**Table S1**. Validation criteria for finals models that included the most important predictors of the probability of submerged aquatic vegetation (SAV) loss in the Bluefields Bay Special Fish Conservation Area (BBSFCA), Westmoreland, Jamaica, for 23, 2 – 4-year periods, generated using a 5-fold cross validation of spatial Bayesian Integrated Nested Laplace Approximation (INLA) generalized linear mixed models. The validation criteria used included: mean squared error (MSE), root mean squared error (RMSE), mean absolute error (MAE), mean absolute percentage error (MAPE), bias (a measure of consistent under- or over-forecasting; BIAS), relative bias (rBIAS), and relative mean separation (rMSEP). Also included are the calculated values for the receiver operating characteristic (ROC) curve (AUC), deviance information criterion (DIC), and marginal R-squared (mR2).

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Period** | **Predictors** | **AUC** | **DIC** | **mR2** | **MSE** | **RMSE** | **MAE** | **MAPE** | **BIAS** | **rBIAS** | **rMSEP** |
| 1984 - 1985 | aspect+ aspect2 | 0.817 | 517.6 | -2.1 | 31.42 | 5.60 | 5.54 | 557.26 | -5.54 | -1598.15 | 1.02 |
|  | bsm | 0.714 | 529.8 | -1.2 | 31.95 | 5.65 | 5.57 | 583.32 | -5.57 | -1602.25 | 1.04 |
|  | ***dist+ bsm*** | ***0.728*** | ***525.9*** | ***-0.6*** | ***31.17*** | ***5.58*** | ***5.49*** | ***571.58*** | ***-5.49*** | ***-1579.07*** | ***1.04*** |
| 1985 - 1986 | ***dir*** | ***0.944*** | ***500.3*** | ***13.0*** | ***69.06*** | ***8.30*** | ***8.07*** | ***328.81*** | ***-8.07*** | ***-1332.97*** | ***1.05*** |
|  | bsm | 0.956 | 548.2 | 6.1 | 101.52 | 10.07 | 9.27 | 344.93 | -9.27 | -1532.28 | 1.20 |
|  | bsm + slope | 0.954 | 543.9 | 7.8 | 101.72 | 10.08 | 9.27 | 339.69 | -9.27 | -1532.57 | 1.20 |
| 1986 - 1987 | ***dist + dir*** | ***0.845*** | ***2643.5*** | ***13.7*** | ***16.95*** | ***4.12*** | ***3.90*** | ***198.36*** | ***-3.87*** | ***-94.65*** | ***1.12*** |
|  | dist + bsm+ bsm2+ bsm3 | 0.868 | 2986.9 | 12.0 | 36.68 | 6.05 | 5.17 | 304.15 | -5.17 | -126.16 | 1.37 |
|  | dist+ dir + aspect | 0.851 | 2638.1 | 13.7 | 17.11 | 4.14 | 3.92 | 198.30 | -3.89 | -95.01 | 1.12 |
|  | dist+ aspect + slope | 0.849 | 3135.3 | 10.1 | 21.88 | 4.68 | 4.29 | 321.38 | -4.29 | -105.07 | 1.17 |
|  | dist+ aspect + bsm+ bsm2+ bsm3 | 0.874 | 2929.0 | 12.6 | 35.86 | 5.98 | 5.12 | 289.81 | -5.12 | -124.82 | 1.37 |
| 1987 - 1988 | dist | 0.712 | 127.3 | -0.2 | 45.68 | 7.35 | 7.35 | 590.37 | -7.35 | -8489.57 | 1.03 |
|  | dir | 0.764 | 132.5 | -0.2 | 48.83 | 7.56 | 7.48 | 610.01 | -7.48 | -8692.97 | 1.06 |
|  | ***aspect*** | ***0.725*** | ***134.1*** | ***-0.1*** | ***41.08*** | ***6.96*** | ***7.01*** | ***644.02*** | ***-7.01*** | ***-8176.68*** | ***1.01*** |
|  | bsm | 0.817 | 122.6 | -0.3 | 54.78 | 8.07 | 7.96 | 582.33 | -7.96 | -9230.55 | 1.05 |
|  | dist + bsm | 0.866 | 109.4 | -1.1 | 84.37 | 9.86 | 9.68 | 525.11 | -9.68 | -11219.13 | 1.09 |
| 1988 - 1990 | dist + dist2 | 0.877 | 893.1 | 6.5 | 39.43 | 6.28 | 6.04 | 406.04 | -6.04 | -715.33 | 1.08 |
|  | ***dist + dist2 + aspect+ aspect2*** | ***0.879*** | ***889.7*** | ***6.3*** | ***39.47*** | ***6.28*** | ***6.04*** | ***402.69*** | ***-6.04*** | ***-714.91*** | ***1.08*** |
|  | dist + dist2 + bsm | 0.898 | 825.2 | 11.5 | 50.66 | 7.11 | 6.76 | 377.87 | -6.76 | -800.35 | 1.12 |
|  | Aspect + aspect2 + bsm | 0.889 | 888.4 | 5.9 | 46.02 | 6.78 | 6.39 | 401.55 | -6.39 | -758.92 | 1.14 |
|  | dist + dist2 + dir + bsm | 0.901 | 819.1 | 9.3 | 48.71 | 6.98 | 6.63 | 361.86 | -6.63 | -785.33 | 1.11 |
| 1990- 1993 | ***dir + bsm + bsm2+ bsm3*** | 0.760 | ***3426.4*** | ***14.2*** | ***14.05*** | ***3.75*** | ***3.64*** | ***339.69*** | ***-3.64*** | ***-90.73*** | ***1.06*** |
|  | dist + dist2+ dir + bsm + bsm2+ bsm3 | 0.805 | 3355.9 | 14.3 | 15.57 | 3.95 | 3.79 | 328.55 | -3.79 | -94.59 | 1.08 |
|  | dir + aspect + bsm + bsm2+ bsm3 | 0.804 | 3346.3 | 14.0 | 14.77 | 3.84 | 3.71 | 333.64 | -3.71 | -92.66 | 1.06 |
|  | dir + slope + slope2 + bsm + bsm2+ bsm3 | 0.821 | 3285.7 | 14.0 | 15.37 | 3.92 | 3.78 | 323.89 | -3.78 | -94.30 | 1.07 |
|  | dist + dist2+ dir + aspect + bsm + bsm2+ bsm3 | 0.832 | 3272.2 | 14.2 | 16.50 | 4.06 | 3.89 | 322.23 | -3.89 | -96.94 | 1.09 |
|  | dist + dist2+ dir + slope + slope2 + bsm + bsm2+ bsm3 | 0.839 | 3244.5 | 14.4 | 16.71 | 4.09 | 3.91 | 317.46 | -3.91 | -97.60 | 1.09 |
|  | dir + aspect + slope + slope2 + bsm + bsm2+ bsm3 | 0.844 | 3213.9 | 14.2 | 16.04 | 4.01 | 3.85 | 318.13 | -3.85 | -96.03 | 1.08 |
|  | dist + dist2+ dir + aspect + slope + slope2 + bsm + bsm2+ bsm3 | 0.856 | 3170.7 | 14.7 | 17.55 | 4.19 | 3.99 | 311.65 | -3.99 | -99.65 | 1.10 |
| 1993- 1994 | dir | 0.980 | 532.9 | -36.9 | 547.31 | 22.59 | 21.55 | 149.50 | -21.43 | -1925.46 | 1.11 |
|  | ***bsm + bsm2+ bsm3*** | ***0.947*** | ***922.3*** | ***9.8*** | ***135.69*** | ***11.49*** | ***10.43*** | ***324.67*** | ***-10.43*** | ***-907.19*** | ***1.23*** |
|  | dir + bsm + bsm2+ bsm3 | 0.987 | 563.5 | 38.6 | 254.53 | 15.88 | 15.01 | 174.60 | -15.01 | -1362.07 | 1.13 |
|  | dist + dir + bsm + bsm2+ bsm3 | 0.987 | 561.3 | 35.5 | 196.68 | 14.02 | 13.24 | 108.99 | -13.24 | -1095.90 | 1.14 |
|  | dist + aspect+ aspect2 + bsm + bsm2+ bsm3 | 0.945 | 856.2 | 12.0 | 142.57 | 11.94 | 10.82 | 271.46 | -10.82 | -895.76 | 1.23 |
| 1994 - 1995 | dist | 0.975 | 396.7 | 5.8 | 453.76 | 21.28 | 18.21 | 341.71 | -18.21 | -3540.77 | 1.34 |
|  | ***dir+ dir2*** | ***0.907*** | ***511.6*** | ***2.1*** | ***35.73*** | ***5.97*** | ***5.90*** | ***417.45*** | ***-5.90*** | ***-1270.88*** | ***1.02*** |
|  | dir+ dir2+ aspect+ aspect2 | 0.922 | 490.4 | 4.7 | 41.65 | 6.45 | 6.33 | 425.66 | -6.33 | -1361.70 | 1.04 |
| 1995 - 1996  | dist | 0.680 | 1353.9 | 0.2 | 18.59 | 4.31 | 4.28 | 505.79 | -4.28 | -399.54 | 1.01 |
|  | dir | 0.724 | 1195.6 | 3.0 | 22.83 | 4.78 | 4.70 | 441.00 | -4.70 | -443.05 | 1.03 |
|  | ***aspect+ aspect2+ aspect3+ aspect4*** | ***0.673*** | ***1331.6*** | ***-1.3*** | ***18.42*** | ***4.28*** | ***4.23*** | ***484.96*** | ***-4.23*** | ***-397.36*** | ***1.02*** |
