

Example Invasive Species Ranking: Pennsylvania Terrestrial Species

Introduction

This example is supplied to illustrate how to use the invasive species and species of greatest conservation need (SGCN) tables to produce a ranking for the invasive species posing the greatest threat to SGCNs in Pennsylvania. This stepwise process can be used for any subset of the data provided.

We will draw upon the information provided in the final report and tables accompanying this exercise. The terms and background used in this example are explained in detail in the final report, and we will assume users are familiar with this document before using this example. If terms or processes are unclear, please refer back to the final report.

All operations used will be completed using Microsoft Excel and the tools and functions included in it with the exception of one custom macro contained in the file supplied (Note: in order to use this macro, macros must be enabled upon opening the file when prompted) entitled “Appendix C – Interaction Tables.xls”. Wherever possible, specific formulas and steps will be provided in detail. Some functions such as “Copy/Paste Special” will not be explained in detail. These are simple functions to master in Excel.

In all cases, we recommend making changes to copies of the original data when completing custom analyses. This is good practice and will ensure the integrity of the original dataset for subsequent analyses.

Example Analysis

For this example, we will synthesize a ranked list of invasive species for Pennsylvania. We are primarily interested in terrestrial species. The final ranked list should represent those species that pose the greatest threat to these SGCNs based on the number of species impacted and the severity of that impact.

Analysis Steps

For this, or other, analyses it is best to map out the basic steps to achieving the objective. In this case, our basic steps are:

1. Subset the SGCN data for species found in Pennsylvania (PA)
2. Review/modify SGCN habitat information as necessary
3. Use habitat information to further subset the SGCN to terrestrial species only
4. Review/modify the full invasive species dataset as necessary

5. Calculate the Habitat Matrix and Habitat Ratio values
6. Select ranking criterion and perform necessary calculations
7. Complete ranking process

In order to complete this analysis, we will take data from the tables provided and create appropriate subsets in new files to complete the analysis.

Step 1 - Subset the SGCN data for species found in Pennsylvania (PA)

First, we will create a subset of the SGCNs for PA using the information provided in the *Appendix A – SGCN info.xls* file. We will open this file and then use “Save As” to create a working copy called “PA SGCN.xls”.

The first tab of this spreadsheet contains information on the distribution of the SGCNs in the northeast (named “SGCN list”). There are columns to the right for each state that includes a value of 1 if the species was listed in that state’s Wildlife Action Plan (SWAP). For this example, we are interested in those species found in PA. There are several ways to subset the data to include only those SGCNs with a 1 in the PA column. We suggest simply sorting the table by this column then deleting those species that are not found in PA. The resulting list should have 206 species in it.

Note: When sorting, you must be sure to select the entire table! Otherwise, the data in the unselected columns will no longer match the correct SGCN in the first column. Excel will typically warn you if this is about to happen.

The next step is to use this new list to do a similar sub-setting of the habitat information found in the second tab in Appendix A (named SGCN Habitat). Again, there are several ways to do this. We suggest adding a new column to the habitat table and using a function to determine if the SGCN is in the PA only list. Then this value can be used to complete the subset of the SGCN habitat using a sort and delete.

First, add a field at the far right of the table named “PAcheck”. For each row (i.e., SGCN), we will use a vertical lookup function to determine if the species is included in the PA subset. We will use the scientific name column (“Sci name”) to determine if the species is present in PA. The formula will look something like this:

=VLOOKUP(B11,'SGCN list'!\$B\$11:\$B\$216,1,0)

Note: The dollar signs in the range will anchor the location of the table to these rows/columns. This is critical when doing a look up and copying the formula to multiple cells. By anchoring those values, they will not change when the cell is copied to the rest of the column. However, the first reference (B11 in this formula) will increment with each row.

It is important to use the FALSE (the 0) value for the last part of the function. This will ensure that an exact match is found. This function can be copied and pasted to the entire column. Each row should either have the name of the SGCN or a value of “#N/A”. We can now sort the table by the PAcheck field, select all the rows that have a value of “#N/A” and delete them. It is a good idea to perform a quick check to make sure you have the same number of SGCNs in this table as the SGCN subset (in this case, 206).

