APPENDIX 1-3. Thiamethoxam Scenario Development for Aquatic Modeling

The purpose of this Appendix is to provide supporting information for the aquatic modeling work.

The use sites simulated for thiamethoxam are documented in **APPENDIX 3-1**. Agricultural modeling simulations are also summarized in **Table 2**. In **Table 2**, the use data layer (UDL) was obtained from information provided in **APPENDIX 3-1**. The PWC scenario simulated was determined based on the UDLs used in mapping. Unless otherwise noted, aquatic modeling for a HUC2 was simulated when the 2012 National Agricultural Statistics Service (NASS) Census Data indicated that a crop was grown in that region. Limited data were available with regards to Puerto Rico, Alaska, and Hawaii and some assumptions were made in those areas based on best available information. Most crops were assumed to be grown in these areas when information was not available; however, some crops were assumed not to be grown in HUC-02 region 20 or HUC-02 region 21. For example, tobacco and cranberry were assumed not to be grown in HUC-02 region 20 and HUC-02 region 21. See **Chapter 3** for additional details on the aquatic modeling.

In selecting application dates for aquatic modeling, EPA considered many factors. Label directions are considered, such as treatment timing (*e.g.*, pest pressure). Selection of application dates included an analysis of weather files to determine the time of year most likely to produce the greatest off-site transport. The meteorological information is considered as pesticide loading to surface water may be directly affected by precipitation events. The wettest month (*i.e*., the month with the highest average daily precipitation) within each HUC2 was identified (**Table 1**), and a random date (*i.e*., the 15th of each month) was considered to maintain the probability of the distribution of environmental exposure concentrations generated. In general, minimum retreatment intervals were modeled.

Table 1. Month with highest total precipitation in each 30-year weather file in each HUC2

| **HUC2** | **City, State** | **Meteorological File** | **Average Wettest Month**  **in 30 Years of Data** |
| --- | --- | --- | --- |
| 1 | Hartford, CT | w14740 | May |
| 2 | Lynchburg, VA | w13733 | July |
| 3 | Atlanta, GA | w13874 | March |
| 4 | Milwaukee, WI | w14839 | August |
| 5 | Covington, KY | w93814 | May |
| 6 | Knoxville, TN | w13891 | March |
| 7 | Des Moines, IA | w14933 | June |
| 8 | Fort Smith, AR | w13970 | July |
| 9 | Fargo, ND | w14914 | June |
| 10a | Grand Island, NE | w14935 | June |
| 10b | Sheridan, WY | w24029 | May |
| 11a | Fort Smith, AR | w13964 | May |
| 11b | Amarillo, TX | w23047 | June |
| 12a | Fort Worth, TX | w03927 | May |
| 12b | Abilene, TX | w13962 | September |
| 13 | El Paso, TX | w23044 | September |
| 14 | Rock Springs, WY | w24027 | May |
| 15a | Flagstaff, AZ | w03103 | July |
| 15b | Phoenix, AZ | w23183 | December |
| 16a | Salt Lake City, UT | w24127 | April |
| 16b | Winnemucca, NV | w24128 | November |
| 17a | Eugene, OR | w24221 | December |
| 17b | Pocatello, ID | w24156 | May |
| 18a | Sacramento, CA | w23232 | January |
| 18b | San Diego, CA | w23188 | January |
| 19a | Big Delta, AK | w26415 | July |
| 19b | Talkeetna, AK | W26528 | August |
| 20a | Hilo, HI | w21504 | November |
| 20b | Honolulu, HI | w22521 | December |
| 21 | Puerto Rico | w11641 | May |

# Use Scenarios

**Table 2** provides a listing of the thiamethoxam uses that were modeled in this BE, along with the maximum single application rate, number of applications, and retreatment interval. More information on the assumptions used in aquatic modeling and which HUC2 regions were modeled for each use pattern is available in **APPENDIX 3-2**.