|  | dist + aspect + aspect2 + aspect3 + aspect4 + slope | 0.680 | 1333.8 | -0.9 | 18.72 | 4.32 | 4.26 | 483.93 | -4.26 | -430.92 | 1.03 |
|  | dir + aspect + aspect2 + aspect3 + aspect4  | 0.751 | 1192.6 | 2.3 | 22.58 | 4.75 | 4.66 | 428.18 | -4.66 | -439.21 | 1.03 |
| 1996 - 1997 | dist | 0.886 | 239.3 | -1.1 | 86.7 | 9.3 | 8.7 | 573.6 | -8.7 | -5281.8 | 1.1 |
|  | dir | 0.990 | 149.1 | -6.0 | 260.64 | 16.13 | 15.64 | 325.79 | -15.64 | -8601.72 | 1.06 |
|  | ***aspect*** | ***0.637*** | ***281.9*** | ***-0.2*** | ***35.44*** | ***5.95*** | ***5.94*** | ***679.23*** | ***-5.94*** | ***-3721.99*** | ***1.00*** |
|  | dist + slope | 0.915 | 237.8 | -0.4 | 102.42 | 10.11 | 9.34 | 558.21 | -9.34 | -5832.06 | 1.16 |
|  | aspect + slope | 0.738 | 239.3 | -1.1 | 86.7 | 9.3 | 8.7 | 573.6 | -8.7 | -5281.8 | 1.1 |
| 1997 – 1999  | ***dir*** | ***0.713*** | ***907.5*** | ***3.6*** | ***27.59*** | ***5.25*** | ***5.18*** | ***488.98*** | ***-5.18*** | ***-731.55*** | ***1.03*** |
|  | dist + dir | 0.743 | 895.0 | 3.0 | 29.42 | 5.42 | 5.29 | 474.80 | -5.29 | -738.02 | 1.04 |
|  | dist + bsm  | 0.880 | 839.0 | 2.7 | 41.85 | 6.47 | 6.14 | 424.68 | -6.14 | -858.44 | 1.12 |
|  | dist + aspect + bsm | 0.883 | 831.8 | 1.0 | 40.50 | 6.36 | 6.03 | 406.05 | -6.03 | -841.72 | 1.12 |
|  | aspect + bsm + slope | 0.878 | 846.4 | 1.0 | 40.13 | 6.33 | 6.00 | 408.66 | -6.00 | -839.98 | 1.13 |
| 1999 - 2000 | dist | 0.856 | 1650.9 | 4.9 | 35.63 | 5.96 | 5.50 | 395.56 | -5.50 | -316.53 | 1.16 |
|  | dir | 0.842 | 1405.0 | 12.8 | 27.25 | 5.22 | 5.07 | 323.70 | -5.07 | -292.04 | 1.05 |
|  | ***bsm + bsm2*** | ***0.832*** | ***1641.4*** | ***6.8*** | ***25.04*** | ***5.00*** | ***4.82*** | ***392.83*** | ***-4.82*** | ***-277.13*** | ***1.09*** |
|  | dist + dir | 0.887 | 1387.6 | 13.4 | 31.91 | 5.65 | 5.45 | 329.09 | -5.45 | -313.34 | 1.07 |
|  | dist + aspect | 0.862 | 1638.3 | 4.7 | 34.99 | 5.91 | 5.46 | 386.83 | -5.46 | -313.74 | 1.16 |
| 2000 - 2002 | dist+ dist2 + dist3 *+* dist4 *+*dir | 0.9190 | 1312.6 | 8.9 | 70.37 | 8.39 | 7.74 | 356.47 | -7.74 | -440.45 | 1.18 |
|  | dist+ dist2 + dist3 *+* dist4 *+* aspect | 0.8843 | 1442.2 | 6.5 | 51.04 | 7.14 | 6.54 | 390.41 | -6.54 | -372.90 | 1.20 |
|  | dist+ dist2 + dist3 *+* dist4 *+* bsm + bsm2 + bsm3 | 0.9315 | 1233.0 | 13.1 | 60.73 | 7.79 | 7.20 | 320.41 | -7.20 | -410.38 | 1.19 |
|  | dist+ dist2 + dist3 *+* dist4 *+* aspect + bsm + bsm2 + bsm3 | 0.9345 | 1221.2 | 13.6 | 60.78 | 7.80 | 7.21 | 319.77 | -7.21 | -411.30 | 1.18 |
|  | ***aspect + bsm + bsm2 + bsm3*** | ***0.7614*** | ***1677.3*** | ***2.8*** | ***22.92*** | ***4.79*** | ***4.66*** | ***455.95*** | ***-4.66*** | ***-265.14*** | ***1.06*** |
| 2002 - 2006 | ***dir + dir2 + dir3 + aspect + aspect2 + aspect3*** | ***0.708*** | ***5685.3*** | ***15.8*** | ***7.737*** | ***2.781*** | ***2.656*** | ***261.240*** | ***-2.655*** | ***-28.643*** | ***1.091*** |
|  | dist + dir + dir2 + dir3 + aspect + aspect2 + aspect3 | 0.760 | 5556.9 | 16.8 | 8.178 | 2.859 | 2.706 | 249.316 | -2.699 | -29.110 | 1.134 |
|  | dist + dir + dir2 + dir3 +bsm + bsm2 | 0.775 | 5530.9 | 15.4 | 8.184 | 2.858 | 2.687 | 240.470 | -2.680 | -29.110 | 1.191 |
|  | dir + dir2 + dir3 + aspect + aspect2 + aspect3 +bsm + bsm2 | 0.731 | 5600.6 | 16.7 | 8.163 | 2.857 | 2.720 | 257.870 | -2.717 | -29.276 | 1.125 |
|  | dist + dir + dir2 + dir3 + aspect + aspect2 + aspect3+ slope + slope2 + slope3 + slope4 | 0.794 | 5382.8 | 15.4 | 7.963 | 2.822 | 2.616 | 208.265 | -2.581 | -26.916 | 1.219 |
| 2006 - 2008 | ***dist*** | ***0.817*** | ***3837.8*** | ***9.1*** | ***16.28*** | ***4.03*** | ***3.72*** | ***317.68*** | ***-3.72*** | ***-70.35*** | ***1.15*** |
|  | dist+ dist2 + dist3 *+* dist4 *+* bsm + bsm2 | 0.867 | 3132.9 | 13.2 | 65.93 | 8.12 | 6.24 | 193.45 | -6.24 | -119.04 | 1.70 |
|  | dir + bsm + bsm2 | 0.839 | 3640.7 | 8.5 | 50.17 | 7.08 | 5.44 | 283.38 | -5.44 | -102.94 | 1.72 |
|  | dist+ dist2 + dist3 *+* dist4 *+* dir + bsm + bsm2 | 0.876 | 3106.5 | 16.7 | 65.17 | 8.07 | 6.29 | 211.45 | -6.29 | -115.90 | 1.65 |
|  | dist+ dist2 + dist3 *+* dist4 *+* bsm + bsm2 + Dean | 0.846 | 4499.5 | -391.4 | 0.05 | 0.23 | 0.07 | 98.06 | -0.06 | -1.06 | 0.96 |
| 2008 - 2010 | ***dir + dir2*** | ***0.846*** | ***2050.8*** | ***19.2*** | ***19.21*** | ***4.38*** | ***4.30*** | ***334.31*** | ***-4.30*** | ***-166.52*** | ***1.04*** |
|  | dist + dir + dir2 | 0.867 | 1978.9 | 19.2 | 24.46 | 4.95 | 4.74 | 321.83 | -4.74 | -183.64 | 1.08 |
|  | dir + dir2 + bsm + bsm2 | 0.874 | 1913.3 | 18.5 | 21.18 | 4.60 | 4.47 | 291.21 | -4.46 | -172.81 | 1.07 |
|  | dist + dir + dir2 + bsm + bsm2 | 0.874 | 1892.9 | 19.7 | 23.19 | 4.82 | 4.65 | 296.32 | -4.65 | -180.17 | 1.07 |
|  | dist + dir + dir2 + Ivan | 0.864 | 1986.4 | 18.9 | 23.62 | 4.86 | 4.63 | 298.37 | -4.63 | -181.65 | 1.03 |
|  | dir + dir2 + bsm + bsm2 + Ivan | 0.878 | 1909.8 | 18.0 | 21.01 | 4.58 | 4.44 | 283.74 | -4.44 | -169.50 | 1.04 |
|  | dist + dir + dir2 + bsm + bsm2 + Avg | 0.874 | 1890.7 | 20.1 | 23.49 | 4.85 | 4.68 | 298.99 | -4.68 | -181.38 | 1.05 |
| 2010 - 2013 | dist+ dist2 + dist3 *+* dist4 *+* slope + slope2 | 0.691 | 3576.6 | 1.5 | 12.65 | 3.56 | 3.34 | 365.99 | -3.34 | -84.71 | 1.14 |
|  | ***dist+ dist2 + dist3 + dist4 + Avg*** | ***0.673*** | ***3609.9*** | ***1.5*** | ***11.85*** | ***3.44*** | ***3.26*** | ***368.13*** | ***-3.26*** | ***-82.12*** | ***1.07*** |
|  | dist+ dist2 + dist3 + dist4 + aspect + slope | 0.699 | 3625.3 | 1.5 | 11.90 | 3.45 | 3.27 | 360.75 | -3.27 | -81.28 | 1.12 |
|  | dist+ dist2 + dist3 + dist4 + aspect + Ivan | 0.661 | 3628.4 | 1.5 | 12.36 | 3.52 | 3.27 | 363.49 | -3.27 | -87.62 | 1.11 |
|  | dist+ dist2 + dist3 + dist4 + Dean | 0.673 | 3614.7 | 1.5 | 12.19 | 3.49 | 3.30 | 371.69 | -3.30 | -83.19 | 1.10 |
| 2013 - 2015 | ***dist+ dist2 + dist3*** | ***0.935*** | ***305.9*** | ***9.8*** | ***71.77*** | ***8.46*** | ***8.20*** | ***379.33*** | ***-8.20*** | ***-2875.17*** | ***1.07*** |
|  | bsm | 0.962 | 284.6 | 7.9 | 187.64 | 13.57 | 12.49 | 392.63 | -12.49 | -4252.76 | 1.20 |