We strongly suggest users save their work frequently throughout this process. We will not include specific directions to save in the steps that follow, but users should be sure to save their work at each stage of the process.

Step 2 - Review/modify SGCN habitat information as necessary

While we have attempted to provide accurate habitat information for all the species included in this project, there are certainly instances where users would want to change that information to suit their needs. This is done simply by changing the values in the “SGCN habitat” subset as necessary. If a species is expected to utilize the general habitat type, then the value in that cell should be 1, otherwise it should be 0.

If users wish to add a habitat category (or completely change to another system) this can be accomplished by adding or modifying columns (or completely replacing them). Please note, however, that any changes to the structure of the SGCN habitat file must also be made to the analogous invasive species dataset. Further, the macro that performs all the pairwise comparisons to calculate the Habitat Score must also be modified to include the correct number of classes in these tables. This is not difficult for users familiar with programming in Visual Basic (the programming language of Excel).

Step 3 - Use habitat information to further subset the SGCN to terrestrial species only

In this example, we are particularly interested in terrestrial SGCNs and want to exclude species that are entirely aquatic (such as fish). It is important to carefully consider the specifics of any query to the database for subsetting. In this case, is it important to include species such as the beaver or muskrat (aquatic mammals) in the final set? If not, we would need to be careful about which attributes we used to build the subset. Simply selecting all groups but fish (using the “Group” column) would retain these, and other, semi-aquatic species and all of the invasive species interactions associated with them.

For this example, we will clarify our need as all primarily terrestrial species. So, we are not interested in including semi-aquatics such as waterfowl, shorebirds, aquatic turtles, etc. The easiest way to create this subset is to use the habitat information (this is why this process is included after Step 2 above. This may not be necessary).

We would suggest creating a new column that will indicate whether the SGCN is attributed to terrestrial habitats (at all). First, add a new column to the right of the SGCN habitat table subset named “Habcheck”. To determine if the species uses terrestrial habitats at all, we suggest using a simple sum of all the terrestrial types. If the result is greater than 1 then the SGCN utilizes terrestrial habitats. If not, then the species is primarily associated with aquatic types. The formula we used was:

=SUM(I11:U11)

This will sum the habitat values for all types starting with “Beach” and proceeding to the right through “Rock/Cliff”. So, the columns to the left (namely, “Lake”, “River”, “Wetland”, “Intertidal”, and “Marsh” are deemed aquatic and excluded). It is important to note that this does not exclude species that used these types if they also are associated with one of the terrestrial types. It will only exclude those species that

are found solely in one or more aquatic types only. In this case, the resulting subset now has 107 SGCNs in it.

Now that we have a new subset, we have the information we need to move on to the habitat score calculations. We do not have to go back and subset the SGCN list, since we do not need that information moving forward for this analysis.

Step 4 - Review/modify the full invasive species dataset as necessary

The next step is to review and modify the invasive species dataset as necessary. In this example, we do not expressly need to modify the tables (Appendix B Invasive Species Info.xls). By including all of the invasive species, we will ensure that future threats are included even if those species are not presently distributed in PA. Of course, such a subset could be accomplished using the same steps outlined above for SGCN.

We do not need to make any adjustments to the invasives to remove aquatic species (although we could if we wanted to). We have already removed those SGCNs that would be impacted most heavily by aquatic invasive species; that is the habitat interaction will result a 0 when the values are compared. However, we still will include the impacts of aquatic invasives for those species that have an aquatic component to their habitat classification.

If the user is interested in modifying the general habitat associations for any of the invasive species they can do that. Modifications of the system itself would require modifications of the SGCN habitat and the macro as described above.

Step5 - Calculate the Habitat Matrix and Habitat Ratio values

With the SGCN and invasive species habitat files ready for analysis, we can proceed onto the habitat calculations. The analysis will make all pair-wise comparisons between SGCN and invasive species. The total number of comparisons can be calculated by multiplying the number of SGCNs in the analysis by the total number of invasive species in the analysis. For this example, we have a subset of 107 SGCNs and 238 invasive species. So, we will need to complete 24,466 comparisons.

