Changes to ETI Tool 3

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17 October 2018

This document outlines updates and changes that have been made to \textit{ETI Tool 3: Assessing Estuary Trophic State using a Bayesian Belief Network}. Please read the documentation below carefully to understand the implications that these changes may have on the calculated results of the tool. For further clarification, please email the ETI Team at eti-tools@niwa.co.nz.

**Version 1.1.2**

\textit{Release Date: 17 October 2018}


**Version 1.1.1**

\textit{Release Date: 12 June 2018}

- Corrected units in metadata table for \textit{Macroalgae} from \textit{OMBT EQR (dry wt/m2)} to \textit{OMBT EQR (dimensionless)}. This change may affect the calculated results if users were using the \textit{Macroalgae} node with the wrong units.

**Version 1.1.0**

\textit{Release Date: 3 November 2017}

- Added a new Situation Node (\textit{Percent Intertidal}) to the BBN. This change may affect the calculated results. This change was made to match changes in ETI Tool 1. Banding is provided for both macroalgae and phytoplankton eutrophication potentials in the BBN. However, the main effects of phytoplankton eutrophication are oxygen depletion and high light attenuation in deeper and often stratified estuarine systems, which typically do not occur in New Zealand SIDES when they are permanently open. Phytoplankton effects are more likely in SSRTREs, particularly those with longer flushing times. Using the Tool 1 database, we have found that the great majority of estuaries with intertidal areas less than 20\% are SSRTRES, while the great majority of SIDES have intertidal areas greater than 40\%. To prevent the phytoplankton primary indicator having effect when operating the BBN for estuaries with intertidal areas greater than 40\% (i.e., for SIDEs), the BBN selects the macroalgal primary indicator as the driver of the ETI primary node. For estuaries with intertidal areas less than 20\% the BBN selects the phytoplankton primary indicator as the driver of the ETI primary node. If the intertidal area is between 20\% and 40\%, the BBN considers both macroalgal and phytoplankton indicators, and the ETI primary node is determined by the greater of these two indicators. Although the percent intertidal setting affects whether the ETI primary node is driven by macroalgae or phytoplankton, it does not affect how the nutrient and flushing decision nodes affect the macroalgae and phytoplankton nodes. Therefore, if the estuary is a SIDE, but is known to have areas that have deep holes with high nutrients and low flushing, the user may wish to consider the results of phytoplankton primary indicator in decision-making. Conversely, if the estuary is an SSRTRE, but is known to have small but important intertidal areas, the user may wish to consider results of the macroalgae node.

- The phytoplankton half saturation coefficient and net growth rates were altered from 35 mg/m$^3$ and 0.43 day$^{-1}$ to 45mg/m$^3$ and 0.4 day$^{-1}$. These changes bring the coefficients in line with accepted values.
for NZ (see references below), slowing the rate of phytoplankton growth and reducing the potential susceptibility to phytoplankton.


• The TN thresholds for banding macroalgae have been recalculated based on updated dilution models for the estuaries. This has resulted in lower A/B and B/c thresholds and a higher C/D threshold as shown in the table below. This may change an estuary’s banding for macroalgae.

<table>
<thead>
<tr>
<th>ETI macroalgal susceptibility</th>
<th>New threshold (mg/m³)</th>
<th>Old threshold (mg/m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>TN ≤ 40</td>
<td>TN &lt; 56</td>
</tr>
<tr>
<td>B</td>
<td>40 &lt; TN ≤ 120</td>
<td>56 ≤ TN &lt; 178</td>
</tr>
<tr>
<td>C</td>
<td>120 &lt; TN ≤ 380</td>
<td>179 ≤ TN &lt; 350</td>
</tr>
<tr>
<td>D</td>
<td>TN &gt; 380</td>
<td>TN ≥ 351</td>
</tr>
</tbody>
</table>

• Updated text, figures and tables to reflect the changes to the BBN described above.

**Version 1.0.3**

*Release Date: 16 October 2017*

• Corrected error in metadata units for potential Total Nitrogen from mg/L to mg/m³.
• Added downloadable citation that can be loaded into referencing software.

**Version 1.0.2**

*Release Date: 3 August 2017*

• Added suggest citation. This change will not affect the calculated results.

**Version 1.0.1**

*Release Date: 20 June 2017*

• Added the ETI email address eti-tools@niwa.co.nz to the app. This change will not affect the calculated results.
• Added link to change log and updated version control number. This change will not affect the calculated results.

**Version 1.0.0**

*Release Date: 1 April 2017*

• Initial release of ETI Tool 2 on NIWA’s external shiny server.