# Overview and User Guide of MAGtool v2.4

The Magnitude of Effect tool (MAGtool) is a model created by the EPA to assist in the determination of the magnitude of the effect of potential pesticide use on listed species. The output of the tool provides an estimate of the numbers of individuals of a given listed species which are potentially impacted due to mortality losses or adverse sublethal effects. Additionally, the number of individuals of the listed species potentially impacted due to losses in their prey, pollination, habitat or dispersal (PPHD) vectors is predicted. The MAGtool combines toxicological information, species traits, exposure analysis and spatial results into one tool. Results may be generated for the species or critical habitat under different scenarios including variations in assumptions related to exposure, extent of pesticide usage on a crop, and extent of pesticide usage for the species. The MAGtool implements the Revised Method for National Level Listed Species Biological Evaluations (BEs) for Conventional Pesticides[[1]](#footnote-2).

1. MAGtool Versions and Development

The MAGtool was developed through iterations of work on the development of methods for conducting national level risk assessments for listed species. The MAGtool stemmed from the Terrestrial Effects Determination (TED) tool[[2]](#footnote-3) which was first created in 2015 as part of the first three national BEs ( *i.e.,* for chlorpyrifos, diazinon and malathion).[[3]](#footnote-4) The TED tool was the first iteration of this model and still serves as the basis of the initial analyses in the MAGtool. The TED tool combined the established models used by the Environmental Fate and Effects Division (EFED) for ecological risk assessments into one Excel tool. Those models include: T-REX, T-HERPS, the earthworm fugacity model, TerrPlant and AgDRIFT. The TED tool was converted into the Weight of Evidence (WoE) tools [[4]](#footnote-5), which was used to make effects determinations for the first three BEs. After the release of the draft pilot BEs, and work on the biological opinions started, the MAGtool was formed to carry forward the results generated in the Step 2 BE analysis into the Step 3 population-level analysis for multiple lines of evidence, including mortality, growth, reproductive, behavioral and sensory effects.

MAGtool version 2.1 (released in March 2020) was an update from the original MAGtool and was revised to allow for incorporation of concepts from the Revised Method. It is advisable for users to refer to the Revised Method document for a detailed discussion of the conceptual model and intended purpose of the MAGtool. The major differences between the current version of the MAGtool and the previous version of the MAGtool include:

* Incorporation of usage data and usage table output from GIS tools
* Integration of output that can be used in a probabilistic analysis with the Excel Add-In, Oracle® Crystal Ball, Fusion Edition, Release 11.1.2.3.000 (32-bit)
* Limitation of effects endpoints to those representing mortality, sublethal effects and impacts to PPHD vectors
* Generation of output in the context of number of individuals impacted
* Streamlining the ability to batch process species analyses
* Streamlining the output provided for each species into one summary page
* Providing output workbooks incorporating weight of evidence analysis
* Correction of issues with Use Data Layer (UDL) redundancy

Supplementary spreadsheets were developed with the MAGtool Version 2.1 to aid in probabilistic analyses and integration of results with the Excel Add-In, Oracle® Crystal Ball, Fusion Edition, Release 11.1.2.3.000 (32-bit) software[[5]](#footnote-6). In order to increase speed in the analysis, the Crystal Ball or probabilistic analyses are run separately from the initial MAGtool runs. There are two versions of the MAGtool, one for analyses in the terrestrial environment (MAG\_TerrTool) and one for the aquatic environment (MAG\_AquaTool).

MAGtool Version 2.2, released in October 2020, improved upon the functionality of the previous version of the tool. Updates to this version included:

* Addition of a batch analysis function via a new spreadsheet, MAGtool Batch analysis.xlsm. This replaced the need for the user to run each part of the tool separately and integrated the supplementary spreadsheets to automatically run with the MAGtool.
* Update of the WoE input parameter file to include all aquatic EECs as part of the input file
* Update to allow specific buffers and specific droplet size distributions as part of input file
* Addition of spreadsheets in the MAGtool to provide more transparency on endpoints utilized in each Step of the analysis and drift calculations
* Incorporation of exposure estimates from the new Plant Assessment Tool (PAT) for analyzing risks to terrestrial plants[[6]](#footnote-7)
* Incorporation of monitoring data from the downstream transport analysis results into the weight of evidence output sheets
* Continuation of updates to remove previous spreadsheets or functions in tool that are no longer utilized

MAGtool version 2.3, released with the final carbamate Biological Evaluations (BE) in March 2021, and MAGtool version 2.3.1, released with the draft neonicotinoid BEs in August 2021, continued with additional improvements and updates to the tool, based both on continued use and review of the tool, as well as public comments. These updates included:

* Incorporation of option to run analysis deterministically or probabilistically based on selection of run type in batch analysis tool. This allows the tool to run without the use of Crystal Ball, although the Add-in is still required to run the terrestrial probabilistic analysis
* Review and update of spray drift functions in tools. Includes further refinements and more options on input sheet, including the ability to enter user defined spray drift parameters (sometimes available from chemical specific drift studies)
* Correction of errors identified in public comments or model review
* Continuation of updates to remove functions in previous versions of tool that are no longer utilized

The update of the MAGtool to allow for a deterministic output option, as well as the MAGtool Batch Analysis spreadsheet, provide for a much quicker analysis. The probabilistic analysis can be run on any species where the deterministic analysis results indicate probabilistic analysis would be beneficial. As noted above, to run the analysis in probabilistic mode for terrestrial species, users will still need Crystal Ball and will need to load a different file in the folder for the analysis[[7]](#footnote-8). Further details on the deterministic analysis are provided below.

MAGtool version 2.4, released with the inpyrfluxam Biological Evaluations (BE) in October 2022, incorporated improvements to assist with making preliminary jeopardy and adverse modification species determinations, as well as incorporated new overlap inputs. These updates included:

* Incorporation of option to load overlap generated from new Census of Agriculture (CoA) overlap tool
* Revision of output sheet formats to streamline information provided and include factors used in prediction of jeopardy or adverse modification

1. MAGtool Introduction and Inputs

The MAGtool functions to carry out the analysis described for making endangered species effects determinations in the Revised Method document. For each step of the analysis described in the Revised Methods document, from Steps 1a through Step2i, the MAGtool generates output for each species analyzed, including the effects determination for the species and the Step of the analysis in which the determination was made. As the tool follows the conceptual model described in the Revised Methods document, the user is referred to that document for a full description of the conceptual method and is not repeated herein. Rather, this document is intended to provide more clarity regarding where and how in the tool these Steps are performed.

As described in the MAGtool Batch analysis tool ReadMe document, two types of input files, Chemical inputs file and GIS inputs files, are loaded to run the tool. The MAG\_TerrTool and MAG\_AquaTool located in this folder have example chemical inputs and overlap files already loaded. The overlap files originate from the Co-Occurrence analysis output files with the UDL or with the Census of Agriculture (CoA) tool (described elsewhere) and the files have been formatted to feed into the MAGtool. For purposes of this manual, where reference is made to “UDL”, this terminology can generally apply to either overlap analysis. The Chemical inputs file contains the chemical and physical properties of the chemical, toxicity endpoints, uses and use rates for the chemical and aquatic EECs. The ReadMe sheet in the Chemical input file contains more information on the specific worksheets contained in the file.

