RANK CALCULATION UPDATE
June 24, 2020

This document describes updates to the Element Rank Calculation for species and ecosystems. We thank Dan Bachen for bringing the trend calculation issue to our attention and Leah Ramsay for bringing the inconsistency issue to our attention.

INTRODUCTION

NatureServe methodology for Conservation Status Assessments at global, national, and subnational levels was officially revised in 2012 (Master et al. 2012, Faber-Langendoen et al. 2012). Application of the methodology was facilitated by providing a rank calculator, which was designed to improve consistency, transparency, and repeatability of the ranking process (NatureServe 2012). Subsequently, the calculation method was incorporated into Biotics. The methodology is now widely used across the Network.

Recently, we have discovered an error and an inconsistency in the calculation method:
- The formula for incorporating short term trend into the overall rank has an error.
- The points assigned to the various ratings of each factor were being rounded differently in Biotics versus the Excel Rank Calculator.

Corrections to the two issues will be released on the evening of June 24, 2020 in Biotics and on the Excel Rank Calculator download site. The new Excel Rank Calculator is version 3.2, and the new Biotics calculation is version 2. These are reflected in new Rank Methodology Used choices in Biotics.

Here, we describe the corrections and provide guidance for users of previous versions that contained the issues.

SHORT-TERM TREND WEIGHTING ERROR

The Problem

In the rank calculation, ratings for Short-Term Trend and Long-Term Trend are combined with a weighted average and then used to adjust the points assigned after the Rarity and Threats points have been totaled. The adjustment is made through the "subtraction/addition" method shown in Table 1 below). Points for Short-Term Trend should be weighted 2x more than Long-Term trend, but **instead points for Short-Term Trend were being weighted 4x more.**

Example: The species has a long-term decline of 80-90% (code B = -0.40) and a short-term decline of 30-50% (code E = -0.14).

Correct calculation: Multiplying these assigned code values by the appropriate trend weights (1 and 2, respectively) and summing them provides a final trends score: (-0.4*1) + (-0.14*2) = -0.68.

Incorrect calculation: Assigning these values for Short and Long-term Trend in versions of the Calculator prior to 3.2 returns a score of -0.98 not -0.68. What's been happening is that the calculator was multiplying the base score by the weight twice (-0.40*1*1) + (-0.14*2*2) = -0.98.

Table 1. Factor and category weightings and calculation of overall conservation status score

Factor Category	Weight	Subcategory	Factor	Factor Weight	Process
Rarity	0.7	Range/ Distribution	Range Extent	1.0	Factor weight(s) and score(s) are used to calculate **rarity** category sub-score
			Area of Occupancy	2.0	
		Abundance/ Condition	Population Size	2.0	
			Number of Occurrences	1.0	
			Number of Occurrences *or* Percent Area with Good Viability/ Ecological Integrity	2.0	
			Conditional use: Environmental Specificity	1.0	
Threats	0.3		Threat Impact	1.0	Factor weight and score are used to calculate a **threats** category sub-score
			Conditional use: Intrinsic Vulnerability	1.0	
Weighted average of **rarity** and **threats** sub-scores is calculated as an initial status score					
Trends			Long-term Trend	1.0	Trend Subtraction/ Addition Method is used to calculate a **trends** category sub-score
			Short-term Trend	2.0	
Trends sub-score is applied to initial status score to calculate the final overall conservation status score					

The Effect of the Problem

How much does much short-term trend affect the final calculated rank? First, a reminder of how the calculation works:

- Total calculated points correspond directly with ranks, i.e. 0 through 1.5 is G1, 1.5 through 2.5 is G2, etc.
- The maximum difference between the incorrect and correct short-term trend weighted points is 1, so the maximum possible change in calculated rank is 1 (e.g. G3 to G2).
- Elements that are doing very well can have total points > 5.5, but the first step is to lower the points to 5.5. Therefore, the short-term trend doubling is unlikely to change a solid G5. Likewise, total points can be >0, but you can't have lower than a G1 rank.

In summary, the likelihood of the error changing the rank depends on the short-term trend rating, as shown in Table 2. Our assessment of the extent of change to current ranks is shown in Table 3.

Table 2. Summary of effect of the Short-Term Trend error on conservation status ranks

Rating	Points	Correctly weighted	Incorrectly weighted	Difference	Effect
A = Decline of >90%	-0.50	-1.00	-2.00	-1.00	certain to reduce rank (except maybe G5)
B = Decline of 80 - 90%	-0.40	-0.80	-1.61	-0.80	likely to reduce rank (e.g. G3 to G2)
C = Decline of 70 - 80%	-0.31	-0.62	-1.24	-0.62	likely to reduce rank
D = Decline of 50 - 70%	-0.22	-0.45	-0.90	-0.45	might reduce rank
E = Decline of 30 - 50%	-0.14	-0.29	-0.58	-0.29	might reduce rank
F = Decline of 10 - 30%	-0.07	-0.14	-0.28	-0.14	unlikely to change rank
G = Relatively Stable	0.00	0.00	0.00	0.00	won't change rank
H = Increase of 10 - 25%	0.07	0.14	0.28	0.14	unlikely to change rank
I = Increase of >25%	0.14	0.29	0.58	0.29	might increase rank (e.g. G3 to G4)

Table 3. Summary of the extent of calculated ranks in *Central Biotics* that change with the corrected calculation

	Global	National	Subnational	Total
count of calculated ranks	4,037	1,547	13,479	19,063
count of ranks *with short-term trend value*	1,626	219	2,185	4,030
count of ranks that changed	295	43	325	663
count of ranks that changed a full rank	53	18	94	165
% ranks *with s-t trend* that changed	18%	20%	15%	16%
% ranks *with s-t trend* that changed a full rank	3%	8%	4%	4%
% of calculated ranks that changed	7%	3%	2%	3%
% of calculated ranks that changed a full rank	1%	1%	1%	1%

ROUNDING INCONSISTENCY ISSUE

The points assigned to the various ratings of each factor were being rounded differently in Biotics versus the Excel Rank Calculator, occasionally resulting in a minor difference in Excel vs. Biotics results, e.g. S2? vs. S2S3.

