent a different use footprint than already being captured by the flowable uses.

Table 14. Summary of the application parameters/procedures for tree injection

| ***Use Pattern*** | ***Formulations; Purpose, When/Where/How to Use, and Application Rates*** |
| --- | --- |
| **Forest trees: Containerized,**  **Newly**  **Planted,**  **and Established Seedlings** | **Formulations:** ***SilvaShield™ Insecticide Tablet*** (**432-1484**; 20% IMI; each Tablet contains 0.0011 lb. IMI a.i)  **Purpose for all formulations:** To control insects attacking newly-planted seedlings and established seedling trees in forestry  **When/Where/ How to Us:** (1) Seedling in containers prior to planting: place prescribed tablets 1-4” deep into the soil in the container; (2) Bare-root seedlings, rooted and unrooted cuttings, or small trees at planting: place prescribed tablets 1-3” deep into the soil hole underneath or next to the tree; (3) newly-planted and established trees: Apply 2-5” below the soil surface within 3-5” of the tree.  **Application Rate:**  **Maximum Rate for in-ground plants:** 450 tablets= **0.5 lb. IMI a.i/A/Y; One Application;**  **Maximum rate/tree (**in-hole at planting or as soon as possible after planting**): Poplar/cottonwood=** 1 tablet/tree**= 0.0011 lb. IMI/tree; Conifer:** 2 tablet/tree= **0.0022 lb. IMI/tree.** Therefore, a maximum label rate of 450 tablets/A will treat **450 trees** of **Poplar/cottonwood or 225** trees of **Conifer** in one acre. |
| **Trees, including Forest Trees,**  **and**  **Shrubs** | **Formulations:** ***Merit® Injectable Capsule*** (**432-1463**; 17.1% IMI in 3 and 6 mL capsules of liquid formulation with a density of 9.75 lb./gal “BEAD report”= 0.000440489 lb. IMI a.i/mL; 3 mL capsule contains 0.0013215 lb. IMI and 6 mL capsule contains 0.0026429 lb. IMI)  **Purpose:** For injection into trees in nurseries, greenhouses, and interior and exterior landscaped area, and in private, municipal, state, and **national forested areas** to control a variety of insect pests of ornamental or forest trees**.** Not for use on trees where the fruits and/or nuts are consumed  **Where/When to Use:** Post bloom (For bee-pollinated dicotyledonous trees) tree trunk injection of shrubs and trees >2” in trunk diameter  **Application Procedure:** Applied using the Tree Tech microinjection system. Microinjection units should be installed in a hole drilled in the stem and root flares every 6” around the trunk 6-8” from the soil surface  **Application Rate: Maximum rate= One capsule (**0.0026429 lb. IMI a.i/2” of trunk diameter @ chest height (other labels refers to it as the tree diameter at breast height or DBH); For example, if the trunk diameter@ chest height = 12”, then the rate= 6 capsules (12 divided by 2). The rate would be 6 x 0.0013215 lb. IMI a.i= **0.0079288 lb. IMI a.i/12” tree** when a 3 mL capsule is used **Or** 6 x 0.0026429 lb. IMI a.i= **0.0158576 lb. IMI a.i/12” tree** when a 6 mL capsule is used (Label not clear which can be used) |
| **Formulations:** (1) ***IMICIDE® HP*** (**7946-25**; 10% IMI of liquid containing 110.7 mg of IMI/mL= 0.00024405 lb. IMI a.i/mL; and (2) The same product under the name: ***Mauget® IMICIDE® (7946-16)*** in ready to use capsules containing 2, 3, 4, 8, 12, 16 mL ready to use capsules  **Purpose:** Same as ***Merit® Injectable Capsule***, above  **Where/When to Use:** Same as ***Merit® Injectable Capsule***, above  **Application Procedure:** **For product (1)**: Use of liquid loadable, pressure tree injector system. 1st determine the tree diameter at breast height (DBH); 2nd determine the No. of injection sites= DBH divided by 2; 3rd determine total and dosage/tree and dosage per injection site based on DBH in inches: 1st category: DBH >2-10”; 2nd category: DBH 10-36”; and 3rd category: DBH >36. Total dosage for 1st category tree in mL of product= DBH x 1; for 2nd category tree= DBH x 1.5; and for 3nd category tree= DBH x 2. The maximum for **all categories** is **DBH x 2** (heavy infestation/resistant insects). Following determination of the total dosage/tree and the number of injection sites, the dose e site is determined by dividing total dosage/tree by the No. of injection sites. A special rate of 2 mL x DBH (2-23” DBH) and 4 mL x DBH (>24” DBH) are specified, in the label, for USDA supervised treatment program of Asian and Citrus Long-horned beetle. **For product (2):** determine the total dose, number of sites and the dose for each site the same way as in product (1) then choose the required capsules/capacity needed for the treatment. In each site a hole is drilled into the conductive xylem tissue, the micro injector and feeder tube is combined, feeder tube is placed into the tree and the product is injected into the tree.  **Application Rate:** Example, A **tree with 12” DBH; No of sites= 6 (12 divided by 2); Total dosage= 24 mL of product (12 x 2 mL) Or 24 x 0.00024405 lb. IMI a.i= 0.0058571 lb. IMI a.i/12” tree** applied @ 6 sites with 4 mL dose in each site (24 mL divided by 6) |
| **Formulations:** ***POINTER® Insecticide S*** (**69117-8**; 5% IMI of liquid; 0.025 Oz./15 mL= 0.001667 Oz./one mL= 0.00010417 lb. IMI a.i/One mL  **Purpose:** Same as ***Merit® Injectable Capsule***, above  **Where/When to Use:** Same as ***Merit® Injectable Capsule***, above  **Application Procedure:** Applied by syringe that delivers one mL of product into sites (holes) drilled around the base of the tree 12” of the ground. Total dose in mL/tree is determined by the number of sites (holes) which is specified in the label depending on the measured circumference of the tree as follows: 4” (1 site x 1= 1 mL), 12” (3 sites x 1= 3 mL), 24” (6 sites x 1= 6 mL), 36” (9 sites x 1= 9 mL), 48” (12 sites x 1= 12 mL), 60” (15 sites x 1= 15 mL),  **Application Rate:** Example, A **tree with 12” Diameter will have a 37.7” circumference. As per label the rate will be 1 mL x 9 sites= 9 mL (36” is the nearest to 37.7”); Total dosage= 9 mL of product x** 0.00010417 lb. IMI a.i **= 0.0009375 lb. IMI a.i/12” tree** applied @ 9 sites with 1 mL dose in each site |

