Synthesis of Lake TMDL Approaches in EPA Regions 4 and 6

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Abbreviations

# Headings

## Second Level Heading

### Third Level Heading

First, second, and third level headings are defined by #, ##, and ### respectively.

# Introduction

States are required to identify water bodies that do not meet designated water uses under Section 303(d) of the Clean Water Act. Total Maximum Daily Loads (TMDLs) must be developed for pollutants causing the impairment. TMDLs designate an allowable daily allowable pollutant load that can be discharged to the waterbody and continue to meet criteria for designated uses.

# Methods

# Results

# Tables

## New names:  
## Rows: 116 Columns: 47  
## ── Column specification  
## ──────────────────────────────────────────────────────── Delimiter: "," chr  
## (39): organization\_identifier.x, organization\_name.x, organization\_type\_... dbl  
## (5): load\_allocation\_numeric, TMDL\_end\_point\_text, watershed\_area, volu... num  
## (1): surface\_area lgl (2): explicit\_margin\_of\_safety\_text, ...40  
## ℹ Use `spec()` to retrieve the full column specification for this data. ℹ  
## Specify the column types or set `show\_col\_types = FALSE` to quiet this message.  
## • `` -> `...40`

This is an example of an unformatted table and how we cross-reference that table ([Table](#tab:mtcars) ).

Table . this is the builtin mtcars data.

| mpg | cyl | disp | hp | drat | wt | qsec | vs | am | gear | carb |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 21.0 | 6 | 160.0 | 110 | 3.90 | 2.620 | 16.46 | 0 | 1 | 4 | 4 |
| 21.0 | 6 | 160.0 | 110 | 3.90 | 2.875 | 17.02 | 0 | 1 | 4 | 4 |
| 22.8 | 4 | 108.0 | 93 | 3.85 | 2.320 | 18.61 | 1 | 1 | 4 | 1 |
| 21.4 | 6 | 258.0 | 110 | 3.08 | 3.215 | 19.44 | 1 | 0 | 3 | 1 |
| 18.7 | 8 | 360.0 | 175 | 3.15 | 3.440 | 17.02 | 0 | 0 | 3 | 2 |
| 18.1 | 6 | 225.0 | 105 | 2.76 | 3.460 | 20.22 | 1 | 0 | 3 | 1 |
| 14.3 | 8 | 360.0 | 245 | 3.21 | 3.570 | 15.84 | 0 | 0 | 3 | 4 |
| 24.4 | 4 | 146.7 | 62 | 3.69 | 3.190 | 20.00 | 1 | 0 | 4 | 2 |
| 22.8 | 4 | 140.8 | 95 | 3.92 | 3.150 | 22.90 | 1 | 0 | 4 | 2 |
| 19.2 | 6 | 167.6 | 123 | 3.92 | 3.440 | 18.30 | 1 | 0 | 4 | 4 |

The [flextable](https://davidgohel.github.io/flextable/) package provides additional formatting flexibility when exporting to Word (Table ).

Table . flextable formatted table.

| mpg | cyl | disp | hp | drat | wt | qsec | vs | am | gear | carb |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 21.0 | 6 | 160.0 | 110 | 3.90 | 2.620 | 16.46 | 0 | 1 | 4 | 4 |
| 21.0 | 6 | 160.0 | 110 | 3.90 | 2.875 | 17.02 | 0 | 1 | 4 | 4 |
| 22.8 | 4 | 108.0 | 93 | 3.85 | 2.320 | 18.61 | 1 | 1 | 4 | 1 |
| 21.4 | 6 | 258.0 | 110 | 3.08 | 3.215 | 19.44 | 1 | 0 | 3 | 1 |
| 18.7 | 8 | 360.0 | 175 | 3.15 | 3.440 | 17.02 | 0 | 0 | 3 | 2 |
| 18.1 | 6 | 225.0 | 105 | 2.76 | 3.460 | 20.22 | 1 | 0 | 3 | 1 |
| 14.3 | 8 | 360.0 | 245 | 3.21 | 3.570 | 15.84 | 0 | 0 | 3 | 4 |
| 24.4 | 4 | 146.7 | 62 | 3.69 | 3.190 | 20.00 | 1 | 0 | 4 | 2 |
| 22.8 | 4 | 140.8 | 95 | 3.92 | 3.150 | 22.90 | 1 | 0 | 4 | 2 |
| 19.2 | 6 | 167.6 | 123 | 3.92 | 3.440 | 18.30 | 1 | 0 | 4 | 4 |

# Figures

We can embed and cross-reference plots (Figure ).