1. MAGtool Output Description

In the MAGtool Version 2.1, users were required to run different spreadsheets consecutively to complete the entire analysis, including the probabilistic analysis. With the addition of the MAGtool batch analysis tool, the user can conduct all analyses from the MAGtool Batch analysis spreadsheet. Instructions for running the Batch Analysis are contained in the accompanying MAGtool Batch analysis tool ReadMe document. It is highly recommended to use the MAGtool Batch Analysis spreadsheet for running all analyses. Instructions for running individual components of the tool, as done in previous versions of the tool, are provided for reference in **Attachment 1**, but the user does not need any of the tool details in the attachment when using the Batch Analysis tool.

The MAGtool generates output that can be used to evaluate the steps of the decision tree outlined in the Revised Method. Initially, the MAGtool utilizes the percent overlap of the species range (or critical habitat) with the action area to report overlap for each species. These are based on the Step 1 overlap scenario tables from the GIS tools. The overlap analysis results is utilized in calculating percent overlap with the action area, and later used in the analysis to proportion species to locations within their range and serve as a surrogate for percent of the population exposed. The Step 1 and five Step 2 overlap scenarios are generated by the GIS tools and are part of the inputs for the MAGtool. These tools, referred to as Co-occurrence tools, are detailed within the models contained on the **ESA models** webpage.

One of the first outputs provided by the MAGtool is the percent overlap of all use sites (action area) with the species. In order to determine the percent overlap of the action area with the species, the relevant use layers are buffered to the distance where the estimated exposure concentration (EEC) is below the toxicity thresholds, which can be up to a maximum of 2600 ft for aerial applications or 1000 ft for ground applications. This is based on the maximum drift distance considering all use sites and application rates that are relevant to a species. Based on this analysis, a determination can be made if the species is outside the action area (no overlap predicted, resulting in NE determination, See Step 1, part a of the Revised Method) or if the overlap of the species with the action area (direct use sites plus species specific buffer) is <1% (resulting in an NLAA determination, see Step 2, part e of Revised Method).

The next step in the output compares the highest EEC predicted for a species to the minimum threshold toxicity value, based either on mortality or sublethal effects to the species or effects to PPHD vectors. If none of the maximum EECs exceed threshold values, an NE determination is made (See Step 1, parts b and c of Revised Method).

The subsequent analyses rely on the application of usage data. Information on usage data and the method of application to create overlap scenarios for the MAGtool are provided in the Revised Method and **Appendix 1.7** and **1.8** of the carbaryl and methomyl BEs as well as the Co-occurrence tool documentation. These documents detail how different percent crop treated (PCT) values (maximum, minimum or average) and acreage distributions (upper, lower, and uniform distribution of acres) are utilized, as well as the adjustment of drift to scale for the number of acres likely treated.

With the update of the MAGtool batch analysis spreadsheet, the default setting runs the tool for the maximum PCT and upper distribution of acres and the average PCT and the uniform distribution of acres. These two combinations are chosen as these are the PCT/acres distribution combinations utilized in the weight of evidence analysis and were determined to be the most useful for making effects determinations and characterizing the uncertainty in the analysis. Using the Batch Analysis spreadsheet, the output is automatically carried forward to generate the final effects determinations for the species through the weight of evidence analysis. If the tool is run outside of the batch analysis function, output is created for each PCT and acreage distribution that can be run in the individual spreadsheets. As in previous versions, the user can still run any of the PCT/acres distribution combinations, with the option to run up to 9 different combinations of PCT and acres distribution.

* 1. Exposure concentrations

In the probabilistic analysis, for determining exposure concentrations, individuals of a species are randomly assigned to areas of their range or critical habitat based on the percent overlap with different zones, including: being on the use site; in the off-site transport (drift) zone; or in an area of the species range where the pesticide is not expected to reach (unaffected area). Exposure is based on a residue value selected from a distribution of concentrations relevant to the diet of the organism or aquatic exposure concentrations and the organism’s spatial location (*e.g.,* on-field, 60-90 meters from field). The likelihood of an individual of an assessed species being in that area of exposure is equal to the overlap of the species range or critical habitat with that zone. The exposure concentration is drawn from the distribution of predicted EECs at that distance. For example, using the uniform distribution assumption, if there is a 7% overlap of the use site with a species range, an individual of a species has a 7% chance of being in that area. Exposure analyses are conducted differently for species that inhabit terrestrial and aquatic environments.

In the terrestrial environment, on-field concentrations are based on a residue value randomly selected from a distribution of exposure concentrations relevant to the diet of the organism, using the means and standard deviations as outlined in the TIM manual[[8]](#footnote-9), which are the same residue values incorporated in EFED’s standard terrestrial exposure tools. Off the treated field, the same principles apply, but the dose received by the individual will be decreased based on the distance from the edge of the field and the amount of spray drift expected. Estimated exposures are reduced using the percent deposition estimates derived from AgDRIFT. Several worksheets within the MAGtool contain species-specific information on dietary items, including dietary preferences, and body weights used in the analysis. If a species has multiple dietary items, the EECs are drawn randomly from any of those items as part of the Crystal Ball analysis; however, if the species has a preferential dietary item, the distribution of residues on that dietary item is used for exposure estimates.

Similar to the terrestrial analysis, in the aquatic environment the percent overlap is used as a surrogate for the percent of the species exposed to an EEC in all water bodies. Locations of individuals will be similarly modeled with the water body located next to the use site (receiving direct runoff) or in the spray drift zone from 0 to 2600 ft. For individuals of a species within the area of direct overlap with a use site, the individual is considered to be adjacent to the use site, and exposure EECs are drawn directly from the PWC output. For individuals of a species within the spray drift area, EECs will be decreased based on the distance from the edge of the field at 30 m increments and calculated using deposition estimates derived from AgDRIFT as described above. It is important to note that aquatic species ranges are not based just on the water body a species occupies, but the entire catchment that feeds that water body. Therefore, while any direct overlap of a use site within the range could be anywhere in the catchment, the assumption is conservatively made that the water body is directly next to the use site.

In addition, other components have been incorporated into the aquatic analyses for randomly selecting the EEC. In addition to being assigned a zone of overlap, individuals placed in a zone with a use site overlap were also randomly assigned to a hydrologic unit code level 2 (HUC2) within their range that is associated with the use site. If, for example, through the random distribution the species was located in an area with overlap with the Corn Use Data Layer (UDL), the proportion of each HUC2 having overlap with Corn uses was considered. If a species was in HUC2s 4 and 5 and HUC2 4 represented 70% of the corn acres between the two HUC2s, the EECs from that HUC2 would have a 70% chance of being selected. Additionally, the aquatic bin to use for modeled EECs was randomly selected from all of the bins assigned to the species. In summary, the EEC used for each iteration of the analysis was randomized for use site, HUC2 location, and bin, with the use site and HUC2 being based on the overlap percentage or the relative distribution of the use within the species relevant HUC2s. Additional discussion on bins and aquatic modeling is found in **Attachment 3-1** of the BEs.