Table 2. Modeled Crop Groups with Maximum Single Application Rate, Application Types, and Application Timing and/or Target

| **Crop/Use Site** | **Use Data Layer** | **PWC scenario** | **HUC2s** | **Specific crops included in this group** | **Max. Single App. Rate**  **(lb a.i./acre),**  **No. of Apps, Max. Annual Rate**  **(lb a.i./acre),**  **RTI*2*** | **ApplicationType*1*** | **Application Timing** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Root & Tuber Vegetables  *Crop Subgroup 1B* | Vegetables and ground fruit | Vegetable | 1-21 | garden beet, edible burdock, carrot, celeriac, chervil, chicory, ginseng, horseradish, parsley, parsnip, radish, oriental (daikon), rutabaga, salsify, skirret, turnip | 0.063, 2, 0.125, 7 | A,G | Based on pest pressure; wettest month |
| 0.188, 1, 0.188, N/A | C |
| Root & Tuber Vegetables  *Crop Subgroup 1C,D* | Vegetables and ground fruit | Vegetable | 1-21 | arracacha, arrowroot, canna, cassava, cayote, chinese artichoke, chufa, dasheen, ginger, Jerusalem artichoke, leren, potato, sweet potato, tanier, tumeric, yam bean, yams | 0.050, 2, 0.100, 7 | A,G | Based on pest pressure; wettest month |
| Root & Tuber Vegetables  Crop Subgroup 1C,D (potato) | Vegetables and ground fruit | Vegetable | 1-21 | arracacha, arrowroot, canna, cassava, cayote, chinese artichoke, chufa, dasheen, ginger, Jerusalem artichoke, leren, potato, sweet potato, tanier, tumeric, yam bean, yams | 0.125, 1, 0.125, N/A | C |
| Radish | Vegetables and ground fruit | Vegetable | 1-20 | radish | 0.063, 1, 0.063, N/A | A,G | Based on pest pressure; wettest month |
| 0.1016, 1, 0.1016, N/A | C |
| Sugarbeet | Other row crops ORWA | OtherRow | 1,4,5,7,9,10,11,14,15,16,17,18 | sugarbeet | 0.050, 2, 0.100, 7 | A,G | Based on pest pressure; wettest month |
| Potato | Vegetables and ground fruit | Vegetable | 1-20 | potato | 0.050, 2, 0.100, 7 | C | Based on pest pressure; wettest month |
| Crop Group 4 *– Leafy Vegetables (except Brassica)* | Vegetables and ground fruit | Vegetable | 1-21 | Crop Group 4; All leafy vegetables (except Brassica) including: Amaranth (leafy amaranth, chinese spinach, tampala); arugula (roquette); cardoon; celery; celery, Chinese; celtuce; chervil; chrysanthemum, edible-leaved; chrysanthemum, garland; corn salad; cress, garden; cress, upland; dandelion; dock (sorrel); endive (escarole); fennel, Florence; lettuce, head and leaf; orach; parsley; purslane, garden; purslane, winter; radicchio (red chicory); rhubarb; spinach; spinach, New Zealand; spinach, vine; Swiss chard | 0.088, 2, 0.175, 7 | A,G | Based on pest pressure; wettest month |
| 0.172, 1, 0.172, N/A | C |
| Crop Group 5 *– Brassica (Cole) Leafy Vegetables* | Vegetables and ground fruit | Vegetable | 1-21 | Crop Group 5; All leafy vegetables (with Brassica) including: Broccoli; broccoli, Chinese (gai lon); broccoli raab (rapini); Brussels sprouts; cabbage; cabbage, Chinese (bok choy); cabbage, Chinese (napa); cabbage, Chinese mustard (gai choy); cauliflower; cavalo broccolo; collards; kale; kohlrabi; mizuna; mustard greens; mustard spinach; rape greens | 0.088, 2, 0.175, 7 | A,G | Based on pest pressure; wettest month |
| 0.172, 1, 0.172, N/A | C |
| Soybean | Soybeans | Soybean | 1-14, 16,17,18,20 | Soybeans | 0.063, 2, 0.125, 7 | A,G | Based on pest pressure; wettest month |
| *Fruiting Vegetables (except cucurbits)* Crop Group 8 | Vegetables and ground fruit | Vegetable | 1-21 | Crop Group 8; All fruiting vegetables (except cucurbits) including: Eggplant; groundcherry (Physalis spp); pepino; pepper (includes bell pepper, chili pepper, cooking pepper, pimento, sweet pepper); tomatillo; tomato | 0.088, 2, 0.175, 5 | A,G | Based on pest pressure; wettest month |
| 0.172, 1, 0.172, N/A | C |
