**Supplementary Material**

**Effects of altered streamflow on macroinvertebrate taxonomic richness and composition in the Goulburn River, Australia**

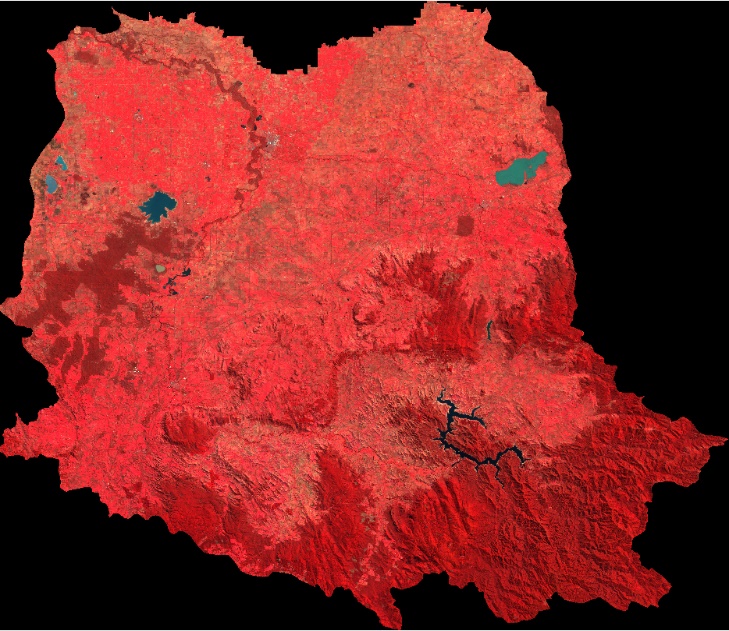
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S1. Satellite images used for river channel extraction.



FCC 2011

FCC 2001

Figure S1. False colour composite of Goulburn basin using Landsat 7 images

S2. Flow-based indices which represent the five most critical components of the flow regime, which regulate the ecological processes in river ecosystems

Table S1. Flow indices used.