Once the use, HUC2 and bin have been selected, EECs are selected from a distribution of potential values, as outlined in the Revised Method. For the static and low-flow waterbodies (bins 2, 5, 6, and 7, described in the Revised Method), the distribution of maximum daily EECs from the 30 years of data is used for all scenarios analyzed for that UDL. For medium and high flowing waterbodies (bins 3 and 4), the distribution of daily EECs is based on a 90-day window around the 30 years of maximum annual daily concentration for all scenarios analyzed for that UDL.

Lastly, the influence of two additional factors, application date and hydrologic soil group, are considered for their potential influence in the distribution of EECs. These factors were chosen as they can have a substantial impact on EECs and are expected to vary considerably in real world applications.[[9]](#footnote-10) A complete discussion of how these distributions are developed and used is provided in the Revised Method and **Appendix 4-1**. The factors used are provided as sheets within the Excel workbook and are also provided in **Appendices 4-3 and 4-4** of the BEs.

In summary, for the probabilistic aquatic analysis, EECs are drawn from the specific use site, HUC2 and bin (distribution of original EECs modeled at the maximum application rates and wettest predicted month for the HUC2) and multiplied by the factors developed for the hydrologic soil group and application date. Resulting EECs are defined by the equation below.

*Exposure value EEC = EEC from max labeled rate run\*app date factor\*soil factor*

Aquatic EECs resulting from spray drift only are estimated using the same algorithms employed in the Tier I modules of AgDRIFT and the original waterbody dimensions for the 6 aquatic bins. Estimates of the average drift across the waterbody width at 30-meter distances away from a treated field are developed and the product of this average drift and the application rate, divided by the depth of the waterbody, results in a short-term average concentration in the waterbody due to spray drift.

For the deterministic analysis option, selection of EECs follows the same general premise as above, but simplifying assumptions are applied. Species are assumed to be in specific locations based on the percent overlap with the direct use site and the drift zone in the same manner as the probabilistic analysis, but variability in the EECs in each zone is captured through a “minimum” or “maximum” exposure scenario, which represents an upper and lower bound, with differences between the terrestrial and aquatic environments. In the terrestrial environment, for direct overlap with use sites, the mean EECs for each dietary item relevant to the species for each specified use layer are determined, and the maximum and minimum dietary item EECs are utilized in the respective analyses. In the aquatic environment, the same principle is used but the maximum and minimum EECs from all bins for the UDL are utilized instead of the distribution, and the curve number and application date scaling factors are not applied. The deterministic output represents more of an upper and lower bound of exposure rather than a maximum or minimum, as the use of distributions of EECs and adjustment factors in the probabilistic analysis could lead to slightly higher or lower EECs than those predicted with the deterministic output. However, these deviations were not found to have a major influence on the effects determinations for most species, and the probabilistic analysis can still be utilized when a particular species’ analysis would be more significantly impacted by these differences.

* 1. Toxicity Assessment

In the probabilistic analysis, under both the terrestrial and aquatic simulations, a distribution of sensitivities among individuals are considered when determining the likelihood of mortality. Similar to the method used in TIM, the mortality endpoint of concern is based on the dose-response curve for a given toxicity endpoint provided in the inputs (*e.g.*, the median lethal dose (LD50) representing the 5th percentile of species sensitivity distribution and associated slope).

**Equations 1 and 2** below describe the calculation of the sensitivity of one individual, designated as Tmortality. The Z-score is a random number selected from a normal distribution. The slope is based on the slope of the dose response curve of toxicity data available for the LD50 or LC50. The intercept of the dose response curve is calculated according to **Equation 2**. These principles are more fully described in the TIM manual[[10]](#footnote-11).

Equation 1:

Equation 2: OR

This method for determining sensitivity of an individual is used for both terrestrial and aquatic species. The Tmortality value is compared to the predicted EEC; if the EEC exceeds Tmortality, the organism is considered impacted. For sublethal effects, the same assumption is made, where the organism is considered impacted if the EEC exceeds the geomean of the no observed adverse effect concentration (NOAEC) and the lowest observable adverse effect concentration (LOAEC)[[11]](#footnote-12) value (if the NOAEC is not available, the LOAEC is used; see Table 3 of Revised Method). The difference between the mortality and sublethal effects thresholds is that, for mortality, there is a distribution of sensitivities among individuals, while for sublethal effects, all individuals have the same sensitivity (i.e., represented by the geomean of the NOAEC and LOAEC).

For the deterministic analysis, the same mortality and sublethal toxicity endpoints are utilized. However, the percent mortality is based on the mean EEC, and the dose response curve (utilizing the slope) for each UDL and the associated EEC. The NOAEC, LOAEC or MATC value is compared directly to the EEC, similar to the method used in the probabilistic analysis.

* 1. Effects Determinations Output and Weight of Evidence

The probabilistic analysis utilizes distributions available in the Excel Add-in Oracle Crystal Ball software. Using similar principles described in the TIM manual, after thousands of simulations, the fraction of total simulated individuals that are impacted based on mortality, sublethal effects, or effects to PPHD vectors (denoted as “p”) is used in the Crystal Ball probability density function for a binomial distribution. From the output of this Crystal Ball analysis, the most likely and the 95th percentile of the number of individuals predicted to be impacted is reported in the output sheet. Output is also generated for the number of individuals impacted due to direct overlap with each individual UDL, as well as those impacted by drift. Distributions utilized in Crystal Ball are more fully described in the Oracle Crystal Ball User’s Guide[[12]](#footnote-13). For the terrestrial analyses, output is generated based both on dietary and dose-based exposures. As discussed in theRevised Method, for both terrestrial and aquatic analyses, an alternative scenario is also used to generate output based on different assumptions for population size, toxicity inputs, application rates and application methods.

For the deterministic analysis, the percent mortality is calculated for each UDL or drift zone from the dose response relationship, using the EEC for each zone, the toxicity endpoint and the slope. The calculated mortality is then multiplied by the percent overlap with each UDL or drift zone to determine the overall mortality contribution. The percent mortality for each UDL and drift are summed to determine the total predicted mortality. For sublethal effects, the predicted EEC in each zone is compared to the toxicity endpoint. If the endpoint is exceeded, the percent overlap for the area is considered to have potential impacts to the species; all areas where the individuals are predicted to be impacted are summed to determine the total percent overlap impacted. The total area of impact is multiplied by the population number to determine the number of individuals potentially impacted.

After a simulation is complete, the MAGtool produces a model output workbook that incorporates the components of the weight of evidence methodology outlined in the Revised Method (Step 2, parts h and i)and **Attachment 4-1**. It is also provided with this document in **Attachment 2**. The MAGtool automatically generates workbooks for each batch of species run through each batch analysis. Additional species-specific information contained in worksheets in the MAGtool, including information gathered on the habitat, migration and dormancy of a species, are utilized in the weight of evidence analysis and displayed in the output files (A description of each of the tabs in both the aquatic and terrestrial MAGtool is provided in **Attachment 3**). The weight of evidence output file generated allows for automation of species effects determinations and summarizes information on the deterministic or probabilistic output as well as overlaps of use sites with the species range and drift adjustment factors developed for the analysis.