While this is a relatively simple process, it requires a great deal of effort to calculate manually. We have included a simple macro within the Excel file (Appendix C – Interaction Tables.xls) that will make the comparison much easier to complete. The following steps provided detailed instructions for successfully completing the formatting and calculations necessary to use the macro. While this may seem complicated and overly-detailed it is not really that complex.

Note: When opening the Appendix C – Interaction Tables spreadsheet you will be prompted to “enable macros” at the top of the screen. Macros must be enabled to access these functions.

As we did with other tables, please open the Appendix C – Interaction Tables.xls file and use “Save As...” to rename the file (in this case “PA Interaction Tables”). Before we can complete the comparisons, we have a bit of structural clean-up to do on this file. By setting up the spreadsheet for the total number of SGCNs and invasive species in the analysis ahead of time, we will be able to more easily calculate the summary

statistics needed to complete the ranking later. We will not include the details for deleting, cutting/pasting, etc. except where critical to success in these steps.

First, clear any existing information in the Appendix C file under the SGCNhabitat tab (the first tab on the left in the spreadsheet). Simply select the entire sheet and delete the contents (do NOT delete the sheet itself or change the name please). Then, copy the entire SGCN Habitat table (the subset we created) to this sheet. **Make sure to Paste the table so that the “Species” column header is positioned at B1.** This is important to ensure the correct cell addressing is retained and the macro functions properly.

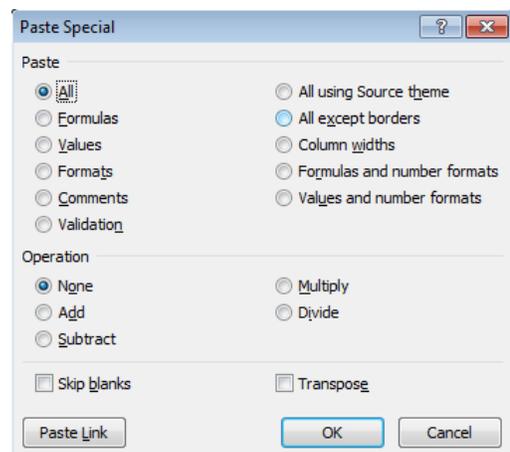
Next, we will need to update the invasive species habitat tables. If you have not made any modifications to this table (we have not in this example) then this step can be skipped. If modifications are necessary follow the same process used for the SGCN. Again, please be sure to Paste the new data in the correct position (in this case, the A1 cell).

The third tab in the Appendix C file is the sheet that contains the macro that will be run to complete the calculations. You may see an SGCN-invasive species pair on the sheet, and it is OK to just leave it. There are other cells with formulas on this sheet that should not be changed. It is best to not change anything on this sheet! We will return to it later.

Now, we need to reformat the output sheets for both Habitat Score (will contain the results of the pairwise habitat comparison) and the Habitat Ratio (will contain the results of the ratio). These tables must be formatted so that the number of rows is equal to the number of SGCN in the analysis, and the number of columns is equal to the number of invasive species. Both tables will be formatted the same and will be empty initially.

For this analysis, simply select all but the first row in the HabMatrix table and delete the contents. Then Copy/Paste the scientific name of SGCNs taken from the SGCN Habitat tab (the 107 species in PA). Repeat this process for the HabRatio tab. It is important to maintain the same order of SGCN species for these tables (match the order in the first table). We suggest using the scientific name values to ensure that each row is identifiable from others in the analysis. Further, we suggest sorting the table by scientific name (ascending) so that all of the tables can be easily matched.