|  |  |
| --- | --- |
| **Variable** | **Description** |
| QMEAN | Mean average discharge |
| Q50 | Median discharge |
| QCVANN | Coefficient of variation of discharges |
| QDFRANGE | Range of discharges |
| QMR | Mean annual runoff. QMEAN ÷ catchment area |
| QJAN | Mean January discharge |
| QFEB | Mean February discharge |
| QMAR | Mean March discharge |
| QAPR | Mean April discharge |
| QMAY | Mean May discharge |
| QJUN | Mean June discharge |
| QJUL | Mean July discharge |
| QAUG | Mean August discharge |
| QSEP | Mean September discharge |
| QOCT | Mean October discharge |
| QNOV | Mean November discharge |
| QDEC | Mean December discharge |
| Q1 | Discharge exceeded 1% of the time |
| Q5 | Discharge exceeded 5% of the time |
| Q10 | Discharge exceeded 10% of the time |
| Q20 | Discharge exceeded 20% of the time |
| Q25 | Discharge exceeded 25% of the time |
| Q75 | Discharge exceeded 75% of the time |
| Q80 | Discharge exceeded 80% of the time |
| Q90 | Discharge exceeded 90% of the time |
| Q95 | Discharge exceeded 95% of the time |
| Q99 | Discharge exceeded 99% of the time |
| Q10Q90 | Ratio of 10th and 90th discharge percentile. Q10 ÷ Q90 |
| Q20Q80 | Ratio of 20th and 80th discharge percentile. Q20 ÷ Q80 |
| Q25Q75 | Ratio of 25th and 75th discharge percentile. Q25 ÷ Q75 |
| Q1Q50 | Ratio of 1st and 50th discharge percentile. Q1 ÷ Q50 |
| Q5Q50 | Ratio of 5th and 50th discharge percentile. Q5 ÷ Q50 |
| Q10Q50 | Ratio of 10th and 50th discharge percentile. Q10 ÷ Q50 |
| Q20Q50 | Ratio of 20th and 50th discharge percentile. Q20 ÷ Q50 |
| Q25Q50 | Ratio of 25th and 50th discharge percentile. Q25 ÷ Q50 |
| Q75Q50 | Ratio of 75th and 50th discharge percentile. Q75 ÷ Q50 |
| Q80Q50 | Ratio of 80th and 50th discharge percentile. Q80 ÷ Q50 |
| Q90Q50 | Ratio of 90th and 50th discharge percentile. Q90 ÷ Q50 |
| Q95Q50 | Ratio of 95th and 50th discharge percentile. Q95 ÷ Q50 |
| Q99Q50 | Ratio of 99th and 50th discharge percentile. Q99 ÷ Q50 |
| QS100 | Range discharge variability. QDFRANGE ÷ Q50 |
| QS50 | Interquartile discharge variability. (Q75‐Q25) ÷ Q50 |
| QS80 | 90th and 10th percentiles discharge variability (Q90‐ Q10) ÷ Q50 |
| QSK1 | Discharge skewness one. QMEAN ÷ Q50 |
| QSK2 | Discharge skewness two. (QMEAN‐Q50) ÷ Q50 |
| QSMED | Specific median discharge. Q50 ÷ Catchment area |
| QSTDEV | Standard deviation of discharges |
| QMAX | Maximum discharge |
| QSMAX | Specific maximum discharge QMAX ÷ Catchment area |
| QAMAX | Annual maximum discharge. QMAX ÷ Q50 |
| QJANMAX | Maximum January discharge |
| QFEBMAX | Maximum February discharge |
| QMARMAX | Maximum March discharge |
| QAPRMAX | Maximum April discharge |
| QMAYMAX | Maximum May discharge |
| QJUNMAX | Maximum June discharge |
| QJULMAX | Maximum July discharge |
| QAUGMAX | Maximum August discharge |
| QSEPMAX | Maximum September discharge |
| QOCTMAX | Maximum October discharge |
| QNOVMAX | Maximum November discharge |
| QDECMAX | Maximum December discharge |
| QCVANNMAX | Coefficient of variation of monthly maximum discharge |
| QDFMEDMAX | Median maximum monthly discharge ÷ Q50 |
| HQ | High discharge volume. Mean maximum monthly discharge ÷ Q50 |
| QMAX90 | Maximum discharge for the previous 90 days |
| QMAX180 | Maximum discharge for the previous 180 days |
| QMAX270 | Maximum discharge for the previous 270 days |
| QMIN | Minimum discharge |
| QJANMIN | Minimum January discharge |
| QFEBMIN | Minimum February discharge |
| QMARMIN | Minimum March discharge |
| QAPRMIN | Minimum April discharge |
| QMAYMIN | Minimum May discharge |
| QJUNMIN | Minimum June discharge |
| QJULMIN | Minimum July discharge |
| QAUGMIN | Minimum August discharge |
| QSEPMIN | Minimum September discharge |
| QOCTMIN | Minimum October discharge |
| QNOVMIN | Minimum November discharge |
| QDECMIN | Minimum December discharge |
| QCVANNMIN | Coefficient of variation of monthly minimum discharge |
| QSMIN | Specific minimum discharge. QMIN ÷ catchment area |
|  |  |
| Frequency. |  |
| QFRE1 | Number of flow events greater than Q50 |
| QFRE3 | Number of flow events greater than 3 x Q50 |
| QHPC | High pulse count. Number of flow events greater than Q25 |
| QLPC | Low pulse count. Number of flow events less than Q75 |
|  |  |
| Duration |  |
| QDAYMAX35 | Average 35‐day (7 week) maximum discharge |
| QDAYMAX91 | Average 91‐day (13 week) maximum discharge |
| QDAY35MAX50 | QDAYMAX35 ÷ Q50 |
| QDAY91MAX50 | QDAYMAX91 ÷ Q50 |
| Q5MEAN | Monthly high flow duration index. Q5 ÷ QMEAN |
| QDAYMIN35 | Average 35‐day (7‐week) minimum discharge |
| QDAYMIN91 | Average 91‐day (13‐week) minimum discharge |
| QDAY35MIN50 | QDAYMIN35 ÷ Q50 |
| QDAY91MIN50 | QDAYMIN91 ÷ Q50 |
| Q95QMEAN | Monthly low flow duration index. Q95 ÷ QMEAN |
| QZEROWEEK | Number of weeks possessing zero flow |
| QZEROMON | Number of months possessing zero flow |
|  |  |
| Timing |  |
| QMAXJW | Julian week occurrence of the maximum discharge |
| QMEMAXJW | Mean average of the seven Julian weeks possessing the highest discharges |
| QSTDMAXJW | Standard deviation of the seven Julian weeks possessing the highest discharges |
| QCV7JWMAX | Coefficient of variation of the seven Julian weeks possessing the highest discharges |
| QMINJW | Julian week occurrence of the maximum discharge |
| QMEMINJW | Mean average of the seven Julian weeks possessing the lowest discharges |
| QSTDMINJW | Standard deviation of the seven Julian weeks possessing the lowest discharges |
| QCV7JWMIN | Coefficient of variation of the seven Julian weeks possessing the lowest discharges |