|  | aspect + aspect2 + bsm | 0.960 | 282.6 | 11.2 | 185.93 | 13.51 | 12.47 | 393.98 | -12.47 | -4244.73 | 1.19 |
|  | dist+ dist2 + dist3 *+* bsm | 0.968 | 239.9 | 24.9 | 191.96 | 13.69 | 12.86 | 336.27 | -12.86 | -4385.65 | 1.15 |
|  | dir + aspect + aspect2 + bsm  | 0.962 | 285.9 | 5.0 | 137.47 | 11.70 | 10.90 | 309.02 | -10.90 | -3807.03 | 1.17 |
| 2015 - 2016 | ***dir*** | ***0.728*** | ***3945.4*** | ***6.5*** | ***10.49*** | ***3.24*** | ***3.17*** | ***344.72*** | ***-3.17*** | ***-65.88*** | ***1.04*** |
|  | dir + bsm | 0.724 | 3924.9 | 6.7 | 11.09 | 3.33 | 3.24 | 344.40 | -3.24 | -67.32 | 1.04 |
|  | dist+ dist2 + dist3 *+* dir + bsm | 0.736 | 3897.6 | 7.0 | 10.98 | 3.31 | 3.22 | 337.42 | -3.22 | -66.88 | 1.05 |
|  | dir + bsm *+* slope + slope2 | 0.745 | 3870.5 | 6.6 | 11.09 | 3.33 | 3.22 | 330.85 | -3.22 | -66.94 | 1.06 |
|  | ***dist+ dist2 + dist3 + dir + aspect + aspect2 + bsm*** | ***0.740*** | ***3889.7*** | ***6.7*** | ***10.66*** | ***3.26*** | ***3.16*** | ***329.58*** | ***-3.16*** | ***-65.72*** | ***1.05*** |
| 2016 - 2017 | bsm + bsm2 | 0.743 | 1142.2 | 1.9 | 23.302 | 4.826 | 4.747 | 457.111 | -4.747 | -465.102 | 1.046 |
|  | dist + dir  | 0.789 | 1174.7 | 2.1 | 28.554 | 5.343 | 5.137 | 484.099 | -5.137 | -503.440 | 1.067 |
|  | ***dist + bsm*** ***+ bsm2*** | ***0.801*** | ***1107.2*** | ***2.4*** | ***25.811*** | ***5.080*** | ***4.944*** | ***437.092*** | ***-4.944*** | ***-484.426*** | ***1.055*** |
|  | dist + dir + bsm + bsm2 | 0.775 | 1103.7 | 5.4 | 27.931 | 5.285 | 5.139 | 449.426 | -5.139 | -503.842 | 1.056 |
|  | dist + dir + slope | 0.788 | 1175.7 | 2.1 | 27.984 | 5.288 | 5.092 | 477.800 | -5.092 | -499.277 | 1.065 |
| 2017 - 2019 | slope + slope2 + slope3 + slope4 | 0.669 | 603.8 | -1393.5 | 9.17 | 2.17 | 2.08 | 283.08 | -2.06 | -504.19 | 1.05 |
|  | dir + slope + slope2 + slope3 + slope4 | 0.739 | 2410.4 | -3915.2 | 4.68 | 1.16 | 1.12 | 190.75 | -1.12 | -311.60 | 1.02 |
|  | aspect + aspect2 + slope + slope2 + slope3 + slope4+ bsm + bsm2 + bsm3+ bsm4 | 0.724 | 550.9 | 2.6 | 36.35 | 6.02 | 5.95 | 576.60 | -5.95 | -1242.79 | 1.03 |
| 2019 - 2020 | ***dir*** | ***0.778*** | ***116.9*** | ***0.2*** | ***49.96*** | ***7.07*** | ***7.05*** | ***779.01*** | ***-7.05*** | ***-13222.51*** | ***1.01*** |
|  | bsm | 0.900 | 103.2 | 0.3 | 82.44 | 9.07 | 8.78 | 1024.29 | -8.78 | -16746.33 | 1.07 |
|  | dir + aspect + aspect2 | 0.751 | 112.2 | -0.3 | 72.43 | 8.49 | 8.29 | 833.84 | -8.29 | -15041.75 | 1.04 |
| 2020 - 2021 | dir | 0.770 | 2022.4 | 19.3 | 21.658 | 4.654 | 4.522 | 318.179 | -4.522 | -170.827 | 1.057 |
|  | dir + aspect | 0.771 | 2018.8 | 19.4 | 21.734 | 4.662 | 4.528 | 316.885 | -4.528 | -171.061 | 1.058 |
|  | ***dir + slope*** | ***0.773*** | ***2018.8*** | ***19.2*** | ***21.512*** | ***4.638*** | ***4.501*** | ***312.531*** | ***-4.501*** | ***-170.047*** | ***1.060*** |
|  | dist+ dist2 + dist3 *+* bsm | 0.937 | 1769.6 | 18.5 | 102.702 | 10.121 | 8.667 | 251.874 | -8.665 | -325.583 | 1.371 |
|  | dir + aspect + slope | 0.774 | 2015.5 | 19.3 | 21.649 | 4.653 | 4.515 | 312.464 | -4.514 | -170.563 | 1.061 |

dir = direction from river mouth; dis = distance from river mouth; bsm = bathymetric surface model (depth); Ivan = exposure vulnerability (EV) for Hurricane Ivan; Dean = EV for Hurricane Dean; Avg. = average EV for Ivan and Dean.

**Table S2**. Validation criteria for finals models that included the most important predictors of the probability of submerged aquatic vegetation (SAV) gain in the Bluefields Bay Special Fish Conservation Area (BBSFCA), Westmoreland, Jamaica, for 23, 2 – 4-year periods, generated using a 5-fold cross validation of spatial Bayesian Integrated Nested Laplace Approximation (INLA) generalized linear mixed models. The validation criteria used included: mean squared error (MSE), root mean squared error (RMSE), mean absolute error (MAE), mean absolute percentage error (MAPE), bias (a measure of consistent under- or over-forecasting; BIAS), relative bias (rBIAS), and relative mean separation (rMSEP). Also included are the calculated values for the receiver operating characteristic (ROC) curve (AUC), deviance information criterion (DIC), and marginal R-squared (mR2).

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Period** | **Predictors** | **AUC** | **DIC** | **mR2** | **MSE** | **RMSE** | **MAE** | **MAPE** | **BIAS** | **rBIAS** | **rMSEP** |
| 1984 - 1985 | dir | 0.716 | 2086.9 | 8.9 | 18.27 | 4.27 | 4.19 | 384.44 | -4.19 | -182.56 | 1.04 |
|  | bsm + bsm2 | 0.829 | 1996.3 | 8.5 | 19.68 | 4.44 | 4.31 | 354.77 | -4.31 | -187.83 | 1.08 |
|  | dist + bsm + bsm2 | 0.817 | 1985.8 | 9.0 | 19.91 | 4.46 | 4.33 | 353.47 | -4.33 | -188.83 | 1.08 |
|  | dir + slope + slope2 + slope3 + slope4 | 0.723 | 2088.5 | 8.8 | 19.02 | 4.36 | 4.13 | 374.38 | -4.13 | -184.16 | 1.10 |
|  | ***dist + slope + slope2 + slope3 + slope4+ bsm + bsm2*** | ***0.819*** | ***2001.5*** | ***7.8*** | ***16.82*** | ***3.69*** | ***3.39*** | ***290.45*** | ***-3.39*** | ***-151.26*** | ***1.15*** |
| 1985 - 1986 | dist | 0.724 | 787.8 | 0.4 | 27.23 | 5.22 | 5.14 | 550.06 | -5.14 | -886.39 | 1.02 |
|  | ***aspect*** | ***0.675*** | ***760.4*** | ***0.3*** | ***24.80*** | ***4.98*** | ***4.93*** | ***511.95*** | ***-4.93*** | ***-804.13*** | ***1.02*** |
|  | dist + aspect | 0.761 | 758.1 | 0.6 | 28.71 | 5.36 | 5.26 | 522.95 | -5.26 | -907.86 | 1.03 |
|  | dist + bsm | 0.782 | 754.8 | 0.1 | 29.91 | 5.47 | 5.35 | 520.65 | -5.35 | -924.86 | 1.05 |
|  | dist + slope + slope2 | 0.732 | 787.0 | 0.4 | 27.38 | 5.23 | 5.14 | 552.42 | -5.14 | -916.55 | 1.03 |
| 1986 - 1987 | ns |  |  |  |  |  |  |  |  |  |  |
| 1987 - 1988 | ***dir + bsm + bsm2 + bsm3*** | ***0.898*** | ***2395.5*** | ***25.7*** | ***25.95*** | ***5.09*** | ***4.74*** | ***227.63*** | ***-4.73*** | ***-117.92*** | ***1.16*** |
|  | dist + dir + bsm + bsm2 + bsm3 | 0.889 | 2392.1 | 28.3 | 27.70 | 5.26 | 4.90 | 238.63 | -4.90 | -123.11 | 1.15 |