# ATTACHMENT 1. User Guidance for individual MAGtool spreadsheets

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This attachment describes how to run individual components of the MAGtool, in the case where the Batch Analysis tool is not used. The MAGtool has evolved through the past several years and continues to evolve as new methods are developed. As such, many areas of the tool draw on previous iterations of the analysis and some cells and worksheets may be obsolete. Many of these have been removed from the tool, but some calculations and inputs may remain and be grayed out in the analysis. These sections will be refined, and extraneous information removed, as future versions of the tool are released. As stated above, the user does not need to refer to any of these internal files when using the Batch Analysis tool, which is recommended.

The user should only modify cells and worksheets discussed in the steps below. Other worksheets in the workbook are used by the tool, but do not require modifications by the user. All workbooks require Macros to be enabled to run. Any worksheets with “CB” in the title, an acronym for Crystal Ball, require the Excel Add-In, Oracle® Crystal Ball, Fusion Edition, Release 11.1.2.3.000 (32-bit)[[13]](#footnote-14) to be installed and enabled in the program, if the analysis is to be run in probabilistic mode. This is not a standard module within Microsoft Excel.

## MAG\_TerrTool v2.4 (**Animals** analysis)

1. On the Step 2 File Generator worksheet, select the chemical to run and load the chemical input parameters (Cell D1) and the GIS input files (Cell D5). The user should select the appropriate files from the dropdown lists and click on the Load Chemical Inputs and Load GIS Files buttons. Note: It will take a few minutes to load these files.
2. Go to the “Animal multi species” tab.
3. In cells AD3 through AD10, specify the input parameters to use for the run. (Note: Although specific selections can be made for #3b and #3c below, these will be overwritten by choices in #4 during a batch analysis).:
   1. Rate: Labeled maximum or typical rates (used in calculating drift distances)
   2. PCT Applied: Max, Average or Minimum
   3. Distribution of treated acres: Upper, Uniform or Lower
   4. Range or CH: Range or Critical Habitat (CH) – select which run. This should match the GIS Input file selection from the previous step.
   5. EECs: Not changed, set to mean EECs for Step 2 analysis
   6. Maximum/Minimum Use EECs and drift: For drift calculation, specify if should apply the use site with maximum or minimum rate that overlaps with the species range
   7. Adjust drift for distribution of treated acres: If run uniform or lower distribution, specify yes or no if should apply scaling for distribution of acres
   8. Animal or Plant? Select which run
4. In cell AD20, specify any additional file identifier to include at end of output file name. The file output name is generated automatically based on the inputs selected and is shown in cell AD19.
5. In cells AD22 through AD27, indicate the runs to complete for PCT and Acres distribution. Numbering must be included in column Y (blank cell in column Y will signal runs to stop)
6. In column AF, starting in cell AF5, list species Entity IDs to run
7. Click the “RUN ANALYSIS” button. Note: this analysis may take some time, depending on the computer and the number of species being analyzed.

Output will be generated and saved in the same folder of the analysis with the name specified in the spreadsheet for the output file (Cell AD19 on the Animal multi species worksheet).

### CB Analysis Terrestrial Animals workbook

The Excel Add-In Crystal Ball software is used to conduct the next step of the analysis. This workbook utilizes this software in conjunction with the output produced from the MAGtool.

1. Open the CB Terrestrial Animal Analysis workbook.
2. Go to the Main MC Analysis worksheet.
3. In column B, starting in cell B2, list the Entity IDs to assess. Column A should contain a corresponding number for each species Entity ID.
4. In cell F6, enter the name of the MAGtool output file from which the analysis should be run. All species listed in column B must be in this file. This is the file that is generated when running the MAG TerrTool. This file should be open and in the same folder as the CB Analysis workbook. This cell is used to automatically create the Output file name in cell F18.
5. In cells F9 to F14, list the scenarios to analyze. All of the scenarios listed must have corresponding scenarios in the MAGtool output file.
6. In cell F16, enter the name of the CB output template file to be used (the Excel file should start with “CB output template”). The value in the cell is the current output template for the chemical. However, the PCT and Acre distribution sheets from the MAGtool output will need to be copied into this file for the WoE output to be generated correctly. A discussion of the CB output template is provided below.
7. In cell L3, list if running dietary or dose units. See recommendation regarding this setting in next step.
8. In cells M15 to M17, select the analysis to run. To run the full suite of analyses, it is recommended to set Cell L3 to “Dose” and cells M15 and M16 to “Base” and “Both”, respectively. This allows the tool to produce all the output to populate the CB output workbook and the weight of evidence output.
9. Clear any existing output from the MC Analysis results, MC Analysis results diet and MC Analysis Results alt worksheets by clearing cells to the right and down from cell J4. Clear any existing output from the MC Analysis by use, MC Analysis results by use diet and MC Analysis Results by use alt by clearing cells to the right and down from cell E4. While the analysis will proceed without clearing these cells, a prompt for permission to overwrite the cells will interrupt the program, so it is best to clear these cells of any prior results before running. Cells to the left of these columns will be overwritten automatically or contain links to other sheets that should not be deleted.
10. Click the “RUN ANALYSIS” button on the Main MC analysis worksheet.

Output will be generated and saved in the same folder of the analysis with the name specified in the spreadsheet for the output file (Cell F18 on the Main MC analysis worksheet).

## MAG\_TerrTool v2.4 (**Plants** analysis)

1. In the Step 2 File Generator worksheet, select the chemical to run and load the chemical input parameters (Cell D1) and the GIS input files (Cell D5). The user should select the appropriate files from the dropdown lists and click on the Load Chemical Inputs and Load GIS Files buttons. Note: It will take a few minutes to load these files.
2. For the next steps use the “Animals multi species” (some settings on the animal tab also control the plant tab settings). In cells AD3, and AD6 through AD10, specify the input parameters to use for the run. (Note: Although specific selections can be made for #2b and #2c below, these will be overwritten by choices in #4 during a batch analysis).
   1. Rate: Labeled maximum or typical rates (used in calculating drift distances)
   2. Range or CH: Range or Critical Habitat (CH) – select which run. This should match the GIS Input file previously loaded.
   3. EECs: Not changed, set to mean EECs for Step 2 analysis
   4. Maximum/Minimum Use EECs and drift: For drift calculation, specify if should apply the use site with maximum or minimum rate that overlaps with the species range
   5. Adjust drift for distribution of treated acres: If run uniform or lower distribution, specify yes or no if should apply scaling for distribution of acres
   6. Animal or Plant? Select Plant
3. For the next steps use the “Plant multi species” tab. In cells AD4 and AD5, specify the input parameters to use for the run. (Note: Although specific selections can be made for these selections, these will be overwritten by choices in Step 4 during a batch analysis).
   1. PCT Applied: Max, Average or Minimum
   2. Distribution of treated acres: Upper, Uniform or Lower
   3. In cell AD20, specify any additional file identifier to include at end of output file name. The file output name is generated automatically based on the inputs selected and is shown in cell AD19.
   4. In cells AD22 through AD27, indicate the runs to complete for PCT and Acres distribution. Numbering must be included in column Y (blank cell in column Y will signal runs to stop).
   5. In column AF, starting in cell AF5, list species Entity IDs to run.
   6. Click the “RUN ANALYSIS” button. Note: this analysis may take some time, depending on the computer and the number of species being analyzed.

