Merced River Redd Site Selection (12 March 2019)

**General Goals**

The main goal is to perform a logistic regression investigating redd presence (redd=1) and absence (redd=0). Potential parameters include depth, velocity, Darcian velocity (DV), combined habitat suitability index (CSI), and water surface gradient (WSG), for each site. The GIT repository can be found here <https://github.com/RMBond/Merced_Redd_selection.git>

**Description of Datasets:**

The input file “mHabVarsSite.csv” was generated by L. Harrison on 14 February 2019. The script “Redd\_logisticregression.R” was created to run the logistic regression model generation and AIC ranking. Output csv files can be found under the “Data/LR\_Output” folder.

**Manuscript Additions**:

Methods

For each study reach, a candidate set of seven logistic regression models were developed to predict the probability of redd occurrence based on sedimentary, morphologic, and hydraulic variables (Benjankar *et al.* 2016). Models included: (1) depth, (2) velocity, (3) Darcian velocity (DV), (4) combined habitat suitability index (CSI), (5) water surface gradient (WSG), (6) CSI + DV and (7) a null (intercept only) model. DV and WSG are correlated so we chose to focus on DV in our analysis although we expect WSG to have similar results. Models were ranked using Akaike’s information criterion corrected for small sample size (AICc) using the methods of Burnham and Anderson (2002).

Results

A candidate set of seven logistic regression models were developed to predict the probability of redd occurrence for each site. The top model for both sites had CSI as the main parameter given the data (Table X .

Tables

Table X. Comparison of the seven candidate logistic regression models for the Merced River Ranch.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Model Number | Candidate Model | # Par | AICc | ∆ AICc | Weight | Cumulative Weight |
| **4** | **CSI** | **2** | **144.37** | **0** | **0.74** | **0.74** |
| 6 | CSI+DV | 3 | 146.44 | 2.07 | 0.27 | 1.00 |
| 1 | Depth | 2 | 156.51 | 12.15 | 0.00 | 1.00 |
| 2 | Velocity | 2 | 182.86 | 38.50 | 0.00 | 1.00 |
| 7 | Null | 1 | 198.88 | 54.52 | 0.00 | 1.00 |
| 3 | DV | 2 | 200.78 | 56.42 | 0.00 | 1.00 |
| 5 | WSG | 2 | 200.78 | 56.42 | 0.00 | 1.00 |

**Notes:** The model in bold typeface was chosen as the most parsimonious model which represented the data. # Par = number of parameters, AICc = Akaike’s information criterion adjusted for small sample sizes, ΔQAICc = difference in QAICc between the given model and the best-fit model, QAICc weight = indicates the relative support for a model based on QAICc. CSI = combined habitat suitability index, DV = Darcian velocity, WSG = water surface gradient.

Table Y. Comparison of the seven candidate logistic regression models for the Robinson Reach.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Model Number | Candidate Model | # Par | AICc | ∆ AICc | Weight | Cumulative Weight |
| **6** | **CSI+DV** | **3** | **118.27** | **0** | **0.98** | **0.98** |
| 2 | Velocity | 2 | 126.26 | 7.99 | 0.02 | 1.00 |
| 5 | WSG | 2 | 129.26 | 10.99 | 0.00 | 1.00 |
| 3 | DV | 2 | 129.62 | 11.35 | 0.00 | 1.00 |
| 1 | Depth | 2 | 146.33 | 28.06 | 0.00 | 1.00 |
| 4 | CSI | 2 | 152.01 | 33.74 | 0.00 | 1.00 |
| 7 | Null | 1 | 154.52 | 36.25 | 0.00 | 1.00 |

**Notes:** The model in bold typeface was chosen as the top model which represented the data. # Par = number of parameters, AICc = Akaike’s information criterion adjusted for small sample sizes, ΔQAICc = difference in QAICc between the given model and the best-fit model, QAICc weight = indicates the relative support for a model based on QAICc. CSI = combined habitat suitability index, DV = Darcian velocity, WSG = water surface gradient.

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Works Cited:

Burnham, K.P., and Anderson, D.R. 2002. Model selection and multimodel inference: a practical information-theoretic approach. Springer-Verlag, NewYork.