

Frequently Asked Questions: Southwest Association of Freshwater Invertebrate Taxonomists (SAFIT) New (2025) Standard Taxonomic Effort (STE) for Benthic Macroinvertebrates

What has changed?

The Southwest Association of Freshwater Invertebrate Taxonomists (SAFIT, <https://safit.org/>) has recently updated the Standard Taxonomic Effort (STE) that recommends what level of taxonomic resolution benthic macroinvertebrates should be identified to in support of bioassessment in California, e.g., caddisflies to species, mites to genus, etc. The previous version was established in 2011 (Richards and Rogers 2011). Since then, taxonomic revisions have resulted in many nomenclatural changes across major groups, including one-to-one name changes, splitting of one genus into several new genera, and changes to recommended levels of effort, e.g., certain taxa once identified to genus are now left at subfamily. The new STE (Post et al. 2025) can be found at <https://safit.org/downloads/>. The SWAMP Bioassessment Workgroup evaluated potential impacts of these changes on calculations of the California Stream Condition Index (CSCI; Mazor et al. 2016). Based on these evaluations the CSCI package was updated as described below.

Can I still calculate CSCI scores?

Yes, but you need to update the CSCI package to version 1.3.0 or higher. The updated package will recognize new names that have been added to the STE. In addition, and where applicable, the updated CSCI package will “crosswalk” data produced under the new STE to the previous (2011) version for which the CSCI was developed. In most cases, the crosswalk is straightforward, but in other cases, some assumptions had to be made. For example, taxa within the dipteran subfamily Ceratopogoninae were formerly identified to genus, with 10 genera nested therein (6 of which have been commonly reported in California benthic samples, with *Bezzia/Palpomyia* being by far the most common). The updated STE leaves Ceratopogoninae at subfamily, which was not a taxonomic endpoint used in CSCI calibration. As a result, any taxa identified to Ceratopogoninae would effectively be excluded from CSCI calculations, resulting in lower scores at many sites. To prevent the loss of such a common taxon in benthic data sets, identifications left at Ceratopogoninae will be crosswalked to the genus-level identification *Bezzia/Palpomyia* for the purpose of calculating CSCI (see below for more details).

How does the new STE affect CSCI scores?

In general, the effects are small, but can be larger in some samples, especially at sites where “E” (i.e., the expected number of taxa in the O/E portion of CSCI) is lower than 7 taxa. Low values of E are uncommon, but are more likely to occur in southern California than other parts of the state. In a data set of 2470 samples collected from 2008-2022, 87% of samples had score changes < 0.02 points when taxa names were updated to the new STE 2025 (Figure 1). In comparison, 96% of samples had scores that varied < 0.02 points when the CSCI was calculated twice using original STE 2011 taxonomic data. Increases and decreases in scores were unevenly balanced (1455 increases, 895 decreases, 120 no change) as were changes in scores > 0.02 (270 increases vs 55

decreases > 0.02). The largest positive change observed was +0.09; the largest negative change observed was -0.04.

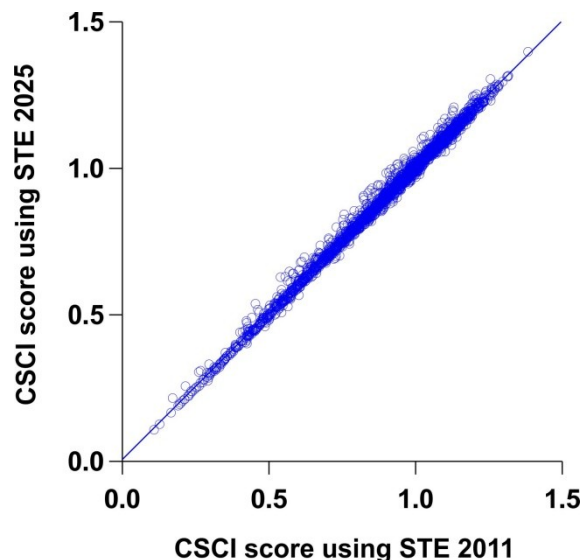


Figure 1. Scatterplot comparing CSCI scores calculated with the previous STE 2011 and the new STE 2025 at 2470 sites collected statewide from 2008-2022.

There are many subtle changes in the STE that can lead to smaller score changes in a sample, but the single biggest change that systematically affected scores was crosswalking Ceratopogoninae to *Bezzia/ Palpomyia*, whereby samples with any ceratopogonid genus present in the original taxa list based on STE 2011 (e.g., *Stilobezzia*, *Ceratopogon*) were treated as having *Bezzia/ Palpomyia* present, even if it was not. This effectively gave “credit” for a widely expected taxon being present in samples even when absent, which skewed score changes in a positive direction (Figure 2). However, dropping *Bezzia/ Palpomyia* from taxa lists by leaving identifications at subfamily led to an even larger negative decrease in scores at far more sites (Figure 3). Based on these two alternative outcomes, the SWAMP Bioassessment Workgroup preferred the former approach over the latter.

