Adult Summary

Daniel J Hocking

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## Summarize Data

|  |  |  |  |
| --- | --- | --- | --- |
| Variable | Mean | Min | Max |
| AreaSqKM | 239.2 | 0.4 | 18068 |
| forest | 79.15 | 0 | 100 |
| surfcoarse | 6.62 | 0 | 100 |
| temp\_mean\_summer\_1 | 17.74 | 15.21 | 21.66 |
| temp\_mean\_fall\_1 | 3.49 | -0.09 | 7.3 |
| temp\_mean\_winter | -1.77 | -7.99 | 2.87 |
| temp\_mean\_spring | 14.63 | 10.31 | 17.31 |
| prcp\_mean\_summer\_1 | 3.78 | 1.59 | 8.92 |
| prcp\_mean\_fall\_1 | 2.99 | 1.29 | 5.01 |
| prcp\_mean\_winter | 2.58 | 1.1 | 4.73 |
| prcp\_mean\_spring | 2.91 | 1.42 | 6.9 |

The West Susquehanna watershed contained 11220 nodes, comprised of 349 survey sites and 10871 stream reaches. Sites were survey in a total of 34 from 1981 and 2014. There were a total of 683 site visits with a mean of 2 and a range of 1 to 21 visits per site. The total drainage area of the watershed was 1.806810^{4} and the smallest stream had a cumulative drainage area of 0.4. The median drainage area was 4.4. The mean distance between nodes in the network was 1.373 and ranged from 0.001 to 11.613 with a median of 1.114 km.

## Model Comparison

|  |  |  |  |
| --- | --- | --- | --- |
| M\_num | Model | AIC | delta\_AIC |
| 4 | Spatiotemporal | 9408 | 0.0 |
| 5 | Temporal + ST | 9408 | 0.3 |
| 7 | Spatial + Temporal | 9583 | 174.9 |
| 3 | Spatial | 9588 | 180.2 |
| 2 | Temporal | 9783 | 375.3 |
| 1 | Obs | 9794 | 386.5 |

|  |  |  |  |
| --- | --- | --- | --- |
| M\_num | Model | AIC | delta\_AIC |
| 5 | Temporal + ST | 9592 | 0 |
| 6 | S+T+ST | 9596 | 4 |
| 4 | Spatiotemporal | 9663 | 71 |
| 8 | Spatial + ST | 9666 | 74 |
| 7 | Spatial + Temporal | 9739 | 147 |
| 3 | Spatial | 9801 | 209 |
| 2 | Temporal | 9925 | 333 |
| 1 | Obs | 10048 | 456 |

Table continues below

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| mean\_N | mu | sigmaIID | rhot | sigmat | theta |
| 44.4 | 0.03315 | 0.5271 | -0.05287 | 0.7631 | 1 |

Table continues below

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| log\_theta\_vec | log\_theta\_vec | theta\_st | SDinput\_st | rho\_st |
| 0 | -2.052 | 0.1285 | 0.6535 | 0.9815 |

Table continues below

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| gamma\_j | gamma\_j | gamma\_j | gamma\_j | gamma\_j | gamma\_j |
| 1.12 | 0.04189 | 0.02157 | 0.05375 | -0.6794 | 0.005151 |

|  |  |
| --- | --- |
| gamma\_j | gamma\_j |
| -0.01061 | -0.06014 |

|  |  |  |
| --- | --- | --- |
| Parameter | Adult | YOY |
| mu | 0.0863301553771209 | 0.033 |
| sigma.mu | 0.360143069917424 | 0.527 |
| theta | NA | NA |
| rhot | 0.592091398513263 | -0.053 |
| sigmat | 0.157625491208394 | 0.763 |
| theta\_st | 0.157951848837916 | 0.129 |
| SD\_st | need | 0.653 |
| rho\_st | 0.973534527694906 | 0.981 |
| forest | 0.821918975822621 | 1.120 |
| surfcoarse | 0.0128252893372141 | 0.042 |
| temp\_mean\_summer\_1 | -0.262772270364136 | NA |
| temp\_mean\_fall\_1 | 0.0917908886840298 | 0.022 |
| temp\_mean\_winter | -0.00861762420043656 | 0.054 |
| temp\_mean\_spring | -0.158564951882698 | -0.679 |
| prcp\_mean\_summer\_1 | -0.0183042310904147 | NA |
| prcp\_mean\_fall\_1 | 0.0493511223964161 | 0.005 |
| prcp\_mean\_winter | 0.043013275406413 | -0.011 |
| prcp\_mean\_spring | 0.0445929903769732 | -0.060 |