|  | dir + aspect + aspect2 + aspect3 + aspect4 + bsm + bsm2 + bsm3 | 0.914 | 2316.4 | 29.7 | 28.59 | 5.35 | 4.97 | 233.26 | -4.97 | -123.74 | 1.16 |
|  | dist + dir + aspect + aspect2 + aspect3 + aspect4 + bsm + bsm2 + bsm3 | 0.907 | 2325.4 | 29.5 | 29.49 | 5.43 | 5.05 | 232.80 | -5.04 | -125.60 | 1.16 |
|  | dir + aspect + aspect2 + aspect3 + aspect4 + Gilbert | 0.843 | 2516.4 | -7.0 | 17.32 | 4.16 | 3.92 | 178.78 | -3.80 | -95.51 | 1.09 |
| 1988 - 1990 | dir | 0.833 | 614.4 | 5.7 | 38.47 | 6.20 | 6.09 | 434.01 | -6.09 | -1104.39 | 1.04 |
|  | ***dir + slope*** | ***0.861*** | ***595.4*** | ***4.1*** | ***38.41*** | ***6.20*** | ***6.08*** | ***433.51*** | ***-6.08*** | ***-963.42*** | ***1.04*** |
|  | dist + dir + slope  | 0.877 | 566.6 | 4.3 | 41.37 | 6.43 | 6.29 | 425.70 | -6.29 | -769.67 | 1.05 |
| 1990 - 1993 | dist+ dist2 + dist3 + bsm + bsm2 + bsm3+ bsm4 | 0.933 | 930.2 | 16.8 | 68.14 | 8.25 | 7.77 | 315.45 | -7.77 | -555.03 | 1.14 |
|  | dist + dir | 0.915 | 896.0 | 18.9 | 46.83 | 6.84 | 6.65 | 278.06 | -6.65 | -474.76 | 1.06 |
|  | dir + aspect | 0.920 | 894.6 | 19.2 | 47.32 | 6.88 | 6.69 | 277.98 | -6.69 | -477.46 | 1.05 |
|  | ***dir + bsm*** | ***0.932*** | ***846.4*** | ***18.3*** | ***46.41*** | ***6.81*** | ***6.61*** | ***267.96*** | ***-6.61*** | ***-472.02*** | ***1.07*** |
|  | dist + dir + aspect | 0.916 | 894.0 | 19.5 | 46.88 | 6.85 | 6.65 | 275.14 | -6.65 | -474.77 | 1.06 |
| 1993- 1994 | dist+ dist2 + dir + dir2 + dir3  | 0.781 | 3214.9 | 11.7 | 14.99 | 3.87 | 3.71 | 326.23 | -3.71 | -90.98 | 1.09 |
|  | ***dir + dir2 + dir3 + bsm*** | ***0.698*** | ***3434.9*** | ***6.8*** | ***11.79*** | ***3.43*** | ***3.35*** | ***346.18*** | ***-3.35*** | ***-82.09*** | ***1.05*** |
|  | dist+ dist2 + dir + dir2 + dir3 + aspect  | 0.814 | 3160.4 | 10.6 | 15.24 | 3.90 | 3.73 | 312.81 | -3.73 | -91.27 | 1.10 |
|  | dist+ dist2 + dir + dir2 + dir3 + bsm | 0.811 | 3154.1 | 12.0 | 15.16 | 3.89 | 3.70 | 307.05 | -3.70 | -90.74 | 1.10 |
|  | dist+ dist2 + dir + dir2 + dir3 + aspect + bsm | 0.830 | 3101.1 | 10.6 | 15.36 | 3.92 | 3.70 | 290.69 | -3.70 | -90.54 | 1.12 |
| 1994 - 1995 | dist | 0.803 | 632.5 | 0.5 | 36.54 | 6.04 | 5.82 | 537.54 | -5.82 | -1334.13 | 1.07 |
|  | dir + dir2 + dir3 | 0.836 | 698.1 | -5064.5 | 0.00 | 0.07 | 0.01 | 98.81 | 0.00 | -0.88 | 0.98 |
|  | ***aspect*** | ***0.608*** | ***674.1*** | ***-0.2*** | ***26.34*** | ***5.13*** | ***5.09*** | ***570.57*** | ***-5.09*** | ***-1165.06*** | ***1.01*** |
|  | dist + aspect | 0.803 | 623.5 | 0.7 | 37.33 | 6.10 | 5.90 | 534.18 | -5.90 | -1355.01 | 1.06 |
|  | dist + bsm | 0.843 | 601.9 | 0.9 | 40.80 | 6.39 | 6.17 | 513.78 | -6.17 | -1412.19 | 1.07 |
| 1995 - 1996  | dist | 0.863 | 701.6 | 0.5 | 59.52 | 7.71 | 7.12 | 459.66 | -7.12 | -1165.03 | 1.16 |
|  | ***aspect*** | ***0.661*** | ***811.2*** | ***0.1*** | ***25.65*** | ***5.06*** | ***5.01*** | ***545.40*** | ***-5.01*** | ***-821.97*** | ***1.02*** |
|  | bsm | 0.901 | 650.2 | 3.7 | 57.19 | 7.56 | 7.11 | 430.66 | -7.11 | -1166.18 | 1.15 |
| 1996 - 1997 | dist | 0.737 | 1602.9 | 1.5 | 19.34 | 4.40 | 4.32 | 478.60 | -4.32 | -307.35 | 1.03 |
|  | dir | 0.796 | 1336.8 | 7.3 | 24.33 | 4.93 | 4.83 | 387.00 | -4.83 | -343.86 | 1.04 |
|  | dist + dir | 0.842 | 1323.6 | 3.3 | 23.52 | 4.85 | 4.71 | 359.85 | -4.71 | -335.64 | 1.06 |
|  | ***dist + slope*** | ***0.726*** | ***1587.2*** | ***1.1*** | ***19.19*** | ***4.38*** | ***4.30*** | ***469.66*** | ***-4.30*** | ***-302.53*** | ***1.04*** |
|  | dist + slope | 0.822 | 1336.7 | 4.5 | 22.44 | 4.74 | 4.62 | 349.54 | -4.62 | -332.89 | 1.05 |
| 1997 – 1999  | dist | 0.926 | 706.1 | 4.0 | 109.46 | 10.45 | 9.29 | 411.09 | -9.29 | -1396.50 | 1.25 |
|  | ***dir*** | ***0.904*** | ***625.1*** | ***10.4*** | ***47.28*** | ***6.87*** | ***6.71*** | ***367.33*** | ***-6.71*** | ***-1008.49*** | ***1.05*** |
|  | dist + dir | 0.954 | 578.8 | 14.9 | 139.95 | 11.76 | 10.81 | 355.71 | -10.81 | -1628.37 | 1.17 |
|  | dist + bsm | 0.959 | 577.3 | 11.5 | 110.73 | 10.52 | 9.72 | 332.77 | -9.72 | -1464.16 | 1.18 |
| 1999 - 2000 | ***dir*** | ***0.859*** | ***454.8*** | ***8.4*** | ***49.65*** | ***7.04*** | ***6.90*** | ***427.56*** | ***-6.90*** | ***-1713.09*** | ***1.04*** |
|  | bsm | 0.960 | 406.5 | 5.3 | 123.34 | 11.09 | 10.22 | 361.24 | -10.22 | -2527.80 | 1.19 |
|  | dist + dir | 0.885 | 446.2 | 11.1 | 54.75 | 7.39 | 7.18 | 420.04 | -7.18 | -1782.38 | 1.06 |
|  | dir + bsm | 0.965 | 377.0 | 3.5 | 91.35 | 9.54 | 8.98 | 308.19 | -8.98 | -2223.87 | 1.14 |
|  | dist + dir + bsm | 0.970 | 369.6 | 5.7 | 99.74 | 9.97 | 9.37 | 301.48 | -9.37 | -2320.26 | 1.15 |
| 2000 - 2002 | dist + dist2 + dist3 + aspect + slope + slope2 | 0.881 | 1751.9 | 6.0 | 39.56 | 6.29 | 5.87 | 365.04 | -5.87 | -327.84 | 1.15 |
|  | dist + dist2 + dist3 + slope + slope2 | 0.877 | 1757.5 | 6.1 | 39.81 | 6.31 | 5.88 | 368.05 | -5.88 | -328.49 | 1.15 |
|  | dir + bsm + bsm2 + bsm3 | 0.891 | 1544.3 | 12.4 | 123.37 | 11.11 | 8.46 | 332.73 | -8.46 | -472.41 | 1.74 |
|  | ***dir + slope + slope2*** | ***0.818*** | ***1653.5*** | ***11.6*** | ***25.89*** | ***5.09*** | ***4.96*** | ***359.30*** | ***-4.96*** | ***-276.86*** | ***1.05*** |
|  | dir + bsm + bsm2 + bsm3 + slope + slope2 | 0.901 | 1538.7 | 12.5 | 132.31 | 11.50 | 8.66 | 327.75 | -8.66 | -484.02 | 1.78 |
| 2002 - 2006 | dist + dir + Ivan | 0.895 | 532.8 | 1.2 | 59.87 | 7.74 | 7.32 | 424.04 | -7.32 | -1576.08 | 1.22 |
|  | dist+ slope + slope2 + bsm | 0.918 | 499.9 | 3.3 | 51.17 | 7.15 | 6.91 | 405.45 | -6.91 | -1385.78 | 1.11 |
|  | dist+ dir + slope + slope2 + bsm | 0.925 | 489.8 | -139.3 | 42.56 | 6.51 | 6.11 | 247.42 | -6.10 | -1241.89 | 1.19 |
| 2006 - 2008 | dir + dir2 + dir3+ slope + slope2 + slope3 + slope4 | 0.779 | 3750.3 | -486.0 | 0.99 | 0.60 | 0.35 | 120.22 | -0.15 | -3.62 | 15.73 |
|  | ***bsm + bsm2 + bsm3 + Ivan*** | ***0.718*** | ***3292.8*** | ***12.2*** | ***11.72*** | ***3.42*** | ***3.34*** | ***321.85*** | ***-3.33*** | ***-77.90*** | ***0.96*** |
|  | dist+ dist2 + dist3 + dist4 + aspect + bsm + bsm2 + bsm3 | 0.843 | 2815.8 | 11.3 | 18.24 | 4.26 | 3.92 | 241.84 | -3.89 | -91.52 | 1.26 |