Output will be generated and saved in the same folder of the analysis with the name specified in the spreadsheet for the output file (Cell AD19 on the Plant multi species worksheet).

### CB Analysis Terrestrial Plants workbook

The Excel Add-In Crystal Ball software is used to conduct the next step of the analysis. This workbook utilizes this software in conjunction with the output produced from the MAGtool.

Note: The user should only modify cells and worksheets discussed in the steps below. Other worksheets in the workbook are used by the tool, but do not require modifications by the user.

1. Open the CB Terrestrial Plants Analysis workbook.
2. Go to the Main MC Analysis worksheet.
3. In column B, starting in cell B2, list the Entity IDs to assess. Column A should contain a corresponding number for each species Entity ID.
4. In cell F6, enter the name of the MAGtool output file from which the analysis should be run. All species listed in column B must be in this file. This is the file that is generated when running the MAG TerrTool for plants. This file should be open and in the same folder as the CB Analysis workbook. This cell is used to automatically create the Output file name in cell F18.
5. In cells F9 to F14, list the scenarios to analyze. All of the scenarios listed must have corresponding scenarios in the MAGtool output file.
6. In cell F16, enter the name of the CB output template file to be used (the Excel file should start with “CB output template”). The value in the cell is the current output template for the chemical. However, the PCT and Acre distribution sheets from the MAGtool output will need to be copied into this file for the WoE output to be generated correctly. A discussion of the CB output template is provided below.
7. In cells M15 to M17, select the analysis to run. To run the full suite of analyses, it is recommended to set cells M15 and M16 to “Base” and “Both”, respectively. This allows the tool to produce all the output to populate the CB output workbook and the weight of evidence output.
8. Clear any existing output from the MC Analysis results and MC Analysis Results alt worksheets by clearing cells to the right and down from cell J4. Clear any existing output from the MC Analysis by use and MC Analysis Results by use alt by clearing cells to the right and down from cell E4. While the analysis will proceed without clearing these cells, a prompt for permission to overwrite the cells will interrupt the program, so it is best to clear these cells of any prior results before running. Cells to the left of these columns will be overwritten automatically or contain links to other sheets that should not be deleted.
9. Click the “RUN ANALYSIS” button on the Main MC analysis worksheet.

Output will be generated and saved in the same folder of the analysis with the name specified in the spreadsheet for the output file (Cell F18 on the Main MC analysis worksheet).

## MAG\_AquaTool v2.4

## 

1. On the Step 2 File Setup worksheet, select the chemical to run and load the chemical input parameters (Cell D1) and the GIS input files (Cell D5). The user should select the appropriate files from the dropdown lists and click on the Load Chemical Inputs and Load GIS Files buttons. Note: It will take a few minutes to load these files.
2. Go to the Multi species aqua tab.
3. In cells Z3 through Z9, specify the input parameters to use for the run:
   1. Rate: Labeled maximum or typical rates (used in calculating drift distances)
   2. PCT Applied: Max, Average or Minimum
   3. Distribution of treated acres: Upper, Uniform or Lower
   4. Range or CH: Range or Critical Habitat (CH) – select which run. This should match the GIS Input file selection from the previous step.
   5. Maximum/Minimum Use EECs and drift: For drift calculation, specify if should apply the use site with maximum or minimum rate that overlaps with the species range
   6. Aquatic Animal or Plant? Select which run
   7. Adjust drift for distribution of treated acres: If run uniform or lower distribution, specify yes or no if the tool should apply a scaling factor for distribution of acres
4. In cell Z20, specify any additional file identifier to include at end of output file name. The file output name is generated automatically based on the inputs selected and is shown in cell Z19.
5. In cells Y22 through AA27, indicate the runs to complete for PCT and Acres distribution. Numbering must be included in column Y (blank cell in column Y will signal runs to stop)
6. In column AC, starting in cell AC5, list species Entity IDs to run
7. Click the “RUN ANALYSIS” button. Note: this analysis may take some time, depending on the computer and the number of species being analyzed.

Output will be generated and saved in the same folder of the analysis with the name specified in the spreadsheet for the output file (Cell Z19 on the Main MC analysis worksheet).

### MC Analysis Aquatic workbook

The Crystal Ball software was initially considered for use in the aquatic analysis to randomize selection of EECs from distributions fit to PWC output runs. Based on the size and number of aquatic runs, the time required to analyze the aquatic EEC data was prohibitive. Alternatively, a spreadsheet was developed that randomly drew directly from the EECs generated by PWC. Based on a comparison of output using the two methods, there was no substantial difference in the output generated. Therefore, the method using the randomized selection of the EECs and factors was performed using the Excel spreadsheet and the output was then used in the CB PDF Aquatic calculator to predict the likely number of individuals impacted, as described in the next section. Instructions for running the MC Analysis workbook are provided below.

Note: The user should only modify cells and worksheets discussed in the steps below. Other worksheets in the workbook are used by the tool, but do not require modifications by the user.

1. Open the MC Analysis workbook.
2. Go to the Main MC Analysis worksheet. This spreadsheet has multiple randomized cells which can slow the opening and function of the spreadsheet. It is recommended as soon as the spreadsheet is open, to go to Formulas>Calculations Options> and set to Manual, if it has not been set to Manual already.
3. In column B, starting in cell B2, list the Entity IDs to assess.
4. In cell F6, enter the name of the MAGtool output file from which the analysis should be run. All species listed in column B must be in this file. This file should be open and in the same folder as the MC Analysis workbook. This is the file that is generated when running the MAG Aquatool. This cell is used to automatically create the Output file name in cell F18.
5. In cells F9 to F14, list the scenarios to analyze. In order to work with the CB PDF Aquatic calculator described below, the scenarios analyzed should be “Max Upper” and “Average Uniform”, as these are the two scenarios that influence the weight of evidence evaluation. However, any scenarios that have been run in the MAGtool and are in the output file can be analyzed.
6. In cells M15 to M17, select the analysis to run. It is recommended to set these to “Base”, “Base Rate” and “Both”. This allows the tool to cycle through the base and alternative outputs and produces output compatible with the CB PDF Aquatic calculator and the weight of evidence output.
7. Clear any existing output from the MC Analysis results and MC Analysis Results alt worksheets by clearing cells to the right and down from cell J4. Clear any existing output from the MC Analysis by use results and MC Analysis Results by use alt by clearing cells to the right and down from cell E4. While the analysis will proceed without clearing these cells, a prompt for permission to overwrite the cells will interrupt the program, so it is best to clear these cells of any prior results before running. Cells to the left of these columns will be overwritten automatically or contain links to other sheets that should not be deleted.
8. Click the “RUN ANALYSIS” button on the Main MC analysis worksheet.