| Crop Group 9  (*Cucurbit Vegetables*) | Vegetables and ground fruit | Vegetable | 1-21 | Crop Group 9; Cucurbit vegetables including: Chayote (fruit); Chinese waxgourd (Chinese preserving melon); citron melon; cucumber; gherkin; gourd, edible (includes hyotan, cucuzza, hechima, Chinese okra); Momordica spp (includes balsam apple, balsam pear, bittermelon, Chinese cucumber); muskmelon (includes true canteloupe, cantaloupe, casaba, crenshaw melon, golden pershaw melon, honeydew melon, honey balls, mango melon, Persian melon, pineapple melon, Santa Claus melon, and snake melon); pumpkin; squash, summer (includes crookneck squash, scallop squash, straightneck squash, vegetable marrow, zucchini); squash, winter (includes butternut squash, calabaza, hubbard squash, acorn squash, spaghetti squash); watermelon | 0.088, 2, 0.175, 5 | A,G | Based on pest pressure; wettest month |
| 0.172, 1, 0.172, N/A | C |
| Crop Group 11 *– Pome Fruits* | Other orchards | Orchard | 1-20 | Crop Group 11; Apple, Pear (1-20) and others (less HUCs). Includes: Apple; crabapple; loquat; mayhaw; pear; pear, oriental; quince | 0.086, 3, 0.258, 10 | G;AB | Based on pest pressure; wettest month |
| Crop Group 12 *– Stone Fruits* | Other orchards | Orchard | 1-20 | Crop Group 12; Plums, Prunes (1-20) and others (various HUCs). Includes: Apricot; cherry, sweet; cherry, tart; nectarine; peach; plum; plum, Chickasaw; plum, Damson; plum, Japanese; plumcot; prune (fresh) | 0.086, 2, 0.172, 7 | G;AB | Based on pest pressure; wettest month |
| Crop Group 10 *– Citrus* | Citrus | Citrus | 2-13, 15-18, 20-21 | Crop Group 10; Citrus including: calamondin; citrus citron; citrus hybrids (includes: chironja, tangelo and tangor); grapefruit; kumquat; lemon; lime; mandarin (tangerine); orange, sour; orange, sweet; pummelo; satsuma mandarin | 0.172, 1, 0.172, N/A | C | Based on pest pressure; wettest month |
| Caneberry 13-07A | Vegetables and ground fruit | Vegetable | 1-19 | Crop Group 13-07A; Caneberry subgroup. Includes: Blackberry; loganberry; raspberry, black and red; wild raspberry; cultivars, varieties, and/or hybrids of these | 0.047, 2, 0.094, 7 | A, G | Based on pest pressure; wettest month |
| Bushberry 13-07B | Vegetables and ground fruit | Vegetable | 1-19 | Crop Group 13-07B; Bushberry subgroup. Includes: Aronia berry; blueberry, highbush; blueberry, lowbush; buffalo currant; Chilean guava; cranberry, highbush; currant, black; currant, red; elderberry; European barberry; gooseberry; honeysuckle, edible; huckleberry; jostaberry; Juneberry (Saskatoon berry); lingonberry; native currant; salal; sea buckthorn; cultivars, varieties, and/or hybrids of these | 0.063, 3, 0.188, 7 | A,G | Based on pest pressure; wettest month |
| 0.188, 1, 0.188, N/A | C |
| Low growing berry  13-07G | Vegetables and ground fruit | Vegetable | 1-19 | Crop Group 13-07G; Low growing berry (strawberry) subgroup. Includes: Bearberry; bilberry; blueberry, lowbush; cloudberry; cranberry; lingonberry; muntries; partridgeberry; strawberry; cultivars, varieties, and/or hybrids of these | 0.063, 3, 0.188, 7,10 | G | Based on pest pressure; wettest month |
| 0.188, 1, 0.188, N/A | C |
| Low growing berry  13-07H | Vegetables and ground fruit | Vegetable | 1-19 | Crop Group 13-07H; Low growing berry except strawberry (cranberry) subgroup. Includes: Bearberry; bilberry; blueberry, lowbush; cloudberry; cranberry; lingonberry; muntries; partridgeberry; cultivars, varieties, and/or hybrids of these | 0.063, 3, 0.188, 7 | G | Based on pest pressure; wettest month |
| Cranberry | Vegetables and ground fruit | Vegetable | 1,2,4,5,7,9,17a,17b,18a,18b | Cranberry | 0.063, 3, 0.188, 7 | G,C | Based on pest pressure; wettest month |
| 0.188, 1, 0.188, N/A | C |