|  | dir + dir2 + dir3+ dir4 + slope + slope2 + slope3 + slope4 + bsm + bsm2 + bsm3 | 0.727 | 2831.8 | -516.5 | 0.04 | 0.21 | 0.06 | 97.37 | -0.05 | -0.99 | 0.96 |
|  | bsm + bsm2 + bsm3 + Avg | 0.696 | 3343.0 | 11.9 | 11.98 | 3.46 | 3.39 | 338.51 | -3.38 | -79.17 | 1.04 |
| 2008 - 2010 | dist+ dist2 + dist3 + dist4 | 0.735 | 2800.7 | 1.5 | 16.19 | 4.02 | 3.81 | 377.16 | -3.81 | -112.62 | 1.11 |
|  | dist+ dist2 + dist3 + dist4 + dir  | 0.783 | 2720.6 | 2.8 | 16.89 | 4.11 | 3.88 | 350.16 | -3.88 | -120.97 | 1.12 |
|  | dir + bsm + bsm2 + bsm3+ bsm4 | 0.692 | 2914.9 | 1.8 | 14.20 | 3.77 | 3.63 | 390.09 | -3.63 | -121.14 | 1.08 |
|  | ***aspect + bsm + bsm2 + bsm3+ bsm4*** | ***0.726*** | ***2876.4*** | ***1.2*** | ***13.65*** | ***3.69*** | ***3.54*** | ***377.66*** | ***-3.54*** | ***-111.90*** | ***1.09*** |
| 2010 - 2013 | ***dist+ dist2 + dist3 + bsm***  | ***0.930*** | ***3024.0*** | ***37.2*** | ***21.79*** | ***4.67*** | ***4.33*** | ***178.08*** | ***-4.27*** | ***-66.27*** | ***1.20*** |
|  | dist+ dist2 + dist3 + bsm + slope + slope2 | 0.936 | 2963.1 | 37.3 | 23.02 | 4.80 | 4.43 | 178.87 | -4.35 | -67.53 | 1.22 |
|  | dist+ dist2 + dist3 + bsm + Avg. | 0.930 | 3003.3 | 36.3 | 21.94 | 4.68 | 4.32 | 179.95 | -4.24 | -65.83 | 1.32 |
|  | dist+ dist2 + dist3 + bsm + slope + slope2 + Avg. | 0.936 | 2933.8 | 38.4 | 23.63 | 4.86 | 4.49 | 182.91 | -4.40 | -69.07 | 1.30 |
|  | dist+ dist2 + dist3 + bsm + slope + slope2 + Ivan | 0.935 | 2960.1 | 37.5 | 23.09 | 4.80 | 4.44 | 179.75 | -4.36 | -67.64 | 1.25 |
|  | dist+ dist2 + dist3 + bsm + Dean | 0.930 | 2992.3 | 38.4 | 22.67 | 4.76 | 4.40 | 179.57 | -4.34 | -67.35 | 1.28 |
| 2013 - 2015 | ***dist+ dist2 + dist3 + dist4 + dir + aspect + slope + slope2*** | ***0.704*** | ***5268.8*** | ***5.6*** | ***7.94*** | ***2.82*** | ***2.71*** | ***302.82*** | ***-2.71*** | ***-38.65*** | ***1.07*** |
|  | dist+ dist2 + dist3 + dist4 + dir + Ivan | 0.688 | 5321.6 | 5.8 | 8.12 | 2.85 | 2.76 | 316.04 | -2.76 | -39.38 | 1.02 |
|  | dist+ dist2 + dist3 + dist4 + dir + aspect + Ivan | 0.695 | 5308.2 | 5.8 | 8.04 | 2.84 | 2.74 | 312.14 | -2.74 | -39.12 | 1.03 |
|  | dist+ dist2 + dist3 + dist4 + dir + slope + slope2 + Ivan | 0.702 | 5276.7 | 5.7 | 8.05 | 2.84 | 2.73 | 306.43 | -2.73 | -38.99 | 1.03 |
|  | dist+ dist2 + dist3 + dist4 + dir + Avg. | 0.687 | 5323.1 | 5.7 | 8.03 | 2.83 | 2.74 | 314.53 | -2.74 | -39.12 | 1.04 |
| 2015 - 2016 | bsm | 0.950 | 227.9 | 5.8 | 150.83 | 12.06 | 11.24 | 465.03 | -11.24 | -5843.99 | 1.17 |
|  | ***dist+ dist2 + dist3*** | ***0.919*** | ***250.4*** | ***6.9*** | ***66.50*** | ***8.15*** | ***7.98*** | ***461.08*** | ***-7.98*** | ***-4492.31*** | ***1.04*** |
|  | dist+ dist2 + dist3 + dir  | 0.937 | 242.1 | 4.0 | 67.36 | 8.21 | 8.00 | 426.72 | -8.00 | -4538.80 | 1.05 |
|  | dir + bsm | 0.949 | 235.8 | 2.3 | 103.02 | 10.13 | 9.57 | 380.00 | -9.57 | -5388.82 | 1.14 |
| 2016 - 2017 | ***dist+ dist2 + dir + dir2 + dir3*** | 0.655 | ***2954.4*** | ***0.4*** | ***10.80*** | ***3.29*** | ***3.24*** | ***400.90*** | ***-3.24*** | ***-108.61*** | ***1.02*** |
|  | dist+ dist2 + dir + dir2 +dir3 + aspect | 0.658 | 2947.8 | 0.0 | 10.93 | 3.30 | 3.25 | 399.65 | -3.25 | -109.07 | 1.02 |
|  | dist+ dist2 + dir + dir2 +dist3 + bsm | 0.662 | 2905.3 | 1.2 | 12.34 | 3.51 | 3.45 | 407.10 | -3.45 | -115.66 | 1.02 |
| 2017 - 2019 | ***dir*** | ***0.726*** | ***2250.2*** | ***11.0*** | ***17.67*** | ***4.20*** | ***4.10*** | ***345.91*** | ***-4.10*** | ***-154.69*** | ***1.05*** |
|  | dist + dir | 0.863 | 2142.1 | 11.9 | 25.35 | 5.03 | 4.77 | 336.99 | -4.77 | -179.85 | 1.10 |
|  | dist + bsm + bsm2 | 0.859 | 2190.1 | 10.2 | 25.31 | 5.03 | 4.72 | 338.53 | -4.72 | -178.08 | 1.13 |
|  | dir + aspect | 0.734 | 2244.6 | 10.9 | 17.86 | 4.23 | 4.12 | 345.45 | -4.12 | -155.53 | 1.05 |
|  | dist + dir + aspect | 0.865 | 2137.7 | 11.8 | 25.49 | 5.05 | 4.78 | 335.50 | -4.78 | -180.30 | 1.10 |
| 2019 - 2020 | dist + dist2 + dist3 + dist4 + dir | 0.912 | 1654.0 | 36.3 | 40.76 | 6.38 | 5.95 | 167.82 | -5.92 | -187.55 | 1.17 |
|  | dir + bsm + bsm2 | 0.921 | 1806.1 | 33.5 | 36.86 | 6.07 | 5.70 | 231.35 | -5.70 | -180.08 | 1.13 |
|  | ***dist + dist2 + dist3 + dist4 + dir + aspect*** | ***0.914*** | ***1701.7*** | ***32.7*** | ***36.74*** | ***6.05*** | ***5.65*** | ***144.04*** | ***-5.60*** | ***-192.83*** | ***1.18*** |
|  | dir + aspect + bsm + bsm2 | 0.923 | 1786.8 | 33.8 | 37.20 | 6.10 | 5.72 | 227.30 | -5.72 | -180.91 | 1.13 |
|  | dir + slope + bsm + bsm2  | 0.928 | 1765.3 | 34.2 | 37.75 | 6.14 | 5.77 | 223.43 | -5.77 | -182.35 | 1.13 |
|  | dir + aspect + slope + bsm + bsm2  | 0.930 | 1747.7 | 34.5 | 38.05 | 6.17 | 5.79 | 219.10 | -5.79 | -182.98 | 1.14 |
| 2020 - 2021 | ***dist + dist2*** |  | ***202.7*** | ***-0.4*** | ***38.43*** | ***6.71*** | ***6.76*** | ***570.82*** | ***-6.76*** | ***-4331.92*** | ***1.02*** |
|  | dir + dir2 |  | 176.6 | -1.7 | 42.26 | 6.96 | 7.11 | 506.86 | -7.11 | -4559.38 | 1.01 |

dir = direction from river mouth; dis = distance from river mouth; bsm = bathymetric surface model (depth); Ivan = exposure vulnerability (EV) for Hurricane Ivan; Dean = EV for Hurricane Dean; Avg. = average EV for Ivan and Dean.

**Table S3**. Validation criteria for finals models that included the most important predictors of submerged aquatic vegetation (SAV) percentage cover change in the Bluefields Bay Special Fish Conservation Area (BBSFCA), Westmoreland, Jamaica, for 23, 2 – 4-year periods, generated using a 5-fold cross validation of spatial Bayesian Integrated Nested Laplace Approximation (INLA) generalized linear mixed models. The validation criteria used included: mean squared error (MSE), root mean squared error (RMSE), mean absolute error (MAE), mean absolute percentage error (MAPE), bias (a measure of consistent under- or over-forecasting; BIAS), relative bias (rBIAS), and relative mean separation (rMSEP). Also included are the calculated values for the deviance information criterion (DIC), and marginal R-squared (mR2).