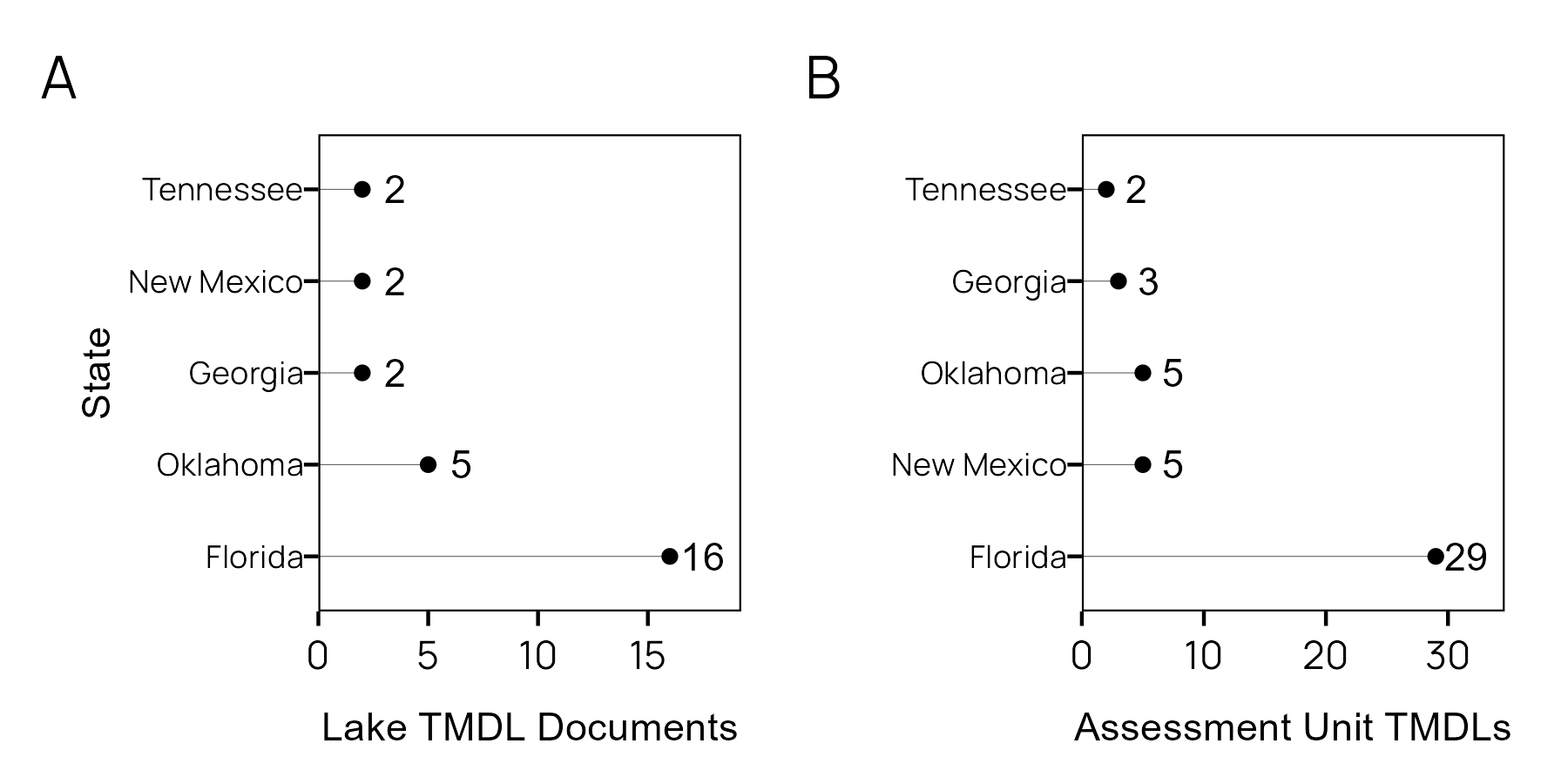


Figure . (A) Number of Lake TMDL documents per state in EPA regions 4 and 6 (January 2020 through December 2024; (B) Distinct lake assessment units covered by TMDLs per state in EPA regions 4 and 6 (January 2020 through December 2024.