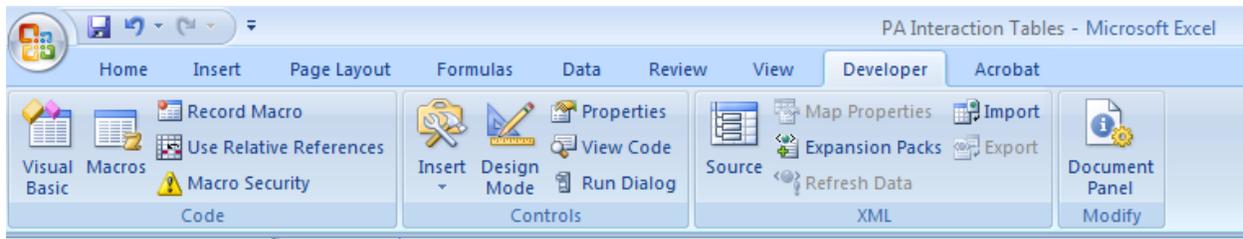
If invasive species were also modified, then the first row of names (also scientific names) would have to be similarly modified. This is accomplished in the same manner with the exception of using a “Paste Special...” function instead of simply “Paste”. The “Paste Special...” menu provides several useful options for pasting. One of those functions is the “Transpose” checkbox located in the lower right corner of the dialog box. When checked, the copied material will be transposed during the Paste. In this example, if we copy all the names of the invasive species in the appropriate column of the invasive species habitat table we can paste them in the top row of the HabMatrix table by selecting the first cell and selecting “Paste Special...” from the right-click menu. Then select the “Transpose” check box. The entire list of invasive



The Paste Special menu is useful when moving large blocks of data between sheets or databases.

species names will be pasted into the HabMatrix spreadsheet but will extend horizontally along the row instead of vertically in the column. Very easy! With the HabMatrix and HabRatio tables ready to receive data, we can update the macro and run the script to complete all the pair-wise comparisons.

Next, make the “Calculation” sheet the active sheet in the Appendix C file. This is the sheet that contains the macro we will run to complete the calculations. Before we do that, we need to hard code (i.e., modify) the number of SGCNs and invasive species in the analysis. The macro program is accessed by selecting “Developer” from the main menu bar at the top of the screen. Then, select the “Macros” icon on the left of the menu (see below).



After the “Macros” button is selected, a new menu will appear and a macro named “HabitatCalculation” will appear in the box (it should be the only macro visible). Highlight that entry, then select the “Edit” button found on the right side of the dialog box.

This will open the macro in a Visual Basic editor program. If you are unfamiliar with programming do not be intimidated. We are only going to locate and change a couple of values and it is an easy operation. Simply scroll down until you see:

$$\text{NumSGCN} = 667 + 1$$
$$\text{NumInvasives} = 238 + 1$$

These are the variables that hold the total number of SGCNs and/or invasive species in the analysis. All we need to do is change the number of SGCNs in the analysis for this example. So, change the line beginning with NumSGCN from 667 to 107. The line should now read:

$$\text{NumSGCN} = 107 + 1$$
$$\text{NumInvasives} = 238 + 1$$

That is all that we need to do. Just save the file (use the icon or the drop-down menu) and close the Visual Basic editor by clicking the “X” in the upper right of the window. You should be returned to the “Calculation” spreadsheet. Now we are ready to run the macro.

Once the macro is activated, the computer will automatically begin the process of completing all the pair-wise comparisons between the SGCNs and the invasive species in the analysis. The total time to complete this process will vary depending on the number of SGCNs and invasive species in the analysis, the speed of the processor in the computer, etc. **This analysis could take multiple hours to complete so**

users should take this into consideration before launching the macro. In many cases, you will want to **run this process during a period where the machine will not be needed for other things** (e.g., overnight).

To launch the macro, press the combination of the control key and the letter Q (“Ctrl +Q”). The screen will immediately start rapidly changing as the macro runs through each of the comparison operations. You can simply turn off the computer monitor and walk away. If you want to check on the process, you can turn the monitor back on and see if the rapid motions still appear. If so, the process is not complete. When finished, the cursor will be found at the last cell of the HabRatio sheet. The calculation process can be interrupted by opening the spreadsheet and hitting the escape key (Esc). The macro may continue to run for several seconds before it is interrupted. If the macro is activated again it will start the entire process over again, writing over any values previously entered into the output matrices. It is not necessary to clear the tables before restarting.

Please make sure to check the tables when finished. The values in each matrix should line up correctly and a spot check of one or more pairs should provide evidence that the calculations were completed accurately. **Be sure to save this file when it is complete!**

Once the macro is finished running the calculations for the HabMatrix and HabRatio, we can incorporate the Applicability Matrix values and calculate the Final Habitat Score and Final Habitat Ratio. The Applicability Matrix is calculated using rules provided in Appendix B. The Applicability Matrix included in Appendix C contains the entire suite of SGCN and invasive species values. Since, in our example, we only need to use the PA subset, and we need this matrix to match both the HabMatrix and HabRatio tables, we will need to modify it.