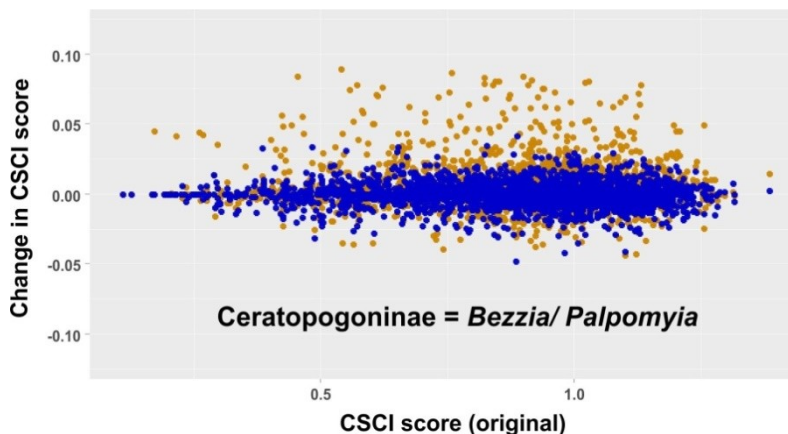


Figure 2. Change in CSCI score as a result of calculating scores twice for all samples using STE 2011 (blue dots) compared to the change in score derived from using STE 2011 vs STE 2025 with Ceratopogoninae crosswalked to *Bezzia/ Palpomyia* (orange dots).

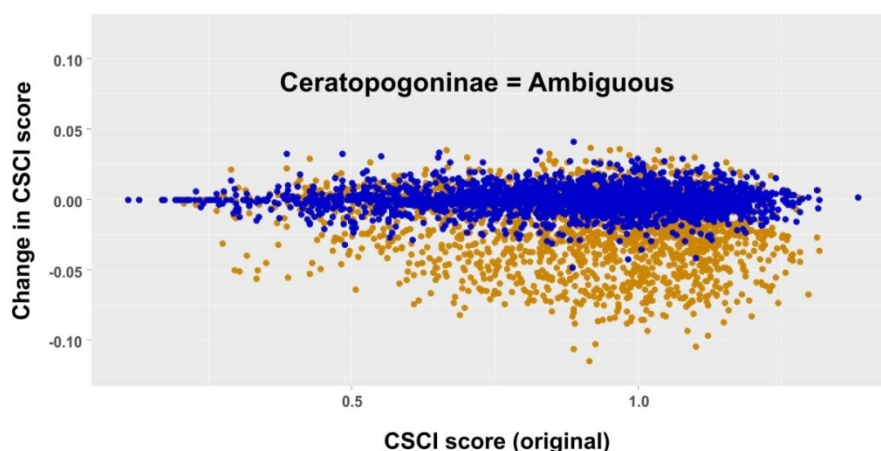


Figure 3. Change in CSCI score as a result of calculating scores twice for all samples using STE 2011 (blue dots) compared to the change in score derived from using STE 2011 vs STE 2025 with Ceratopogoninae treated as ambiguous (orange dots).

Should I recalculate old CSCI scores?

We do not recommend that old scores get recalculated. However, the updated CSCI package retains the ability to calculate CSCI scores using STE 2011, so results from both versions can be compared.

What if the new STE results in a change in score past a threshold?

Although uncommon, it is possible for the new STE 2025 to result in a score that has a different condition status than a score calculated with STE 2011 (e.g., a score might change from 0.78 to 0.80 or vice versa, where 0.79 is the threshold between degraded and undegraded biological condition). Out of 2470 samples, only 32 (1%) had score changes that resulted in a site shifting between degraded/undegraded condition categories. In such cases, it is recommended that additional samples be collected to confirm biological status at those sites, which is the same recommendation for sites that scored close to the 0.79 threshold using STE 2011.

TL/DR: What should I do?

Make sure your taxonomist is using the most up-to-date version of the STE (i.e., STE 2025; <https://safit.org/downloads/>). Update the CSCI package to version 1.3.0 or higher. Older versions do not recognize taxa names that are new to STE 2025. The following R code will install the latest CSCI package on your desktop:

```
install.packages("devtools") # Install devtools from CRAN
library(devtools) install_github("SCCWRP/BMIMetrics")
install_github("SCCWRP/CSCI")
```

Cited works

- Mazor, R. D., A. C. Rehn, P. R. Ode, M. Engeln, K. C. Schi , E. D. Stein, D. J. Gillett, D. B. Herbst, and C. P. Hawkins. 2016. Bioassessment in complex environments: Designing an index for consistent meaning in different settings. *Freshwater Science* 35:249–271.
- Post, D., A.C. Rehn and J. Sandberg. 2025. Standard Taxonomic Effort (STE) for the Identification of Aquatic Benthic Macroinvertebrates Used in Freshwater Bioassessment in California Southwest Association of Freshwater Invertebrate Taxonomists (SAFIT), Sacramento, CA. Available from: <https://safit.org/downloads/>
- Richards, A. B., and D. C. Rogers. 2011. List of Freshwater Macroinvertebrate Taxa from California and Adjacent States including Standard Taxonomic Effort Levels. Southwest Association of Freshwater Invertebrate Taxonomists (SAFIT), Sacramento, CA. (Available from: https://www.safit.org/Docs/STE_1_March_2011_7MB.pdf)