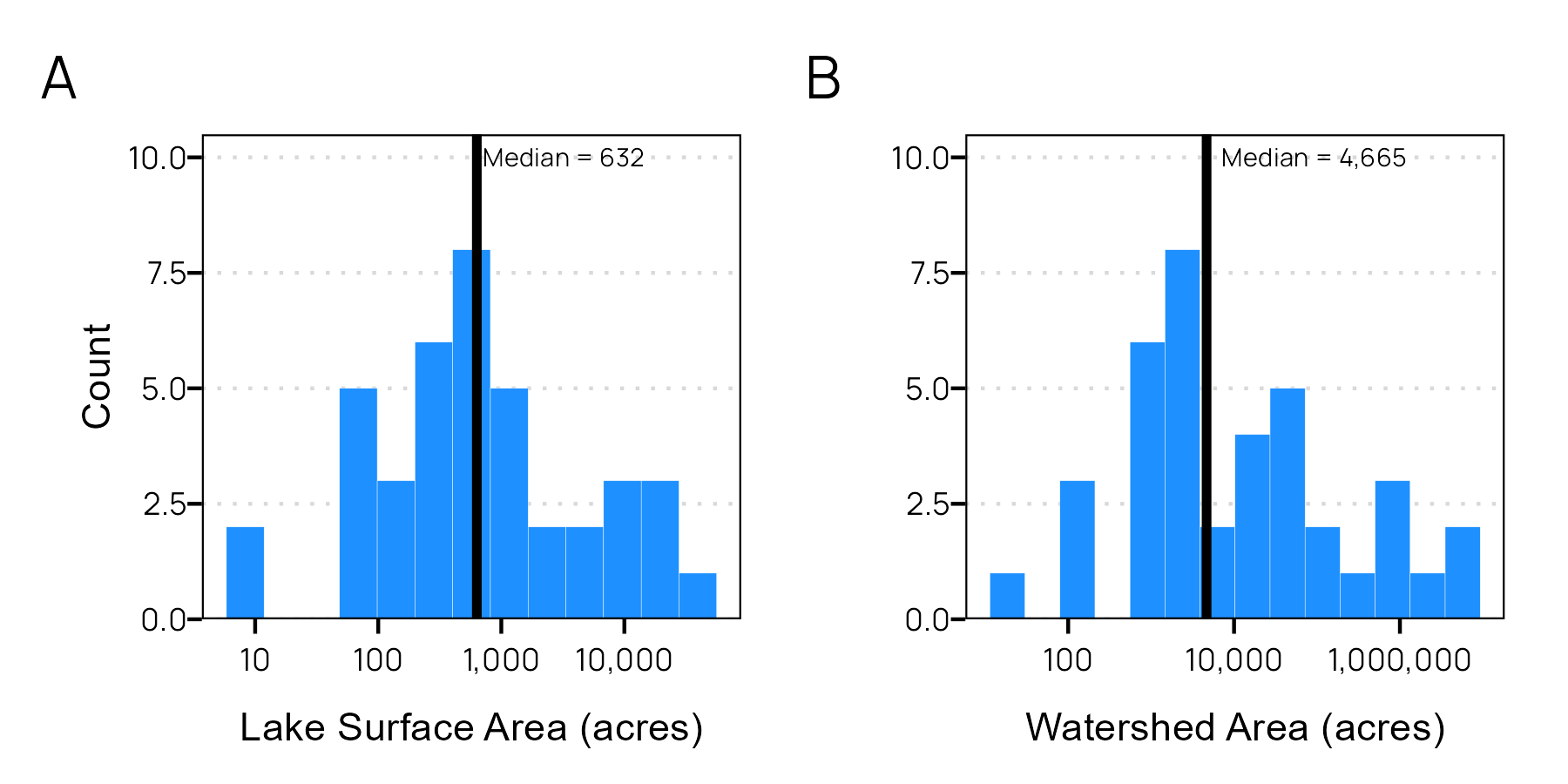


Figure . (A) Histogram of lake surface area (acres) and (B) histogram of lake watershed area (acres).