## Warning in data.row.names(row.names, rowsi, i): some row.names duplicated:  
## 2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114,115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,130,131,132,133,134,135,136,137,138,139,140,141,142,143,144,145,146,147,148,149,150,151,152,153,154,155,156,157,158,159,160,161,162,163,164,165,166,167,168,169,170,171,172,173,174,175,176,177,178,179,180,181,182,183,184,185,186,187,188,189,190,191,192,193,194,195,196,197,198,199,200,201,202,203,204,205,206,207,208,209,210,211,212,213,214,215,216,217,218,219,220,221,222,223,224,225,226,227,228,229,230,231,232,233,234,235,236,237,238,239,240,241,242,243,244,245,246,247,248,249,250,251,252,253,254,255,256,257,258,259,260,261,262,263,264,265,266,267,268,269,270,271,272,273,274,275,276,277,278,279,280,281,282,283,284,285,286,287,288,289,290,291,292,293,294,295,296,297,298,299,300,301,302,303,304,305,306,307,308,309,310,311,312,313,314,315,316,317,318,319,320,321,322,323,324,325,326,327,328,329,330,331,332,333,334,335,336,337,338,339,340,341,342,343,344,345,346,347,348,349,350,351,352,353,354,355,356,357,358,359,360,361,362,363,364,365,366,367,368,369,370,371,372,373,374,375,376,377,378,379,380,381,382,383,384,385,386,387,388,389,390,391,392,393,394,395,396,397,398,399,400,401,402,403,404,405,406,407,408,409,410,411,412,413,414,415,416,417,418,419,420,421,422,423,424,425,426,427,428,429,430,431,432,433,434,435,436,437,438,439,440,441,442,443,444,445,446,447,448,449,450,451,452,453,454,455,456,457,458,459,460,461,462,463,464,465,466,467,468,469,470,471,472,473,474,475,476,477,478,479,480,481,482,483,484,485,486,487,488,489,490,491,492,493,494,495,496,497,498,499,500,501,502,503,504,505,506,507,508,509,510,511,512,513,514,515,516,517,518,519,520,521,522,523,524,525,526,527,528,529,530,531,532,533,534,535,536,537,538,539,540,541,542,543,544,545,546,547,548,549,550,551,552,553,554,555,556,557,558,559,560,561,562,563,564,565,566,567,568,569,570,571,572,573,574,575,576,577,578,579,580,581,582,583,584,585,586,587,588,589,590,591,592,593,594,595,596,597,598,599,600,601,602,603,604,605,606,607,608,609,610,611,612,613,614,615,616,617,618,619,620,621,622,623,624,625,626,627,628,629,630,631,632,633,634,635,636,637,638,639,640,641,642,643,644,645,646,647,648,649,650,651,652,653,654,655,656,657,658,659,660,661,662,663,664,665,666,667,668,669,670,671,672,673,674,675,676,677,678,679,680,681,682,683,684,685,686,687,688,689,690,691,692,693,694,695,696,697,698,699,700,701,702,703,704,705,706,707,708,709,710,711,712,713,714,715,716,717,718,719,720,721,722,723,724,725,726,727,728,729,730,731,732,733,734,735,736,737,738,739,740,741,742,743,744,745,746,747,748,749,750,751,752,753,754,755,756,757,758,759,760,761,762,763,764,765,766,767,768,769,770,771,772,773,774,775,776,777,778,779,780,781,782,783,784,785,786,787,788,789,790,791,792,793,794,795,796,797,798,799,800,801,802,803,804,805,806,807,808,809,810,811,812,813,814,815,816,817,818,819,820,821,822,823,824,825,826,827,828,829,830,831,832,833,834,835,836,837,838,839,840,841,842,843,844,845,846,847,848,849,850,851,852,853,854,855,856,857,858,859,860,861,862,863,864,865,866,867,868,869,870,871,872,873,874,875,876,877,878,879,880,881,882,883,884,885,886,887,888,889,890,891,892,893,894,895,896,897,898,899,900,901,902,903,904,905,906,907,908,909,910,911,912,913,914,915,916,917,918,919,920,921,922,923,924,925,926,927,928,929,930,931,932,933,934,935,936,937,938,939,940,941,942,943,944,945,946,947,948,949,950,951,952,953,954,955,956,957,958,959,960,961,962,963,964,965,966,967,968,969,970,971,972,973,974,975,976,977,978,979,980,981,982,983,984,985,986,987,988,989,990,991,992,993,994,995,996,997,998,999,1000,1001,1002,1003,1004,1005,1006,1007,1008,1009,1010,1011,1012,1013,1014,1015,1016,1017,1018,1019,1020,1021,1022,1023,1024,1025,1026,1027,1028,1029,1030,1031,1032,1033,1034,1035,1036,1037,1038,1039,1040,1041,1042,1043,1044,1045,1046,1047,1048,1049,1050,1051,1052,1053,1054,1055,1056,1057,1058,1059,1060,1061,1062,1063,1064,1065,1066,1067,1068,1069,1070,1071,1072,1073,1074,1075,1076,1077,1078,1079,1080,1081,1082,1083,1084,1085,1086,1087,1088,1089,1090,1091,1092,1093,1094,1095,1096,1097,1098,1099,1100,1101,1102,1103,1104,1105,1106,1107,1108,1109,1110,1111,1112,1113,1114,1115,1116,1117,1118,1119,1120,1121,1122,1123,1124,1125,1126,1127,1128,1129,1130,1131,1132,1133,1134,1135,1136,1137,1138,1139,1140,1141,1142,1143,1144,1145,1146,1147,1148,1149,1150,1151,1152,1153,1154,1155,1156,1157,1158,1159,1160,1161,1162,1163,1164,1165,1166,1167,1168,1169,1170,1171,1172,1173,1174,1175,1176,1177,1178,1179,1180,1181,1182,1183,1184,1185,1186,1187,1188,1189,1190,1191,1192,1193,1194,1195,1196,1197,1198,1199,1200,1201,1202,1203,1204,1205,1206,1207,1208,1209,1210,1211,1212,1213,1214,1215,1216,1217,1218,1219,1220,1221,1222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## Warning in data.row.names(row.names, rowsi, i): some row.names duplicated:  
## 8,13,14,15,16,17,18,19,20,21 --> row.names NOT used