| Crop Groups 13-07 D,E,F  (*Grape*) | Grapes | Grapes | 1-20 | Crop Group 13-07D,E,F; Grape and fuzzy kiwifruit subgroup. Includes: Amur river grape; gooseberry; grape; kiwifruit, fuzzy; kiwifruit, hardy; maypop; schisandra berry; cultivars, varieties, and/or hybrids of these | 0.055, 2, 0.110, 14 | G;AB | Based on pest pressure; wettest month |
| Crop Group 13-07F  (*Small Fruit Vine Climbing*) | Grapes | Grapes | 1-20 | Crop Group 13-07D,E,F; Grape and fuzzy kiwifruit subgroup. Includes: Amur river grape; gooseberry; grape; kiwifruit, fuzzy; kiwifruit, hardy; maypop; schisandra berry; cultivars, varieties, and/or hybrids of these | 0.266, 1, 0.266, N/A | C | Based on pest pressure; wettest month |
| Crop Group 14  (*Tree Nut*s) | Other orchards | Orchard | 1-18, 20-21 | Crop Group 14; Tree Nuts. Includes: Almond; beechnut; Brazil nut; butternut; cashew; chestnut; chinquapin; filbert (hazelnut); hickory nut; macadamia nut; pecan; walnut, black and English including Pistachio | 0.063, 2, 0.125, 7 | G;AB | Based on pest pressure; wettest month |
| Barley (*Cereal Grains*) | Other grains | OtherGrain | 1-19 | Barley | 0.063, 2, 0.125, 7 | A,G | Based on pest pressure; wettest month |
| Mint | Vegetables and ground fruit | Vegetable | 4,5,7,16,17,18,20 | Mint: includes Peppermint and Spearmint | 0.063, 3, 0.188, 14 | A,G | Based on pest pressure; wettest month |
| Cotton (*Oilseed*) | Cotton | Cotton | 2,3,5,6,7,8,11,12,13,15,18 | Cotton | 0.063, 2, 0.125, 5 | A,G | Based on pest pressure; wettest month |
| Tropicals (Subtropicals) | Other orchards | Orchard | 1-21 | Avocado, black sapote, canistel, mamey sapote, mango, papaya, sapodilla, star apple | 0.063, 3, 0.188, 7 | A,G | Based on pest pressure; wettest month |
| Artichoke | Vegetables and ground fruit | Vegetable | 15,16,18,20 | Globe artichoke only | 0.050, 2, 0.100, 7 | A,G | Based on pest pressure; wettest month |
| Hops | Other row crops | OtherRow | 1-7,  10,11,14,15,17,18 | Hops | 0.125, 1, 0.125, N/A | C | Based on pest pressure; wettest month |
| Tobacco | Other row crops | OtherRow | 1-8, 10, 11 | Tobacco | 0.050, 2, 0.100, 3 | A,G | Based on pest pressure; wettest month |
| 0.125, 1, 0.125, N/A | C |
| Turf (golf course , recreational, athletic uses) | Open Space Developed | DevelopedOS | 1-21 | Turfgrass, golf courses, recreational areas, athletic fields, etc (see registered labels for all uses) | 0.266, 1, 0.266, N/A | G | Based on pest pressure; wettest month |
| 0.266, 1, 0.266, N/A | C |
| Turf (sod fields) | Other Crops | OtherCrop | 1-20 | Sod Fields | 0.266, 1, 0.266, N/A | G | Based on pest pressure; wettest month |
| 0.266, 1, 0.266, N/A | C |
| Ornamentals (nurseries, non-bearing fruit/nut cultivars) | Other orchards  Field Nurseries | NSLandcover  Orchard | 1-21 | Ornamentals: nurseries, non-bearing fruit and nut trees (see registered labels for all uses) | 0.266, 1, 0.266, N/A | G | Based on pest pressure; wettest month |
| 0.266, 1, 0.266, N/A | C |
| Christmas Trees | Xmas Trees | XmasTree | 1-19 | Christmas tree farms | |  |  |  | | --- | --- | --- | | 0.266, 1, 0.266, N/A | XmasTree | 1-19 | | G | Based on pest pressure; wettest month |
| Residential Perimeter Uses | Developed | Residential | 1-21 | covers turf, ornamental perimeter uses around residences | 0.1374, 1, 0.1374, N/A | G | apply as needed; wettest month |
| Commercial Perimeter Uses | Developed | ROW | 1-21 | covers perimeter uses around commercial areas | 0.0066, 1, 0.0066, N/A | G | apply as needed; wettest month |
| Poultry Litter Amendment  (low rate) | Poultry Litter | Corn (Vegetable; HUC 19) | 1-18,  20-21 (19) | poultry litter used as soil amendment | 0.007, 1, 0.007, N/A | G | -10 days before emergence |
| Poultry Litter Amendment  (high rate) | 0.266, 1, 0.266, N/A | G | -10 days before emergence |

***1* Application Type**: A= aerial; G= ground; AB= Airblast; C = chemigation.

***2 RTI:*** Minimum retreatment intervals in days.