## CB Output templates

Each of the CB analyses above, for both terrestrial and aquatic analyses, uses an output template to create an output workbook. These output workbooks can be used to view the automated effects determinations for the species analyzed. Each output template is unique to the media (aquatic, terrestrial), animal/plant run and the chemical analyzed (chemical specific worksheets are already populated in the template). Listed below are some steps for using the output.

1. After the output file is generated, all PCT/Distribution outputs in the MAGtool output file need to be copied to the CB Output file on the corresponding sheets (tab names: Max\_Upper, Max\_Upper\_CB, Max\_Uniform, etc.).
2. After these cells are updated, return to the Output by species tab. In cell C2, enter the species entity ID to view the results of the analysis and the weight of evidence information. A preliminary call and strength of evidence is displayed in cells C39 and C40.

# ATTACHMENT 2. Criteria for Strength of Evidence in LAA Determination

The discussion below outlines the criteria that were used for making an automated NLAA/LAA and assessing strength in the evidence (strongest, moderate or weakest). Individual species may have been reviewed by an assessor, which could lead to a change in the NLAA/LAA determination or the strength of evidence characterization (if LAA). Additional details are provided below. The criteria discussed herein was developed under the Revised Methods for existing chemicals. For newer chemicals, where usage data or incident data may not be available or relevant, the assessor may adjust the interpretation of the criteria.

1. Effects Determinations

LAA – If at least 1 individual under the maximum PCT/upper acres distribution scenario is predicted to be impacted, a preliminary LAA determination is generated.

NLAA – If less than 1 individual is predicted to be impacted under the maximum PCT/upper acres distribution scenario, an NLAA call is generated. The exception to this is any species with a population of 100 or less individuals – this generates a “Low population NLAA – needs review” flag (discussed further below).

1. Weight of Evidence (WoE) factors that determine overall strength in evidence of LAA determination

The strength of evidence in the effects determination is based on multiple factors or lines of evidence as outlined in **Table 1** below. The confidence in each line of evidence is assessed to determine its weight or influence in the overall strength of the LAA call, as outlined in the table below.

**Table 1. Lines of Evidence used to determine the strength of evidence of LAA call.**

| **Factor impacting WoE call 🡪**  **Confidence in that factor↓** | **1. Impacts to Mortality/**  **Sublethal/**  **Indirect (PPHD)** | **2. Impact of PCT/Acres Distribution** | **3. Impact of alternative assumptions for population, rates and toxicity data** | **4. Range Data Quality** | **5. Species Surrogacy** | **6. Usage Data Reliability** | **7. Incidents Reported** | **8.Habitat and Exposure model** | **9. Drift contribution to impact** | **10. Monitoring data** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Increased** | If impacts are due to direct (mortality or sublethal) and indirect (PPHD) effects. | If impacts to either direct or indirect (PPHD) effects are still predicted in the average PCT, uniform acres distribution scenario. | If impacts to either direct or indirect (PPHD) effects are predicted in the alternative maximum PCT, upper acres distribution scenario. | If range data are characterized as Green (i.e., review of Services documents indicate species range matches description). | Not used. | If CONUS Ag uses are in the top 3 drivers of risks to individuals. | Incidents are reported for either the direct or indirect (PPHD) taxa of concern. | Not used. | Not used. | If concentrations from monitoring data within the species ranges exceeds toxicity endpoints. |
| **Decreased** | If impacts are due only to direct or indirect (PPHD) effects. | If impacts to either direct or indirect (PPHD) effects are not predicted in the average PCT, uniform acres distribution scenario. | If impacts are not predicted to either direct or indirect (PPHD) effects in the alternative maximum PCT, upper acres distribution scenario. | If range data are characterized as Yellow (i.e., review of Services documents indicate species range differs from the description). | If taxon is reptile or terrestrial amphibian and bird data used. | If species range is in the NL48 or a Non-Ag use is the primary use associated with risks to individuals. | Not used. | If habitat was identified as a mismatch to exposure models. | If 100% of impact is from drift, due to uncertainty in the magnitude and extent of drift in varied environments. | Not used. |
| **No impact on Confidence** | Not used | Not used | Not used | If range data have not been evaluated. | All other taxa. | Those not meeting above criteria. | No incidents are reported. | If habitat was not identified as a mismatch to exposure models. | If drift only partially or does not contribute to impact. | If no monitoring data are available or values are less than toxicity endpoints. |

An automated explanation is provided in the output summary sheet based on which criteria above (increased, decreased or no impact on confidence) is assigned, as listed below in **Table 2**. This is the language that appears in the output for the corresponding confidence in that factor.

**Table 2. Output language associated with changes in confidence in each line of evidence.**

| **Factor impacting WoE call 🡪**  **Confidence in that factor↓** | **1. Impacts to Mortality/Sublethal/Indirect** | **2. Impact of PCT/Acres Distribution** | **3. Impact of alternative assumptions for population, rates and toxicity data** | **4. Range Data Quality** | **5. Species Surrogacy** | **6. Usage Data Reliability** | **7. Incidents Reported** | **8. Habitat and Exposure model** | **9. Drift contribution to impact** | **10. Monitoring data** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Increased** | Impacts due to direct (mortality and/or sublethal) effects. | Impacts predicted even at less conservative PCT/Acre distributions. | Impacts predicted when less conservative population assumptions, application rates and toxicity endpoints are used in analysis. | Range data used matches with Services documents. | Not used | Increased confidence in usage data due to region and/or use sites. | Increased confidence due to presence of incidents. | Not used | Not used | Monitoring data exceeds species toxicity endpoints. |
| **Decreased** | Impacts due only to indirect effects. | Impacts only predicted at more conservative PCT/Acre distributions. | Impacts are not predicted when less conservative population assumptions, application rates and toxicity endpoints are used in analysis. | Parts of range data do not fit with Services document descriptions. | Increased uncertainty regarding surrogacy of tested species for listed species. | Decreased confidence in usage data due to region and/or use sites. | Not used | Conceptual exposure models utilized in modeling differ substantially from species habitat. | Increased uncertainty as impacts based entirely on drift. | Not used |
| **No impact on Confidence** | Not used | Not used | Not used | Range not evaluated against Services documents. | Tested species represents adequate surrogate. | Usage data adequate for species range. | No reported incidents. | Exposure models adequately represent species habitat. | Drift only partially contributes or does not contribute to impact. | No monitoring data available or data below toxicity thresholds. |

Overall Strength of Evidence Characterization: The overall confidence is based on the number of increased or decreased factors in the criteria above. In the criteria for deciding the strength of the evidence, the first 3 factors have more weight, as they are based on the quantitative analysis. Factor 1 captures if greater than 1 individual is impacted from direct (mortality and sublethal) and/or indirect (PPHD) effects, factor 2 captures the influence of changes to the PCT or distribution of acres assumptions and factor 3 captures the influence of alternative assumptions regarding toxicological sensitivity and population values as well as the use of typical application rates and application method. All of these factors are important in addressing the uncertainty in the assumptions of the analysis. When these factors have little or no bearing on the prediction of greater than 1 individual being impacted, there is stronger evidence of the LAA determination. The additional lines of evidence or factors are also used to determine the strength of evidence, but are used to a lesser degree and may serve to characterize the quantitative results (*e.g.*, if there is less confidence in the usage data or there is a poor fit of the exposure model to the species habitat, the strength of the evidence may be reduced even if the quantitative output suggests impacts under all scenarios).