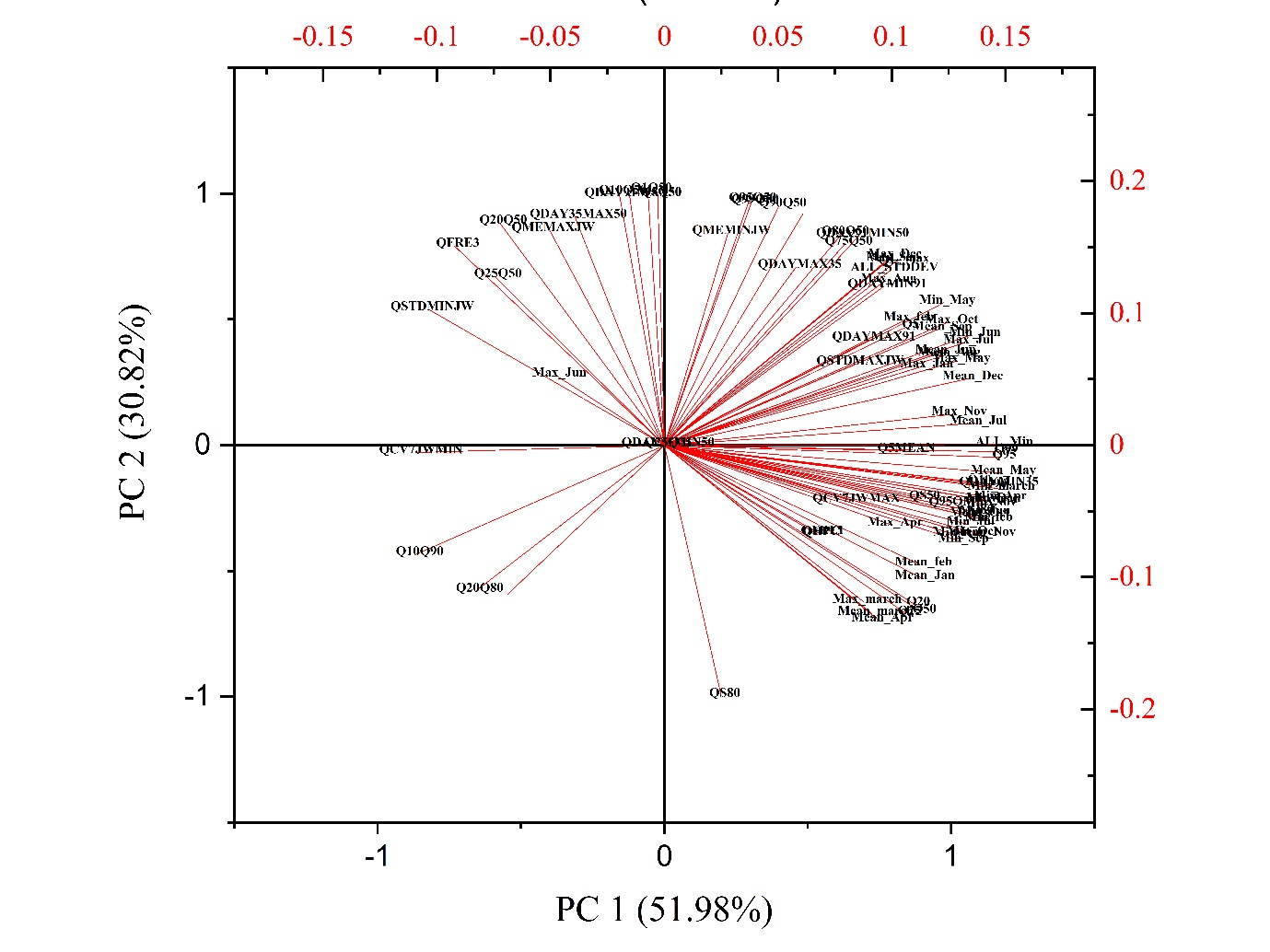


Figure S2 . PCA (axis 1 and 2) plot

S3. Partial dependency plots

These plots show the non-linear shape of the estimated relationship between the predictor variables and the response variable, when all other predictors are held at their average value

A collage of graphs and diagrams

Description automatically generated

Figure S3. Partial dependency plots for species richness

A group of black lines

Description automatically generated with medium confidence

Figure S4. Partial dependency plots for species abundance

A group of black and white graphs

Description automatically generated

Figure S5. Partial dependency plots for species diversity

A group of graphs showing the size of a number

Description automatically generated with medium confidence

Figure S6. Partial dependency plots for EPT index