This subset can be created using the same process we used to reduce the original PA dataset. We will simply add a column and the right side of the table that we will use to identify only those species found in the subset. Use a vertical lookup and the reference list from the SGCN Habitat tab in Appendix C. Then sort the Applicability Matrix alphabetically by the check column and delete all the entries with a value of “#N/A”. Make sure that the Applicability Matrix is ordered identically to the HabMatrix and HabRatio tables. This will make the final calculations easier.

Calculating the Final Habitat Score and Final Habitat Ratio is a straightforward multiplication of the HabMatrix/HabRatio by the Applicability Matrix. These final values will be stored in the Final Habitat Score and Final Habitat Matrix tables, so they need to be structured the same as the HabMatrix/HabRatio tables. That is, they need to have the SGCNs as rows and the invasive species as columns.

Once formatted, be sure that the tables “align correctly”. Each cell corresponds to a specific SGCN-invasive species pair and should be found at the same address in each of the tables. The final values are calculated by multiplying the cell value in the HabMatrix table by the same cell in the Applicability Matrix. The cell formula should look something like this:

=HabMatrix!B2*Applicability!B2

This is copied for each row and column in the Final Habitat Matrix table. The same process is repeated for the Final Habitat Ratio calculation (only using the HabRatio and Applicability tables).

There is one more table in Appendix C spreadsheet named “Modified Habitat Score”. This is a calculation that is needed for one of the optional ranking criteria. Like the other two final scores, this table is structured with the SGCNs as rows and invasive species as columns. The values in this matrix are calculated by multiplying the values from the Final Habitat Matrix by the Final Habitat Ratio. We suggest completing this calculation as well since it may be used in the final ranking steps.

Step 6 - Select ranking criterion and perform necessary calculations

There are a number of options for determining which invasive species are the most “important” to terrestrial SGCNs in Pennsylvania. We started this example by stating that the objective of this ranking exercise was to identify the species that pose the greatest threat to these species of interest *based on the number of species impacted and the severity of that impact*.

In order to address those criteria we will need to calculate metrics that will provide information on those specific factors – namely the number of species impacted and the severity of those impacts.

Determining the number of SGCNs impacted is a relatively straightforward calculation. Since we have completed the Interaction calculations (Appendix C) we now can estimate the number of instances where invasive species actually impact SGCNs. Simply put, if we count the number of SGCNs that each invasive species impacts (i.e., the Final Habitat Score is greater than 0) then we can rank invasive species by that number.

Before proceeding, we suggest creating space to contain all this important information related to ranking invasive species in another spreadsheet. We have included such a spreadsheet in Appendix D – Scoring Tables.xls. We suggest opening this table and completing a “Save As” to store this information (in this example, save as “PA Scoring Table”).

This spreadsheet contains all of the invasive species included in the original project (and all those used in this example). We also included several information fields here that can be found in Appendix B including the total number of states where the invasive occurs, invasive characteristics, and impact scores (again, see the final report for a more detailed explanation of these values). There are also columns included to store values calculated as part of this analysis. These columns will be replaced with the new data we calculated specifically for this example.

Calculating Total Number and Proportion of SGCN Impacted

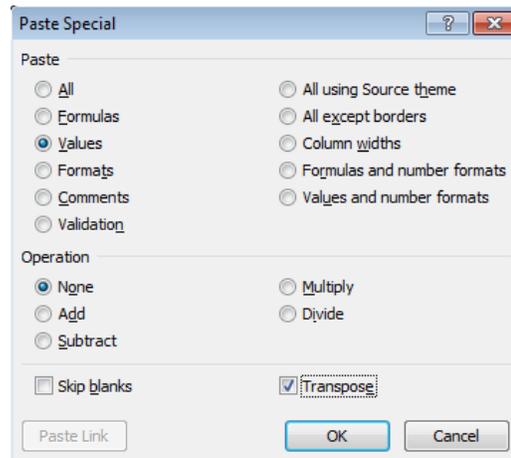
The total number of SGCNs impacted by each invasive species is easily calculated at the bottom of each column in the Final Habitat Score sheet (Appendix C). We can count all the instances where the habitat score is greater than 0 by using the COUNTIF function in Excel:

=COUNTIF(B2:B668, ">0")

This value is copied for each of the invasive species in the analysis (i.e., all the columns in the table). This row can then

The COUNTIF function is already loaded in the spreadsheet and is found in row 670. As long as this row is not overwritten the calculation should be done automatically when the matrix is populated. Make sure the range is correct.

be selected and copied to the “Total No. SGCN” column in Appendix D . Be sure to use “Paste Special...” and both the “Transpose” (since the data need to be put into a column instead of a row) and the “Values” radio button selected. If you do not use the “Values” radio button then you will paste the formulas from the Final Habitat Score spreadsheet instead of the values calculated there. When complete, there should be numbers ranging from 0 to maximum number of SGCNs impacted. This value can be transformed into a proportion by simply dividing be the total number of SGCNs in the analysis (in this case 107).



Note that both the "Values" radio button and "Transpose" check box are selected.

When these values are changed in the PA Scoring Tables spreadsheet, you will notice that the ranking (found in columns labled “Rank 1”) will also change. This field uses the RANK function in Excel to determine the order of the value among a list of values. This provides us the first ranking for our analysis.

Once the values have been correctly pasted into this file and the proportions are correctly calculated (make sure the denominator in the proportion column has been changed to the total number of SGCNs in the analysis) the ranking column will list the the invasive species with the highest proportion of SGCNs impacted as 1. In this case, there are multiple species (feral cat and feral dog) identified as impacting the most terrestrial SGCNs in PA (93.5% of the species potentially impacted). Based on the total number of SGCNs impacted, these are the most threatening invasive species.

However, this particular metric does not take into consideration the severity of the impacts that these species have on individual species, habitats, and/or systems. When an invasive species is found in several habitats, then (according to our assumptions for this analysis) they are likely to impact a larger number of SGCNs but those impacts may be relatively “minor” to the suite of SGCNs found in the same habitats.

We have included several data fields with information to assist in incorporating impact information into the ranking process. It is important to remember that no single metric tends to capture all of the criteria necessary to do complex analyses like these. For example, we also calculated a Modified Final Habitat Score (Appendix C) that takes into account whether each SGCN-invasive species pairing results in complete habitat overlap (i.e., the invasive is found in each of the SGCN general habitat classes leaving no escape habitats), or if one or more habitats could be considered as refuge from that invasive species.

We can easily include that information in our scoring table by summing the columns in the Modified Final Habitat Score table for each invasive species, then copying/pasting (use Paste Special) to the appropriate column in Appendix D. This column is ranked similarly to the other metrics and we see that the invasive species with the highest score (and number 1 ranking in the column named “Rank 3”) in this

case is, again, feral cats and dogs. This makes sense, since they are still impacting each terrestrial SGCN across multiple habitats.

Another metric we have included incorporates the proportion of SGCNs impacted and modifies it by each of the invasive characteristics columns (i.e., species, habitat, and system impacts) values. With this metric, we can incorporate how the invasive species tends to impact SGCNs included in this analysis. We assume that invasive species that impact SGCNs at multiple levels will be more detrimental and should receive a higher score. If we weight all 3 of the invasive factors equally, then the maximum value any invasive species could receive would be 3. Alternatively, we could weight these factors differently according to our perceived importance for each impact level.

For example, in this case we may simply state that the relative importance of system impacts is more important to us than either habitat or species impacts (clearly this could change especially if we are considering single SGCNs, but in this case we are trying to look across the entire suite). These species tend to alter system processes and functions so that even when/if they are eradicated the areas impacted cannot be returned to a previously natural state (e.g., soils receive increased N). Further, habitat impacts should be weighted higher than species impacts because those invasive species are affecting multiple SGCNs using a general habitat class (e.g., *Ailanthus* woodlands replace native arrangements and decrease habitat quality for a number of SGCNs). To capture these weighted importance values, all we need to do is assign a quantitative weight to reflect these characteristics then use that formula to determine where each invasive species ranks.