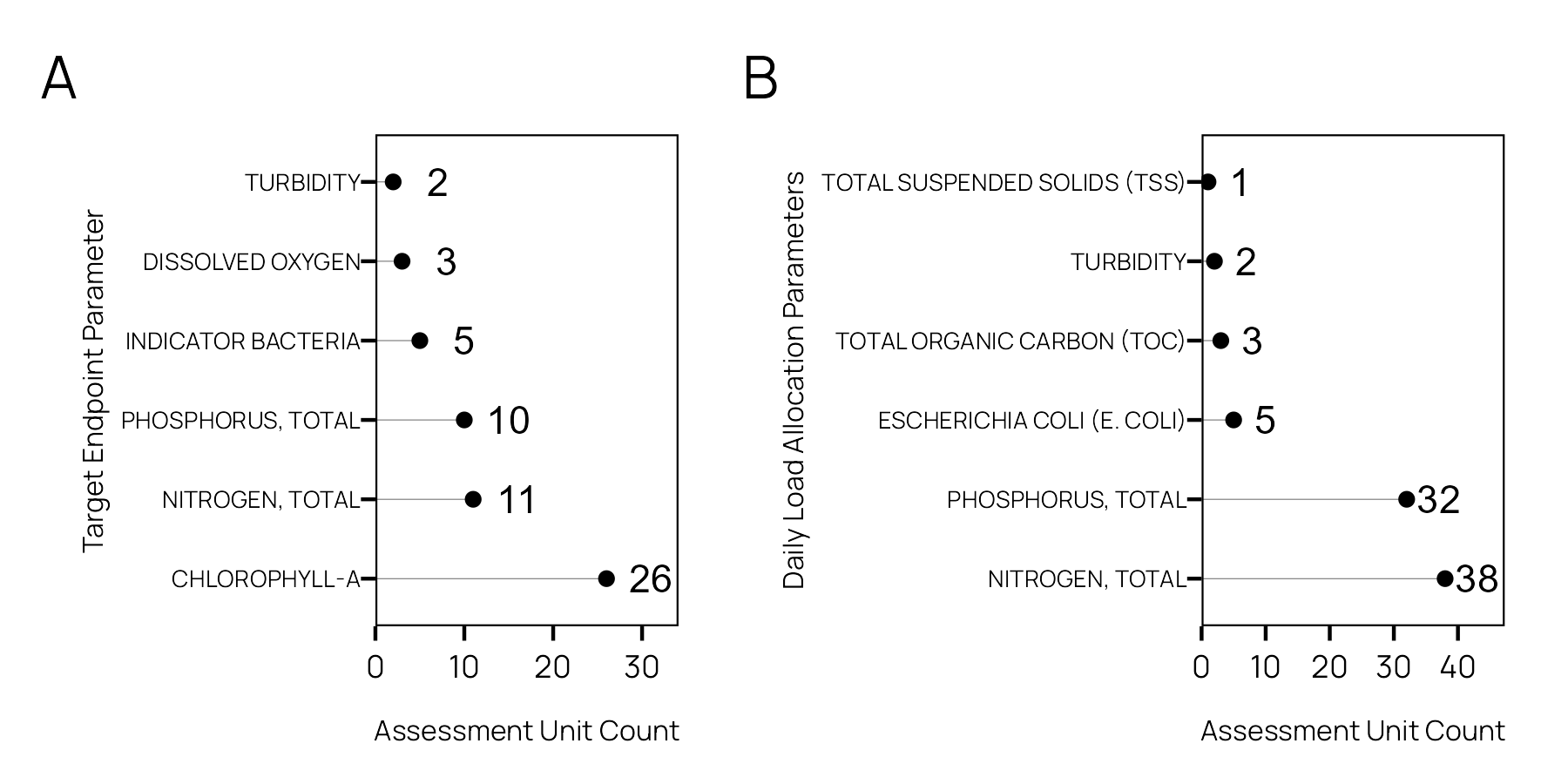


Figure . (A) TMDL Allocation parameter frequency and (B) target parameter frequency.