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Period** | **Predictors** | **DIC** | **mR2** | **MSE** | **RMSE** | **MAE** | **MAPE** | **BIAS** | **rBIAS** | **rMSEP** |
| 1984 - 1985 | dist+ dist2 + dist3 + dist4 + bsm + bsm2 + bsm3+ bsm4 | 47181.8 | 15.2 | 3.92 | 1.98 | 1.47 | 445.48 | 0.0001 | 0.04 | 0.85 |
|  | slope + bsm + bsm2 + bsm3+ bsm4 | 47600.9 | 11.9 | 4.06 | 2.02 | 1.50 | 319.60 | -0.0003 | 0.04 | 0.88 |
|  | ***dist+ dist2 + dist3 + dist4 + aspect + aspect2 + bsm + bsm2 + bsm3+ bsm4*** | ***47115.0*** | ***15.7*** | ***3.89*** | ***1.97*** | ***1.47*** | ***438.14*** | ***0.0001*** | ***0.04*** | ***0.84*** |
|  | dist+ dist2 + dist3 + dist4 + slope + bsm + bsm2 + bsm3+ bsm4 | 47182.0 | 15.2 | 3.92 | 1.98 | 1.47 | 445.57 | 0.0001 | 0.04 | 0.85 |
|  | ***dist+ dist2 + dist3 + dist4 + aspect + aspect2 + slope + bsm + bsm2 + bsm3+ bsm4*** | ***47115.4*** | ***15.8*** | ***3.89*** | ***1.97*** | ***1.47*** | ***438.35*** | ***0.0001*** | ***0.04*** | ***0.84*** |
| 1985 - 1986 | ***dist+ dist2 + dist3 + dist4 + dir + dir2*** | ***22003.5*** | ***11.3*** | ***0.41*** | ***0.64*** | ***0.49*** | ***754.78*** | ***-0.0001*** | ***0.001*** | ***0.89*** |
|  | dist+ dist2 + dist3 + dist4 + bsm + bsm2 + bsm3+ bsm4 | 22080.4 | 10.7 | 0.42 | 0.64 | 0.49 | 808.13 | -0.0001 | 0.002 | 0.89 |
|  | dist+ dist2 + dist3 + dist4 | 22375.4 | 8.3 | 0.43 | 0.65 | 0.50 | 832.29 | -0.0001 | 0.001 | 0.92 |
|  | aspect + aspect2 + aspect3 + aspect4 + slope + slope2 + slope3 + bsm + bsm2 + bsm3+ bsm4 | 22865.2 | 4.3 | 0.45 | 0.67 | 0.51 | 743.04 | 0.00004 | 0.002 | 0.96 |
|  | slope + slope2 + slope3 + bsm + bsm2 + bsm3+ bsm4 | 22914.2 | 3.8 | 0.45 | 0.67 | 0.51 | 729.59 | 0.00002 | 0.001 | 0.96 |
| 1986 - 1987 | dist+ dist2 + dist3 + dist4 + bsm + bsm2 + bsm3 | 17980.5 | 31.9 | 0.29 | 0.54 | 0.43 | 564.6 | -0.00004 | 0.0003 | 0.68 |
|  | dist+ dist2 + dist3 + dist4 + dir + dir2 + dir3 + dir4 + bsm + bsm2 + bsm3 | 17577.8 | 34.4 | 0.28 | 0.53 | 0.42 | 481.6 | 0.00008 | 0.0001 | 0.66 |
|  | dist+ dist2 + dist3 + dist4 + slope + slope2 + bsm + bsm2 + bsm3 | 17881.7 | 32.6 | 0.29 | 0.54 | 0.42 | 547.9 | 0 | 0.0002 | 0.68 |
|  | ***dist+ dist2 + dist3 + dist4 + dir + dir2 + dir3 + dir4 + slope + slope2 + bsm + bsm2 + bsm3*** | ***17505.6*** | ***34.8*** | ***0.28*** | ***0.53*** | ***0.42*** | ***471.5*** | ***0.0001*** | ***0.0001*** | ***0.65*** |
|  | dir + dir2 + dir3 + dir4 + slope + slope2 + bsm + bsm2 + bsm3 | 18819.0 | 26.7 | 0.31 | 0.56 | 0.44 | 512.9 | 0.0001 | 0.00008 | 0.74 |
| 1987 - 1988 | ***dist+ dist2 + dist3 + dist4 + dir + dir2 + dir3 + dir4*** | ***19893.1*** | ***42.2*** | ***0.34*** | ***0.58*** | ***0.47*** | ***792.57*** | ***-0.0001*** | ***0.0001*** | ***0.58*** |
|  | ***dist+ dist2 + dist3 + dist4 + dir + dir2 + dir3 + dir4 + Gilbert*** | ***19884.4*** | ***42.3*** | ***0.34*** | ***0.58*** | ***0.47*** | ***785.17*** | ***-0.0002*** | ***0*** | ***0.58*** |
|  | dir + dir2 + dir3 + dir4 + aspect + aspect2 + aspect3+ aspect4 + slope + slope2 + slope3 + Gilbert | 22187.4 | 29.3 | 0.42 | 0.65 | 0.52 | 888.98 | -0.0001 | 0.0002 | 0.71 |
|  | dir + dir2 + dir3 + dir4 + aspect + aspect2 + aspect3+ aspect4 + slope + slope2 + slope3 | 22407.1 | 29.1 | 0.42 | 0.65 | 0.52 | 900.69 | -0.0001 | 0.0002 | 0.71 |
|  | dir + dir2 + dir3 + dir4 + slope + slope2 + slope3 + Gilbert | 22275.9 | 28.7 | 0.42 | 0.65 | 0.52 | 909.27 | -0.0001 | 0.0003 | 0.72 |
| 1988 - 1990 | dist+ dist2 + dist3 + dist4 + dir + dir2 + dir3 + dir4 + bsm + bsm2 + bsm3 | 11982.4 | 31.0 | 0.17 | 0.41 | 0.31 | 530.52 | -0.00002 | 0.0001 | 0.69 |
|  | dist+ dist2 + dist3 + dist4 + dir + dir2 + dir3 + dir4 + slope + slope2 + slope3 + bsm + bsm2 + bsm3 | 11953.0 | 31.2 | 0.17 | 0.41 | 0.31 | 543.87 | -0.0001 | -0.0002 | 0.69 |
|  | dist+ dist2 + dist3 + dist4 + dir + dir2 + dir3 + dir4 + bsm + bsm2 + bsm3 + Gilbert | 11968.0 | 31.1 | 0.17 | 0.41 | 0.31 | 526.65 | -0.00002 | 0 | 0.69 |
|  | ***dist+ dist2 + dist3 + dist4 + dir + dir2 + dir3 + dir4 + aspect + bsm + bsm2 + bsm3 + Gilbert*** | ***11963.2*** | ***31.1*** | ***0.17*** | ***0.41*** | ***0.31*** | ***518.22*** | ***0*** | ***0.0001*** | ***0.69*** |
|  | dist+ dist2 + dist3 + dist4 + dir + dir2 + dir3 + dir4 + aspect + slope + slope2 + slope3 + bsm + bsm2 + bsm3 + Gilbert | 11939.3 | 31.3 | 0.17 | 0.41 | 0.31 | 530.53 | -0.0001 | -0.0003 | 0.69 |
| 1990- 1993 | ***bsm + bsm2 + bsm3 + bsm4*** | ***3135.8*** | ***27.4*** | ***0.08*** | ***0.27*** | ***0.21*** | ***105.05*** | ***-0.003*** | ***0.004*** | ***0.70*** |
|  | dist+ dist2 + dist3 + dist4 + dir  | 5231.5 | 12.6 | 0.09 | 0.31 | 0.24 | 142.30 | -0.005 | 0.006 | 0.86 |
|  | dist+ dist2 + dist3 + dist4 + aspect  | 5403.8 | 11.2 | 0.10 | 0.31 | 0.24 | 147.05 | -0.005 | 0.005 | 0.88 |
|  | aspect + bsm + bsm2 + bsm3 + bsm4  | 3111.0 | 27.5 | 0.08 | 0.27 | 0.21 | 105.56 | -0.003 | 0.003 | 0.70 |
|  | dist+ dist2 + dist3 + dist4 + dir + aspect  | 5176.5 | 13.0 | 0.09 | 0.30 | 0.24 | 142.42 | -0.005 | 0.006 | 0.86 |
| 1993- 1994 | dist+ dist2 + dist3 + dir + dir2 + dir3 | 24537.5 | 21.7 | 0.52 | 0.72 | 0.57 | 248.79 | -0.00004 | 0.00008 | 0.78 |
|  | dist+ dist2 + dist3 + bsm + bsm2 + bsm3+ bsm4 | 25268.1 | 16.5 | 0.55 | 0.74 | 0.59 | 287.90 | -0.00006 | 0.00004 | 0.84 |
|  | dir + dir2 + dir3 + bsm + bsm2 + bsm3+ bsm4 | 25432.4 | 15.3 | 0.56 | 0.75 | 0.59 | 258.54 | -0.00008 | 0.00006 | 0.85 |
|  | ***dist+ dist2 + dist3 + dir + dir2 + dir3 + bsm + bsm2 + bsm3+ bsm4*** | ***24175.6*** | ***24.2*** | ***0.50*** | ***0.71*** | ***0.56*** | ***250.51*** | ***-0.00004*** | ***0.00002*** | ***0.76*** |
|  | dist+ dist2 + dist3 + slope + slope2 + bsm + bsm2 + bsm3+ bsm4 | 25237.5 | 16.7 | 0.55 | 0.74 | 0.59 | 282.75 | -0.00004 | 0.00004 | 0.83 |
| 1994 - 1995 | dir + dir2 + dir3 + dir4  | 23522.6 | 12.9 | 0.47 | 0.69 | 0.53 | 438.30 | -0.0001 | 0.01 | 0.87 |
|  | ***dist+ dist2 + dist3 + dist4 + dir + dir2 + dir3 + dir4*** | ***22171.8*** | ***22.8*** | ***0.42*** | ***0.65*** | ***0.50*** | ***390.63*** | ***0.0001*** | ***0.01*** | ***0.77*** |
|  | dist+ dist2 + dist3 + dist4 + aspect | 23489.8 | 13.1 | 0.47 | 0.68 | 0.52 | 356.43 | 0.00004 | 0.01 | 0.87 |
|  | dist+ dist2 + dist3 + dist4 + bsm + bsm2 + bsm3+ bsm4 | 23343.4 | 14.3 | 0.46 | 0.68 | 0.52 | 384.40 | 0.0001 | 0.01 | 0.86 |