For this example, let's use the following weighting equation:

$$\text{Value} = 3 * (\% \text{ SGCN impacted} * IC_{\text{system}}) + 2 * (\% \text{ SGCN impacted} * IC_{\text{habitat}}) + (\% \text{ SGCN impacted} * IC_{\text{species}})$$

In this case, invasive species impacting at the systems level are weighted three times as much as those impacting at the species level, and 1.5 times as much as those impacting at the habitat level. Invasive species impacting more than one of these levels will result in much greater values and the total number of SGCNs impacted is included in each. If the value is to be scaled (from 0 to 1) then all we need to do is simply divide the total by 6 which is the theoretical maximum value.

This value can be ranked as the other metrics were. For our PA example, the invasive species with the highest value is garlic mustard (score = 4.112); an invasive species that impacts both habitat quality and system processes. It is important to note that while this process provides a way to place one invasive species in order of importance relative to others, it does not intend to quantify overall impact. One should not assume that garlic mustard (at a score of 4.112) is twice as detrimental as weeping lovegrass (at 2.15).

Step 7 – Complete the ranking process

Once the scoring metrics are calculated, the user should determine how each of these rankings will be used in a final scoring calculation (if desired). One advantage to using multiple metrics in scoring is that separate metrics that capture specific invasive traits can be taken together in a final value. Each metric

could be weighted similarly to the way we weighted the invasive characteristics above if the user chooses, or the final ranking could be made using only a single metric.

For this example, we will create a final ranking using the % SGCN metric (Rank 1; Appendix D) and the Invasive Characteristic score (Rank 4; Appendix D). Since the number of SGCNs is really included in both values, we will weight the invasive characteristics rank 3 times greater than the % SGCN score. The final ranking will be done by summing the ranks (with weights) then ranking the final score in Excel. The equation used is:

$$=(\text{Rank 1} + (3 * \text{Rank 4}))$$

The final value is summed and the *lowest* total is ranked as the number 1 invasive species threat. The list can then be sorted by this ranking to make interpretation easier. For this example, the top 20 invasive species threatening terrestrial SGCNs in PA are:

Scientific Name	Common Name
<i>Alliaria petiolata</i>	Garlic Mustard
<i>Celastrus orbiculata</i>	Oriental Bittersweet
<i>Centaurea biebersteinii</i>	Spotted Starthistle
<i>Lepidium latifolium</i>	Broadleaf Pepper-grass
<i>Pinus sylvestris</i>	Scotch Pine
<i>Bromus tectorum</i>	Cheatgrass
<i>Coronilla varia</i>	Common Crown-vetch
<i>Cynanchum louiseae</i>	Black Swallow-wort
<i>Cytisus scoparius</i>	Scotch Broom
<i>Frangula alnus</i>	Glossy False Buckthorn
<i>Hedera helix</i>	English Ivy
<i>Pueraria montana</i>	Kudzu
<i>Alnus glutinosa</i>	European Alder
<i>Imperata cylindrica</i>	Cogon Satin-tail
<i>Cynanchum rossicum</i>	European Swallow-wort
<i>Ligustrum vulgare</i>	European Privet
<i>Cirsium palustre</i>	Marsh Thistle
<i>Lespedeza bicolor</i>	Shrubby Bushclover
<i>Ailanthus altissima</i>	Tree-of-Heaven
<i>Arundo donax</i>	Giant Reed

There are other ways to rank and sort this information as well. We could use other values in the table to group and sort species or even rank invasives within those categories. For example, we could look at the subset of invasive birds to determine which pose the greater threat by simply ordering the birds (for the PA example the house finch is the highest ranked bird at 150). Or, we could use a value such as the Impact Score (Appendix B) in combination with the ranks to look at which invasive species are currently widespread (value of 3 or 4) versus those that are relatively localized (values 1 and 2).

Summary

There truly is no “correct answer” when creating a ranked list like we have done in this example. The most important points are to accurately apply the information supplied in a way that allows the user to have confidence in the results.

While the analysis outlined here may seem complicated, users who become familiar with the databases and the Excel functions can complete this analysis in approximately 1 hour of time (time to run the macro excluded). Analyses that involve changes to the structure and contents of the database may require a bit more time.