In order to perform the rank calculation, each rank factor rating (A,B,C, etc.) is converted to a numeric point value on a 0 - 5.5 scale, where Z and A=0, the highest letter value=5.5, and all values in between are assigned evenly-spaced values. (This happens on a hidden tab.) For example, Population Size has value choices Z-H, so the value for G is 5.5/7*6=4.71428571.

	0	0	1	2	3	4	5	6	7
Population Size	Z	A	B	C	D	E	F	G	H
Points	0.00	0.00	0.79	1.57	2.36	3.14	3.93	4.71	5.50

Previously, the full calculated point value was used in the Excel rank calculation, but a rounded value (4.71) was used in the Biotics rank calculation. The discrepancy has been corrected by rounding the point values in Excel.

CHECKING AND UPDATING YOUR EXISTING DATA

Email biotics@natureserve.org if you need assistance.

If your data are in Excel

Summary of these steps: A data manager should perform the steps to move your data from your original calculator to the latest version and compare the calculated ranks. A ranker should then reassess those ranks that have changed and update assigned rank and associated fields. Going forward you'll use the new rank calculator version.

Note: A Transfer file is used to copy data from the old calculator version to the latest version, because keeping two Calculator files open at one time can cause problems in Excel. The Transfer file is also used for comparing calculated ranks.

Data manager steps

1. Copy from **Original calculator** to a **Transfer and Rank Comparison file**:
    a. Create a blank Excel file and save it. This is your **Transfer and Rank Comparison file.**
    b. In your Original calculator, **Calculator Table** tab, copy **columns A through AP**. Include the column headers (rows 2-4).
    c. In the blank Transfer file, Paste Special, as Values or Text.
    d. In your Transfer file, rename column A from "Calc Rank" to "OLD Calc Rank".
    e. In your Transfer file, delete any entirely blank rows. (These may exist because you cannot delete entire rows in the Calculator Table.)
    f. If you have **Threats Assessment** data, copy those onto a new tab of the Transfer and Rank Comparison file.
    g. Save your Transfer file.

2. Copy from your **Transfer and Rank Comparison file** to the **new Rank Calculator version**:
    a. Close your original Rank Calculator workbook and then open a copy of the new calculator version.
    b. In your Transfer file, copy only columns **B through AP** for the rows with data, *excluding* Calculated Rank in column A. **Do not include the header rows.**
    c. In the new rank calculator version, paste into **column B** of the first blank row, using Paste Special, as Values or Text.
    d. If you have **Threats Assessment** data, copy those from your Transfer file into the new calculator.
    e. Save your rank calculator with a new filename.

3. Copy new calculated ranks to your **Transfer and Rank Comparison file:**
    a. In your Transfer file, insert 2 columns between column A and B. Label them "NEW Calc Rank" and "Compare".
    b. In your new Rank Calculator file, copy the calculated rank data in column A.
    c. Paste Special, as Values or Text in the "NEW Calc Rank" column of your Transfer file. Make sure you've lined up the rows correctly.

4. Compare the calculated ranks:
    a. In your Transfer file Compare column, add the formula **=A3=B3**. Copy down to all the rows.
    b. If the value is FALSE, the calculated rank has changed.

Ranker steps

5. For any ranks that have changed, complete the rank review and assignment process, and update the assigned rank and associated fields.

If your data are in Biotics

Data manager steps

1. Recalculate the ranks in the new rank calculator because there is no way to do this in bulk in Biotics:

   a. Use the appropriate query on the "Export from Biotics5" tab of the Excel calculator to export data from Biotics. You may want to limit your query to rank assessments that have a short-term trend value, as the rounding issue is nearly negligible. You might also limit to those with a Stored Calculated Rank value or rank methodology. To do so, add the following to the WHERE statement of the ESR B5 export for Calculator Table query (or modify for EGR or ENR):

   ```
   and esr.D_SHORT_TERM_TREND_ID != 46     --exclude Unknown and null
   and esr.s_calculated_rank is not null  --only if calculated rank is stored
   and esr.d_rank_method_used_id in (1,6) --limit to Excel 3.1 or Biotics v1
   ```

   b. Paste the results into the new version of the rank calculator using the instructions on that tab.

2. Find calculated ranks that have changed:

   a. Use the following sql to export the Stored Calculated Rank from the ESR in Biotics (or modify for ENR or EGR), adding criteria to export the same records as in step 1a:

   ```
   select esr.s_calculated_rank old_calc_rank, es.s_rank assigned_rank,
          lower(dcl.classification_level_keyword) name_level,
          sn.scientific_name sname, es.element_subnational_id
   from element_subnational es, scientific_name sn, element_subnatl_rank esr,
        d_classification_level dcl
   where es.element_subnational_id = esr.element_subnational_id
     and es.sname_id = sn.scientific_name_id
     and sn.d_classification_level_id = dcl.d_classification_level_id
     and ....
   ```

   b. Paste the results into a new Excel file. Save the file.

   c. Follow steps 3-4 under If your data are in Excel above. The "Transfer file" is the file you saved in step b.

Ranker steps

3. For any ranks that have changed, open the record in Biotics, store the new calculated rank (which will also update Rank Methodology Used to "Biotics v2"), complete the rank review and assignment process, and update the assigned rank and associated fields.

REFERENCES

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