**Strongest evidence of LAA** – If 2 or more of factors # 1, 2, or 3 are increased, and 2 or more of factors of #4-9 are increased, then strongest evidence of LAA is concluded. However, if usage data reliability (#6), range data reliability (#4), or impacts to mortality/sublethal/indirect (#1) are decreased, the strongest evidence category is not used (i.e., moderate evidence is concluded).

**Moderate evidence of LAA** – If usage data reliability (#6), range data reliability (#4), or impacts to mortality/sublethal/indirect (#1) are decreased, the highest strength of evidence ranking is moderate. If either usage data reliability (#6), range data reliability (#4), or impacts to mortality/sublethal/indirect (#1) are decreased, but 2 or more of factors # 1, 2, or 3 are increased, moderate evidence of LAA is concluded; otherwise weakest evidence of LAA is concluded. Additionally, if the criteria listed above and below for strongest or weakest evidence of LAA are not met, then the species is assigned moderate evidence of LAA.

**Weakest evidence of LAA** - If 1 or less factors #1, 2, or 3 are increased, and greater than 3 criteria overall are decreased, then weakest evidence of LAA is concluded. If either usage data reliability (#6) or range data reliability (#4) are decreased and 1 or less of factors # 1, 2, or 3 are increased, weakest evidence of LAA is concluded. If 100% of impact is from drift and species lives in forest habitat, weakest evidence of LAA is concluded.

Sample Output as appears in species files:





1. Further evaluation of automated determinations

For some species, factors were identified in the gathering of species data that would need further individual evaluation for potential adjustment of the species determination, such as a unique habitat or species traits. Additionally, determinations that were given an automated assignment of LAA with weakest evidence and had very few individuals impacted, and determinations that were listed as NLAA with a low population, were also further evaluated. Certain criteria were identified in the output which served as a prompt for the individual assessor to review the species determination:

* *Impacts only based on drift, habitat description of a forest species* – If a species was determined to likely be an interior forest dwelling species, and the assessed pesticide does not include uses that involve direct applications to forest, the determination was changed to an NLAA based on the unlikely chance that exposure would occur from drift and the poor representation of the species habitat by the drift model. If a species was found to likely be an edge forest inhabitant or was present in multiple habitats, the determination was left as LAA.
* *Impacts only based on drift, habitat description of a cliff dwelling species* – If a species was determined to be located on high cliffs, the determination was changed to an NLAA based on the unlikely chance that exposure would occur from drift and the poor representation of the species habitat by the drift model. If a species was found to likely be on varied cliffs or was present in multiple habitats, the determination was left as LAA.
* *Impacts only based on drift, elevation restrictions applied to species* – If a species was determined to be at high elevation and only impacted by drift, consideration was given to the likelihood of exposure.
* *Impacts only based on drift, non-specific* – If a species determination was determined to be due to drift only, consideration was given to other factors than those identified above which could impact the determination, considering the basis of the drift model. These were briefly reviewed but were generally maintained with the automated determination.
* *NLAA with low population* – If a species with a low population was determined to be NLAA, if no individuals were impacted at the most conservative options and no other qualitative factors were identified that indicated a further evaluation was needed, the determination remained at NLAA.
* *Impacts to aquatic species that reside in cave/karst environments* - If an aquatic species resides in a cave/karst environment, the evidence for the determination was downgraded to weakest. While the EECs used in the quantitative analysis represent concentrations that could potentially be in waterways that feed the cave/karst systems, there is high uncertainty that they represent potential exposure estimates.
* *Federal Lands overlap greater than 95% with species range* – The same criteria were used for evaluating species with high overlap of Federal Lands with the species range, but LAA calls with very low individuals impacted under conservative assumptions were reevaluated for the likelihood of impacts to occur.

# ATTACHMENT 3. MAGtool tab descriptions

## Terrestrial MAGtool tab descriptions (MAG\_TerrTool\_v2.4.xlsm)

README – provides general instructions and list of updates made to tool.

Step 2 File Generator – used to load the Chemical input parameters and GIS input files

Animal multi species – used to assess and summarize the MAGtool results for multiple animals

Plant multi species– used to assess and summarize the MAGtool results for multiple plants

Terr calcs – used to calculate terrestrial exposure for individual listed species

Spray drift aqua – used to estimate the distance to effect for aquatic species based on spray drift alone. Each aquatic bin and threshold is evaluated.

DT Range – results of the downstream transport analysis for species’ ranges

DT CH – results of the downstream transport analysis for species’ critical habitats

WoE Summary – summary of the weight of evidence database information utilized in the analysis (includes on/off field designations, habitat data, etc.)

All\_AAs, AA\_R\_Step1, and AA\_CH\_Step1 – chemical specific overlap of the action area with the species range and species critical habitat broken down into 30 m increments out to 1500 m.

MAX-Upper, MAX-Uniform, MAX-Lower – acreage overlap with the species, using the maximum percent crop treated and the upper, uniform, and lower acreage distributions

AVG-Upper, AVG-Uniform, AVG-Lower - acreage overlap with the species, using the average percent crop treated and the upper, uniform, and lower acreage distributions

MIN-Upper, MIN-Uniform, MIN-Lower - acreage overlap with the species, using the minimum percent crop treated and the upper, uniform, and lower acreage distributions

List species info1 – dietary items by species entity id number (sheet not currently utilized)

Min rate concentrations– upper bound and mean EECs in various dietary items based on application rates of current use being assessed

Min rate - dietary conc results - number of exceedances of thresholds and endpoints for upper bound and mean EECs based on current use being assessed

Min rate doses - for all vertebrate species, dose based dietary EECs for each dietary item as well as dose-based drinking water, dermal and inhalation exposure based on current use being assessed

Step 3 Animal – summary output of animal species information (previously used in Step 3 analysis)

Animal Step 2 WoE – Step 2 matrix and WoE results for animal species (previously used in Step 2 analysis)

Step 3 Plant and Plant Step 2 WoE – Same as above, except for plants instead of animals

TerrRESULTS – detailed calculations used to produce output including magnitude of mortality, percent overlap for individual uses and adjustments for species range. Used for many of the deterministic calculations.