# Soil Applications of Treated Poultry Litter

Imidacloprid also has applications associated with soil treatments for multiple use sites. Based on a comparison of application rates and anticipated EECs, for all use sites for which there are both soil and foliar applications, it is assumed that impacts predicted from flowable uses are protective of soil applications. Imidacloprid can also be used in poultry houses to control darkling and hide beetles. The litter collected from these treated poultry houses can be later used on agricultural fields as a soil amendment. This litter can be applied to the corn, soybeans, other grains, cotton, wheat, rice, other row crops, vegetables and ground fruit and alfalfa use data layers (UDLs). These UDLs were identified based on the 24 crops reported in Kellog *et al.* (2000) for manure/litter application, see **APPENDIX 1-6**, for additional information. Although this is a soil application method, in order to capture the arthropod concentrations from soil applications for this potentially wide footprint, this use was modeled in the MAGtool along with other foliar application rates. Species that were impacted only by poultry litter applications were reevaluated after the analysis to adjust the results for species where the soil application may not be representative for concentrations from a foliar application (*e.g*., vertebrate herbivores). It is noted that the inclusion of all of these uses in counties where poultry operations occur could potentially overestimate the acreage where poultry litter is applied and the overlap with species ranges/critical habitats.

1. <http://www2.epa.gov/pollinator-protection/2013-summit-reducing-exposure-dust-treated-seed> [↑](#footnote-ref-2)
2. Exceptions were noted for small/med passerines potentially consuming corn and soybean seeds and small passerines consuming cotton seeds as these seeds are considered too large to consume by these birds. [↑](#footnote-ref-3)
3. USEPA, Health Canada PMRA, & California Department of Pesticide Regulation. 2014. *Guidance for Assessing Pesticide Risks to Bees*. June 23, 2014. U.S. Environmental Protection Agency. Health Canada Pest Management Regulatory Agency. California Department of Pesticide Regulation. Available at <http://www2.epa.gov/pollinator-protection/pollinator-risk-assessment-guidance>. [↑](#footnote-ref-4)