|  | dir + dir2 + dir3 + dir4 + bsm + bsm2 + bsm3+ bsm4 | 23219.0 | 11.9 | 0.48 | 0.69 | 0.53 | 414.60 | 0.0145 | -0.06 | 0.88 |
| 1995 - 1996  | ***dist+ dist2 + dist3*** | ***28916.1*** | ***16.2*** | ***0.76*** | ***0.87*** | ***0.67*** | ***635.43*** | ***-0.00004*** | ***0.21*** | ***0.84*** |
|  | dir + dir2 + dir3 + dir4 | 30191.2 | 6.2 | 0.85 | 0.92 | 0.69 | 484.47 | 0.0001 | 0.18 | 0.94 |
|  | dir + dir2 + dir3 + dir4 + aspect + aspect2 + aspect3 | 30039.8 | 7.5 | 0.84 | 0.91 | 0.69 | 517.05 | 0.00004 | 0.20 | 0.93 |
|  | dir + dir2 + dir3 + dir4 + aspect + aspect2 + aspect3 + slope + slope2 + slope3 + slope4 | 30084.9 | 7.1 | 0.84 | 0.92 | 0.69 | 511.67 | 0.0003 | 0.19 | 0.93 |
| 1996 - 1997 | dir + dir2 + dir3 + dir4 | 26967.8 | 4.3 | 0.63 | 0.80 | 0.60 | 761.44 | -0.00006 | 0.002 | 0.96 |
|  | ***dist+ dist2 + dist3 + dist4 + dir + dir2 + dir3 + dir4*** | ***26376.9*** | ***8.6*** | ***0.61*** | ***0.78*** | ***0.60*** | ***888.80*** | ***-0.00004*** | ***0.003*** | ***0.92*** |
|  | dist+ dist2 + dist3 + dist4 + bsm + bsm2 + bsm3 | 26929.1 | 3.9 | 0.64 | 0.80 | 0.61 | 692.12 | 0.0001 | 0.004 | 0.96 |
|  | dir + dir2 + dir3 + dir4 + aspect | 26875.9 | 4.4 | 0.63 | 0.80 | 0.60 | 743.82 | -0.0001 | 0.002 | 0.96 |
|  | dir + dir2 + dir3 + dir4 + slope | 26875.0 | 4.4 | 0.63 | 0.80 | 0.60 | 768.01 | -0.0001 | 0.002 | 0.96 |
| 1997 – 1999  | dist+ dist2 + dist3 + dist4 + dir + dir2 + dir3 + dir4 | 6936.3 | 22.6 | 0.11 | 0.33 | 0.25 | 524.16 | 0 | 0.0013 | 0.77 |
|  | ***dist+ dist2 + dist3 + dist4 + slope + slope2 + slope3*** | ***5622.5*** | ***31.1*** | ***0.10*** | ***0.31*** | ***0.24*** | ***607.85*** | ***0.00004*** | ***0.0011*** | ***0.69*** |
|  | dir + dir2 + dir3 + bsm + bsm2 + bsm3+ bsm4 | 6831.6 | 23.3 | 0.11 | 0.33 | 0.25 | 531.90 | -0.00002 | 0.0012 | 0.77 |
|  | dir + dir2 + dir3 + bsm + bsm2 + bsm3+ bsm4 + slope + slope2 + slope3 | 7876.9 | 15.9 | 0.12 | 0.34 | 0.27 | 670.95 | 0 | 0.0011 | 0.84 |
| 1999 - 2000 | dist+ dist2 + dist3 + dist4 + dir + dir2 + dir3 + dir4 | 56256.7 | 11.2 | 8.51 | 2.92 | 2.19 | 660.81 | -0.0003 | 0.006 | 0.89 |
|  | dist+ dist2 + dist3 + dist4 + bsm + bsm2 + bsm3 | 56655.2 | 8.0 | 8.82 | 2.97 | 2.19 | 665.53 | -0.0001 | 0.005 | 0.92 |
|  | ***dist+ dist2 + dist3 + dist4 + dir + dir2 + dir3 + dir4 + slope + slope2*** | ***56337.5*** | ***11.3*** | ***8.51*** | ***2.92*** | ***2.19*** | ***651.03*** | ***-0.0007*** | ***0.006*** | ***0.89*** |
|  | dist+ dist2 + dist3 + dist4 + aspect + aspect2 + aspect3 + bsm + bsm2 + bsm3 | 56632.8 | 8.2 | 8.80 | 2.97 | 2.19 | 666.19 | -0.0003 | 0.005 | 0.92 |
|  | dist+ dist2 + dist3 + dist4 + aspect + aspect2 + aspect3 + slope + slope2+ bsm + bsm2 + bsm3 | 56632.9 | 8.3 | 8.80 | 2.97 | 2.20 | 661.64 | -0.0004 | 0.005 | 0.92 |
| 2000 - 2002 | dist+ dist2 + dist3 + dist4  | 8981.4 | 33.4 | 0.13 | 0.36 | 0.28 | 343.23 | 0.004 | -0.02 | 0.66 |
|  | ***dist+ dist2 + dist3 + dist4 + dir***  | ***8972.2*** | ***33.5*** | ***0.13*** | ***0.36*** | ***0.28*** | ***326.03*** | ***0.003*** | ***-0.02*** | ***0.66*** |
|  | dist+ dist2 + dist3 + dist4 *+* bsm + bsm2  | 8628.5 | 35.5 | 0.12 | 0.35 | 0.27 | 442.10 | 0.005 | -0.03 | 0.64 |
|  | dist+ dist2 + dist3 + dist4 + dir *+* bsm + bsm2  | 8579.1 | 35.8 | 0.12 | 0.35 | 0.28 | 403.65 | 0.004 | -0.03 | 0.64 |
| 2002 - 2006 | dist+ dist2 + dist3 + dist4 | 9973.7 | 12.8 | 0.15 | 0.38 | 0.30 | 509.2 | 0.00004 | 0.00060 | 0.9 |
|  | dist+ dist2 + dist3 + dist4 + dir + dir2 + dir3 | 9649.7 | 15.4 | 0.14 | 0.38 | 0.30 | 480.6 | 0.00014 | 0.00034 | 0.8 |
|  | dist+ dist2 + dist3 + dist4 + aspect + aspect2 + aspect3 | 9939.4 | 13.1 | 0.15 | 0.38 | 0.30 | 500.1 | 0.00004 | 0.00068 | 0.9 |
|  | ***dist+ dist2 + dist3 + dist4 + dir + dir2 + dir3 + aspect + aspect2 + aspect3***  | ***9609.2*** | ***15.8*** | ***0.14*** | ***0.38*** | ***0.30*** | ***471.6*** | ***0.00008*** | ***0.00036*** | ***0.8*** |
|  | dir + dir2 + dir3 + aspect + aspect2 + aspect3 + slope + slope2+ bsm + bsm2 + bsm3 | 9949.5 | 13.1 | 0.15 | 0.38 | 0.30 | 394.5 | 0.00006 | 0.00038 | 0.9 |
| 2006 - 2008 | dist+ dist2 + dist3 + dist4 + bsm + bsm2 + bsm3+ bsm4 | 15692.1 | 43.2 | 0.25 | 0.50 | 0.38 | 285.4 | -0.0001 | -0.0003 | 0.6 |
|  | dist+ dist2 + dist3 + dist4 + dir + dir2 + dir3 + dir4+ bsm + bsm2 + bsm3+ bsm4 | 15282.6 | 45.4 | 0.24 | 0.49 | 0.38 | 286.2 | -0.0002 | -0.0005 | 0.5 |
|  | dist+ dist2 + dist3 + dist4 + bsm + bsm2 + bsm3+ bsm4 + Ivan | 15680.8 | 43.3 | 0.25 | 0.50 | 0.38 | 286.8 | -0.0001 | -0.0002 | 0.6 |
|  | ***dist+ dist2 + dist3 + dist4 + dir + dir2 + dir3 + dir4+ bsm + bsm2 + bsm3+ bsm4 + Ivan*** | ***15265.0*** | ***45.5*** | ***0.24*** | ***0.49*** | ***0.38*** | ***287.6*** | ***-0.0002*** | ***-0.0004*** | ***0.5*** |
|  | dist+ dist2 + dist3 + dist4 + bsm + bsm2 + bsm3+ bsm4 + Dean + Dean2 | 15691.4 | 43.3 | 0.25 | 0.50 | 0.38 | 286.0 | -0.0002 | -0.0006 | 0.6 |
|  | dist+ dist2 + dist3 + dist4 + dir + dir2 + dir3 + dir4+ bsm + bsm2 + bsm3+ bsm4 + Dean + Dean2 | 15283.0 | 45.4 | 0.24 | 0.49 | 0.38 | 286.4 | -0.0002 | -0.0005 | 0.5 |
|  | dist+ dist2 + dist3 + dist4 + slope+ bsm + bsm2 + bsm3+ bsm4 + Dean + Dean2 | 15696.7 | 43.3 | 0.25 | 0.50 | 0.38 | 286.3 | -0.0002 | -0.0009 | 0.6 |
|  | dist+ dist2 + dist3 + dist4 + dir + dir2 + dir3 + dir4+ bsm + bsm2 + bsm3+ bsm4 + Avg | 15278.0 | 45.3 | 0.24 | 0.49 | 0.38 | 288.5 | 0.0001 | 0.0009 | 0.5 |
| 2008 - 2010 | dist+ dist2 + dist3 + dir + dir2 + dir3 + dir4 | 17588.3 | 35.7 | 0.28 | 0.53 | 0.40 | 350.8 | 0 | -0.97 | 0.6 |
|  | dist+ dist2 + dist3 + dir + dir2 + dir3 + dir4 + aspect + aspect2 + aspect3 | 17504.5 | 35.8 | 0.28 | 0.53 | 0.41 | 301.7 | -0.0005 | -1.57 | 0.6 |
|  | ***dist+ dist2 + dist3 + dir + dir2 + dir3 + dir4 + bsm + bsm2 + bsm3+ bsm4*** | ***17492.9*** | ***36.2*** | ***0.28*** | ***0.53*** | ***0.40*** | ***380.3*** | ***-0.00002*** | ***-0.98*** | ***0.6*** |
|  | dist+ dist2 + dist3 + aspect + aspect2 + aspect3+ bsm + bsm2 + bsm3+ bsm4 | 18367.6 | 31.1 | 0.30 | 0.55 | 0.42 | 346.7 | 0.00004 | -1.04 | 0.7 |
|  | dist+ dist2 + dist3 + dir + dir2 + dir3 + dir4 + aspect + aspect2 + aspect3 + bsm + bsm2 + bsm3+ bsm4 | 17475.0 | 36.4 | 0.28 | 0.53 | 0.40 | 377.0 | -0.00002 | -1.00 | 0.6 |
| 2010 - 2013 | dist+ dist2 + dist3 + dist4 + dir + dir2 + dir3 + dir4 | 14272.7 | 36.9 | 0.21 | 0.46 | 0.35 | 206.64 | -0.00006 | 0.0022 | 0.63 |