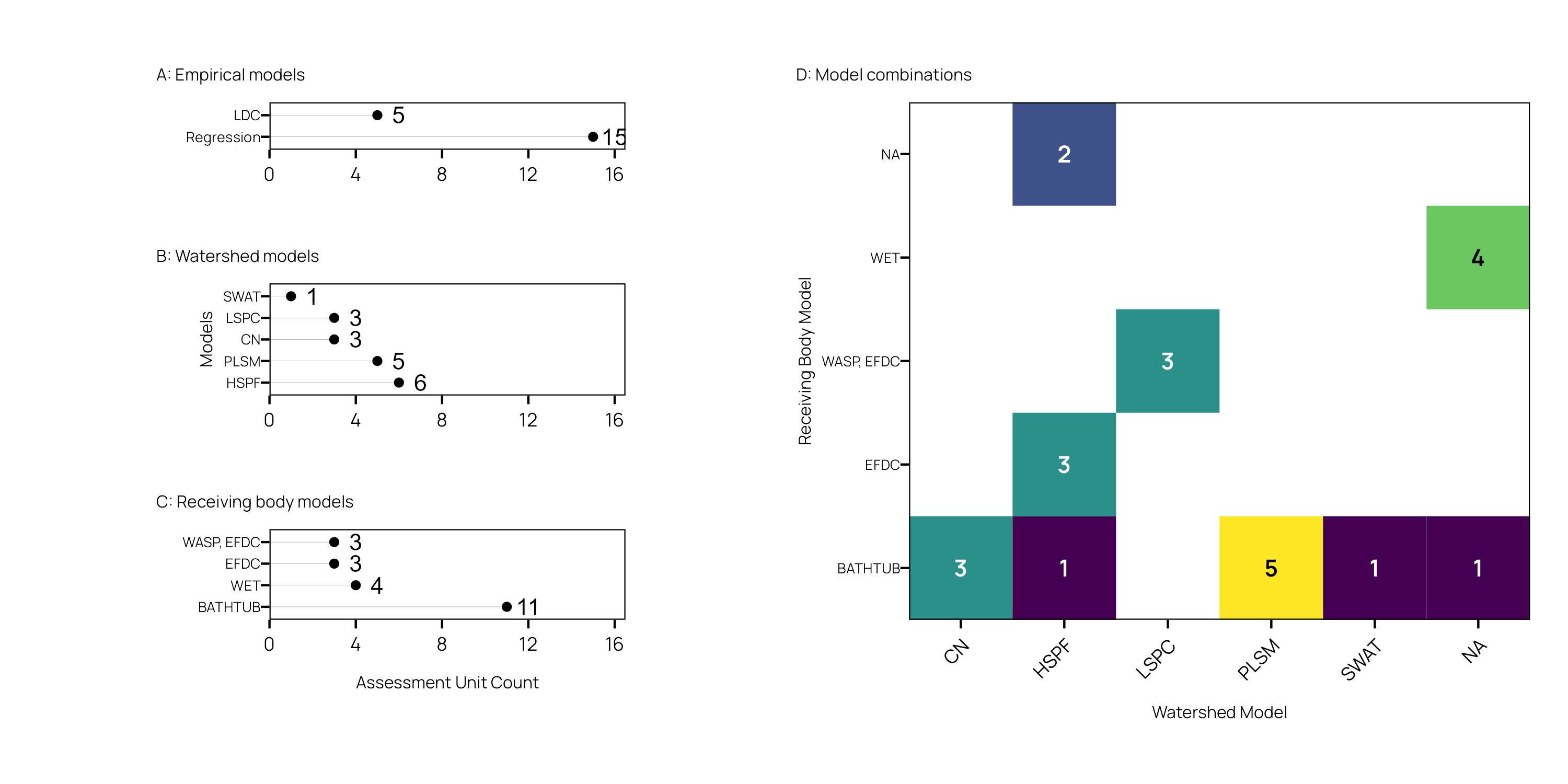


Figure . Models…

# Landscape Section

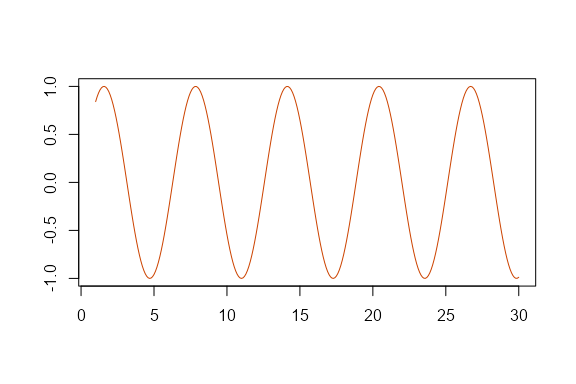


Figure . sin function

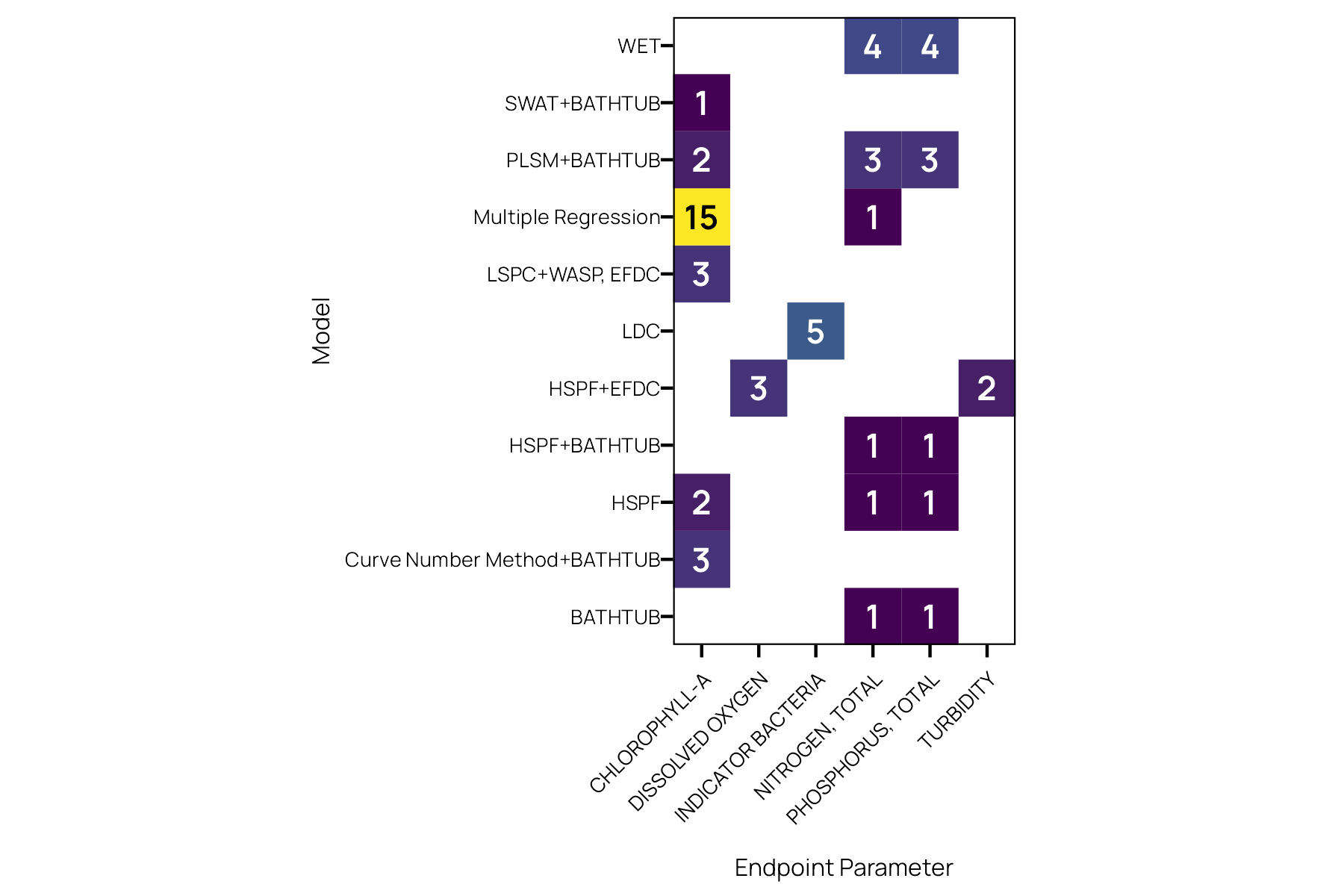


Figure . Models…

# Math

Wrap variables or math in a single $ to show math inline. For example, . Standalone equations are wrapped with $$.

If the equations need to be numbered and cross-referenced the format as:

\begin{equation}  
\left(\prod\_{i=1}^{n}y\_i\right)^{\frac{1}{n}} = \exp\left[\frac{1}{n}\sum\_{i=1}^n\log{y\_i}\right], \quad \textrm{when} \quad y\_1, y\_2, ..., y\_n > 0  
(\#eq:gmean)  
\end{equation}

Which renders as (Equation @ref(eq:gmean):

# References

In-text references and bibliography generation are handled automatically. It relies on creating a bibtex .bib file with your references. Software such as Zotero, Mendely, and even Google Scholar can generate the bibtex entries for you. The entries are stored in the bibliography.bib file