Drift usage adjust state animal – acreage overlap due to drift, adjusted for PCT and broken down by animal species and State

Drift usage adjust state plant - acreage overlap due to drift, adjusted for PCT and broken down by plant species and State

Max treated animal – acres treated based on the maximum PCT, by State and UDL, for animal species and used to calculate crop with max acres treated that also has overlap with the species range when fully buffered, to use in drift calculations by state for AA

Max treated plant - acres treated based on the maximum PCT, by State and UDL, for plant species and used to calculate crop with max acres treated and also has overlap with the species range when fully buffered, to use in drift calculations by state for AA

UDL Use PCT Crosswalk – crosswalk of terminology used for UDLs and PCT sheets, as well as Ag or NonAg denotations for UDLs

Max treated all – acres treated based on the maximum PCT, by State and UDL, for current analysis

State\_PCT\_max, State\_PCT\_avg, and State\_PCT\_min - area treated, by UDL and State/territory, when the maximum, average, and minimum PCTs are applied

All aq thresholds – summary worksheet of all of the chemical-specific aquatic thresholds

MAGtool inputs – all terrestrial and aquatic chemical-specific thresholds

inputs – Relevant data from TEDtool inputs, including application rates for spray drift calculations, relevant use layers and physical, chemical and fate properties

CDL Use Rates – maximum use rate information, broken down by UDL

CDL Use Rates\_All – maximum and typical use rate information, application methods and spray drift parameters, broken down by UDL

Species Summary – species summary worksheet, taken from the PWC runs, for animals that may use aquatic habitats

TPezWPez – species summary for animals and plants that may be exposed in terrestrial and wetland plant exposure zones (TPEZ and WPEZ), broken down by UDL. Concentrations are in lbs/A.

WPez only - species summary for animals and plants that may be exposed in wetland plant exposure zones (WPEZ), broken down by UDL. Concentrations are in µg/L.

listed species info MASTER – Contains animal species information including species IDs, dietary items, terrestrial or aquatic habitats and obligate relationships

Spray Drift – Contains spray drift distances based on the minimum and upper bound application rates for each threshold for each line of evidence for aquatic bins (previously used)

PercentOverlap\_CDL – Used in Step 2, contains the aggregated data layers for 6 years direct overlap with species range; columns with orange headers have been filtered to only show layers relevant to the chemical in question (based on data in input tab for relevant use layers)

PercentOverlap\_CDL\_Buff – Used in Step 2, contains the aggregated data layers for 6 years direct overlap with species range buffered for maximum spray drift (1000 ft or 2600 ft; yellow columns); columns with orange headers have been filtered to only show layers relevant to the chemical in question (based on data in input tab for relevant use layers)

Species Information – Plant species information including taxonomic grouping, FWS regions, obligate relationships and habitat descriptions

Pollination Mechanisms – Plant pollination mechanisms

Diaspore Dispersal Mechanisms – Plant diaspore dispersal mechanisms

Habitat – Indicators if plant habitat is terrestrial or aquatic or wetland

Obligate Relationships –Plant obligate relationships

Elevation restriction – Plant elevation restriction data, if available

Draft – Habitat Groups – FWS plant habitat groups

Dietary categories cross – crosswalk of dietary items by species taxa

Spray Drift by Distance – Upper bound and Mean EECs in various dietary items based on minimum and upper bound application rates (as specified in inputs tab) at 30 m increments (previously used)

SD Dose by Distance Min/Max - – Upper bound and Mean EECs in various dietary items on a dose basis for all vertebrate terrestrial animals; based on minimum and upper bound application rates (as specified in inputs tab) at 30 m increments (previously used)

**Hidden worksheets** – old worksheets that were used to conduct analyses using methods developed prior to the Revised Method. No longer used and will be removed in future versions of the tool.

## Aquatic MAGtool tab descriptions (MAG\_AquaTool\_v2.4.xlsm)

Tabs listed below are only those that are found within the AquaMAGtool that were not described above in the Terrestrial MAGtool.

Multi species aqua – used to assess and summarize the MAGtool results for multiple aquatic species

Aq calcs – used to summarize aquatic thresholds, drift distances, aquatic exposure for individual listed species

Step 3 - summary output of animal species information (previously used in Step 3 analysis)

Animal Step 2 WoE – Step 2 matrix and WoE results for animal species (previously used in Step 2 analysis)

Drift by use endpoint – used in analysis to cycle through drift distance calculations by UDL by Bin, to determine maximum and minimum UDL and bin, and to list UDLs with species overlap

WoE information - summary of the weight of evidence database information utilized in the analysis (includes on/off field designations, habitat data, etc.)

Rate and use inputs – Relevant data from TEDtool inputs, including application rates for spray drift calculations, relevant use layers and physical, chemical and fate properties

Spray Drift all - Contains spray drift distances based on the minimum and upper bound application rates for each threshold for each line of evidence for aquatic bins (previously used)

listed species info- AqWoE – Contains aquatic plant and animal species information including species IDs, dietary items, terrestrial or aquatic habitats and obligate relationships

Spray Drift Distance – Contains spray drift calculations for EECs at distances by bin

1. <https://www.epa.gov/endangered-species/revised-method-national-level-listed-species-biological-evaluations-conventional> [↑](#footnote-ref-2)
2. <https://www.epa.gov/endangered-species/provisional-models-endangered-species-pesticide-assessments#Terrestrial> [↑](#footnote-ref-3)
3. <https://www.epa.gov/pesticides/epa-releases-final-biological-evaluations-three-chemicals-impacts-endangered-species> [↑](#footnote-ref-4)
4. For more information on these exposure models, please refer to the following website: https://www.epa.gov/pesticide-science-and-assessing-pesticide-risks/models-pesticide-risk-assessment [↑](#footnote-ref-5)
5. <https://www.oracle.com/applications/crystalball/crystal-ball-product.html> [↑](#footnote-ref-6)
6. For more information on the Plant Assessment Tool (PAT), please refer to the following website: https://www.epa.gov/pesticide-science-and-assessing-pesticide-risks/models-pesticide-risk-assessment [↑](#footnote-ref-7)
7. To run the terrestrial probabilistic tool using Crystal Ball, the CB Analysis Terrestrial Animals workbook\_prob and the CB Analysis Terrestrial Plants workbook\_prob will need to renamed as the CB Analysis Terrestrial Animals workbook and the CB Analysis Terrestrial Plants workbook, respectively. The original files with these names will need to be saved separately if it is desired to run the deterministic analysis again without the Crystal Ball Add-in installed (either the deterministic or probabilistic analysis can be run with the file updates if Crystal Ball is installed) [↑](#footnote-ref-8)
8. Terrestrial Investigation Model (TIM). https://www.epa.gov/pesticide-science-and-assessing-pesticide-risks/models-pesticide-risk-assessment#tim [↑](#footnote-ref-9)
9. USEPA. 2015. Background Document in Support of the Meeting of the FIFRA Scientific Advisory Panel on the Development of a Spatial Aquatic Model (SAM) for Pesticide Assessments. Available online at: https://www.regulations.gov/docket?D=EPA-HQ-OPP-2015-0424-004 [↑](#footnote-ref-10)
10. USEPA. 2015. Technical Description and User's Guidance Document for the Terrestrial Investigation Model (TIM) Version 3.0 Beta. <https://www.epa.gov/pesticide-science-and-assessing-pesticide-risks/models-pesticide-risk-assessment#tim> [↑](#footnote-ref-11)
11. Note that dose-based endpoints are represented by the no observed adverse effect level and the lowest observed adverse effect level. [↑](#footnote-ref-12)
12. <https://docs.oracle.com/cd/E17236_01/epm.1112/cb_user/toc.htm> [↑](#footnote-ref-13)
13. <https://www.oracle.com/applications/crystalball/> [↑](#footnote-ref-14)