|  | dist+ dist2 + dist3 + dist4 + dir + dir2 + dir3 + dir4 + slope + slope2 | 14260.5 | 37.0 | 0.21 | 0.46 | 0.35 | 206.10 | -0.00010 | 0.0020 | 0.63 |
|  | dist+ dist2 + dist3 + dist4 + dir + dir2 + dir3 + dir4 + Ivan | 14255.4 | 37.0 | 0.21 | 0.46 | 0.35 | 207.80 | -0.00006 | 0.0023 | 0.63 |
|  | ***dist+ dist2 + dist3 + dist4 + dir + dir2 + dir3 + dir4 + slope + slope2 + bsm + bsm2 + bsm3+ bsm4*** | ***14080.4*** | ***38.1*** | ***0.20*** | ***0.45*** | ***0.34*** | ***203.11*** | ***-0.00012*** | ***0.0019*** | ***0.62*** |
|  | dist+ dist2 + dist3 + dist4 + dir + dir2 + dir3 + dir4 + slope + slope2 + Ivan | 14243.9 | 37.1 | 0.21 | 0.46 | 0.35 | 207.34 | -0.00010 | 0.0020 | 0.63 |
|  | dist+ dist2 + dist3 + dist4 + dir + dir2 + dir3 + dir4 + Avg | 14312.2 | 36.9 | 0.21 | 0.45 | 0.35 | 205.61 | -0.00353 | -0.0154 | 0.63 |
| 2013 - 2015 | dist+ dist2 + dist3 + dist4 + dir + dir2 + dir3 + dir4 | 38383.7 | 9.6 | 1.75 | 1.32 | 1.01 | 270.9 | 0 | 0.036 | 0.91 |
|  | ***dir + dir2 + dir3 + dir4 + bsm + bsm2 + bsm3+ bsm4*** | ***37814.9*** | ***14.0*** | ***1.65*** | ***1.28*** | ***0.98*** | ***256.9*** | ***0.009*** | ***0.090*** | ***0.86*** |
|  | dist+ dist2 + dist3 + dist4 + dir + dir2 + dir3 + dir4 + aspect | 38366.5 | 9.7 | 1.75 | 1.32 | 1.01 | 269.7 | 0.00004 | 0.036 | 0.90 |
|  | dist+ dist2 + dist3 + dist4 + dir + dir2 + dir3 + dir4 + aspect + Dean | 38383.7 | 9.7 | 1.73 | 1.32 | 1.01 | 247.1 | 0.009 | 0.094 | 0.90 |
|  | dist+ dist2 + dist3 + dist4 + dir + dir2 + dir3 + dir4 + Avg | 38373.1 | 9.6 | 1.75 | 1.32 | 1.01 | 267.6 | 0.00002 | 0.035 | 0.91 |
|  | dist+ dist2 + dist3 + dist4 + dir + dir2 + dir3 + dir4 + slope + Avg | 38371.0 | 9.7 | 1.75 | 1.32 | 1.01 | 265.3 | 0.00016 | 0.036 | 0.90 |
| 2015 - 2016 | dist+ dist2 + dist3 + dist4 + bsm + bsm2 + bsm3 | 30904.9 | 52.0 | 0.73 | 0.86 | 0.66 | 316.4 | 0.0001 | 0.0004 | 0.48 |
|  | ***dist+ dist2 + dist3 + dist4 + dir + dir2 + dir3 + dir4 + bsm + bsm2 + bsm3*** | ***27722.6*** | ***54.6*** | ***0.69*** | ***0.83*** | ***0.64*** | ***304.7*** | ***-0.0007*** | ***0.0013*** | ***0.45*** |
|  | dist+ dist2 + dist3 + dist4 + aspect + aspect2 + aspect3 +bsm + bsm2 + bsm3 | 28304.1 | 52.1 | 0.73 | 0.86 | 0.66 | 318.5 | 0.0001 | 0.0004 | 0.48 |
|  | dist+ dist2 + dist3 + dist4 + slope + slope2 + slope3+ bsm + bsm2 + bsm3 | 28300.3 | 52.1 | 0.73 | 0.86 | 0.66 | 320.3 | -0.0001 | 0.0006 | 0.48 |
|  | dist+ dist2 + dist3 + dist4 + aspect + aspect2 + aspect3 +slope + slope2 + slope3+ bsm + bsm2 + bsm3 | 28273.1 | 52.3 | 0.73 | 0.85 | 0.66 | 322.3 | -0.0001 | 0.0006 | 0.48 |
| 2016 - 2017 | dist+ dist2 + dist3 + dir + dir2 + dir3 | 31930.9 | 21.2 | 1.01 | 1.00 | 0.78 | 1681.7 | 0.0005 | 0.08 | 0.79 |
|  | dist+ dist2 + dist3 + dir + dir2 + dir3 + aspect + aspect2 | 23902.6 | 21.7 | 0.99 | 1.00 | 0.77 | 1501.3 | 0.0109 | -0.03 | 0.79 |
|  | ***dist+ dist2 + dist3 + dir + dir2 + dir3 + slope + slope2*** | ***23892.4*** | ***21.8*** | ***0.99*** | ***0.99*** | ***0.77*** | ***1729.7*** | ***0.0105*** | ***-0.02*** | ***0.78*** |
|  | dist+ dist2 + dist3 + dir + dir2 + dir3 + aspect + aspect2 + aspect3 +slope + slope2 | 31748.4 | 22.3 | 1.00 | 1.00 | 0.78 | 1275.2 | 0.0004 | 0.08 | 0.78 |
|  | dist+ dist2 + dist3 + aspect + aspect2 + aspect3 +slope + slope2 + bsm + bsm2 + bsm3 | 32947.4 | 13.5 | 1.11 | 1.05 | 0.83 | 2649.8 | 0.0003 | 0.09 | 0.87 |
| 2017 - 2019 | dist+ dist2 + dist3 + dist4 + dir + dir2 + dir3 + dir4 + bsm + bsm2 + bsm3 | 13069.5 | 28.8 | 0.19 | 0.43 | 0.31 | 551.2 | -0.00010 | 0.0007 | 0.71 |
|  | ***dist+ dist2 + dist3 + dist4 + dist4 + dir + dir2 + dir3 + dir4 + aspect + aspect2 + aspect3+ aspect4 + bsm + bsm2 + bsm3*** | ***13068.3*** | ***28.8*** | ***0.19*** | ***0.43*** | ***0.31*** | ***547.5*** | ***-0.00008*** | ***0.0008*** | ***0.72*** |
|  | ***dist+ dist2 + dist3 + dist4 + dist4 + dir + dir2 + dir3 + dir4 + slope + slope2 + slope3 + slope4 + bsm + bsm2 + bsm3*** | ***13059.3*** | ***28.9*** | ***0.19*** | ***0.43*** | ***0.31*** | ***553.0*** | ***0.00004*** | ***0.0013*** | ***0.71*** |
|  | dist+ dist2 + dist3 + dist4 + dist4 + dir + dir2 + dir3 + dir4 + aspect + aspect2 + aspect3+ aspect4 + slope + slope2 + slope3 + slope4 + bsm + bsm2 + bsm3 | 13058.7 | 28.9 | 0.19 | 0.43 | 0.31 | 549.5 | 0.00008 | 0.0014 | 0.71 |
|  | dist+ dist2 + dist3 + dist4 + dir + dir2 + dir3 + dir4 + aspect + aspect2 + aspect3+ aspect4 + slope + slope2 + slope3 + slope4 | 14420.3 | 19.8 | 0.21 | 0.46 | 0.33 | 520.0 | 0.00002 | 0.0017 | 0.81 |
| 2019 - 2020 | ***dist+ dist2 + dist3 + dist4 + dir + dir2 + dir3 + dir4*** | ***20352.5*** | ***36.4*** | ***0.36*** | ***0.60*** | ***0.45*** | ***276.2*** | ***0.00012*** | ***-0.00080*** | ***0.64*** |
|  | dir + dir2 + dir3 + dir4 + bsm + bsm2 + bsm3 | 21429.6 | 30.0 | 0.39 | 0.63 | 0.48 | 322.3 | 0.00006 | -0.00038 | 0.70 |
|  | dir + dir2 + dir3 + dir4 + slope + slope2 + slope3 | 21748.3 | 28.0 | 0.41 | 0.64 | 0.49 | 315.5 | 0 | 0 | 0.72 |
|  | dir + dir2 + dir3 + dir4 + slope + slope2 + slope3 + bsm + bsm2 + bsm3 | 21353.2 | 30.5 | 0.39 | 0.63 | 0.48 | 320.6 | 0.00002 | 0.00002 | 0.70 |
|  | dist+ dist2 + dist3 + dist4 + aspect + aspect2 + aspect3+ slope + slope2 + slope3 + bsm + bsm2 + bsm3 | 21817.4 | 27.6 | 0.41 | 0.64 | 0.48 | 270.8 | 0.00016 | -0.00050 | 0.73 |
| 2020 - 2021 | dist+ dist2 + dist3 + dist4 + dir + dir2 + dir3 | 21061.7 | 37.3 | 0.38 | 0.62 | 0.46 | 740.9 | 0.00008 | 0.0038 | 0.63 |
|  | dist+ dist2 + dist3 + bsm + bsm2 + bsm3+ bsm4 | 21946.6 | 32.2 | 0.41 | 0.64 | 0.48 | 888.0 | 0.00014 | 0.0044 | 0.68 |
|  | dist+ dist2 + dist3 + dist4 + dir + dir2 + dir3 + bsm + bsm2 + bsm3+ bsm4 | 20473.5 | 41.1 | 0.36 | 0.60 | 0.45 | 778.0 | 0.00012 | 0.0033 | 0.59 |
|  | dist+ dist2 + dist3 + aspect + aspect2 + aspect3+ aspect4 + bsm + bsm2 + bsm3+ bsm4 | 21945.2 | 32.3 | 0.41 | 0.64 | 0.48 | 900.9 | 0.00016 | 0.0042 | 0.68 |
|  | ***dist+ dist2 + dist3 + dist4 + dir + dir2 + dir3 + aspect + aspect2 + aspect3+ aspect4 + bsm + bsm2 + bsm3+ bsm4*** | ***20362.5*** | ***41.2*** | ***0.36*** | ***0.60*** | ***0.45*** | ***783.0*** | ***0.00010*** | ***0.0033*** | ***0.59*** |

dir = direction from river mouth; dis = distance from river mouth; bsm = bathymetric surface model (depth); Gilbert = exposure vulnerability (EV) for Hurricane Gilbert; Ivan = EV for Hurricane Ivan; Dean = EV for Hurricane Dean; Avg. = average EV for Ivan and Dean.