inside the same directory as this .Rmd file. To make a in text citation, use the following syntax, [@helsel\_statistical\_2002] to generate the reference at the end of this sentence (Helsel and Hirsch 2002). Use a semicolon to include multiple references [@helsel\_statistical\_2002; @hirsch2010weighted] (Helsel and Hirsch 2002; Hirsch et al. 2010). Or we might use @helsel\_statistical\_2002 without brackets to indicate Helsel and Hirsch (2002) provide a fundamental overview of water quality statistics. The bibliography will populate automatically.

# Styling and fonts

This template uses Minion Pro for body fonts and Open Sans for headings following TWRI brand guidance and AgriLife brand guidance. I can’t bundle Minion Pro in this package because of licensing, but you can download and install both fonts from AgriLife (<https://agrilife.tamu.edu/wp-content/uploads/2021/03/AgriFonts.zip>). I recommend downloading and installing the fonts before knitting your documents. Note that Minion Pro won’t “embed” in Word documents because it is an OTF style font and currently Word only embeds TTF fonts. That means collaborators without the font installed on their system will see a different serif font on their system in Word. Once exported to pdf, both OTF and TTF fonts should be embedded correctly.

# Bibliography

Helsel D, Hirsch R. 2002. Statistical methods in water resources. U.S. Geological Survey (Techniques of water-resources investigations of the United States Geologic Survey). <http://water.usgs.gov/pubs/twri/twri4a3/>.

Hirsch RM, Moyer DL, Archfield SA. 2010. Weighted regressions on time, discharge, and season (WRTDS), with an application to Chesapeake Bay river inputs. JAWRA Journal of the American Water Resources Association. 46(5):857–880. doi:[10.1111/j.1752-1688.2010.00482.x](https://doi.org/10.1111/j.1752-1688.2010.00482.x).

# Appendix A

You can add more info, tables, and figures here.