## Warning in data.row.names(row.names, rowsi, i): some row.names duplicated:  
## 8,13,14,15,16,17,18,19 --> row.names NOT used

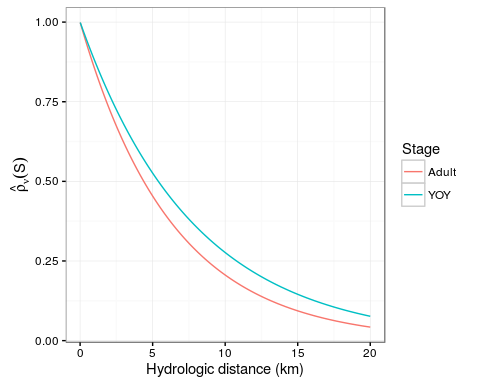
|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Estimate | Std..Error | z.value | Pr...z.2.. |
| mean\_N | 36.686 | 4.051 | 9.1 | 1e-19 |
| mu | 0.086 | 0.011 | 7.5 | 5e-14 |
| sigmaIID | 0.360 | 0.036 | 10.0 | 2e-23 |
| rhot | 0.592 | 0.255 | 2.3 | 2e-02 |
| sigmat | 0.158 | 0.059 | 2.7 | 7e-03 |
| theta | 1.000 | 0.000 | Inf | 0e+00 |
| log\_theta\_vec | 0.000 | 0.000 | NaN | NaN |
| log\_theta\_vec | -1.845 | 0.199 | -9.3 | 2e-20 |
| theta\_st | 0.158 | 0.032 | 5.0 | 5e-07 |
| SDinput\_st | 0.588 | 0.059 | 10.0 | 1e-23 |
| rho\_st | 0.974 | 0.008 | 128.2 | 0e+00 |
| forest | 0.822 | 0.116 | 7.1 | 1e-12 |
| surfcoarse | 0.013 | 0.064 | 0.2 | 8e-01 |
| temp\_mean\_summer\_1 | -0.263 | 0.052 | -5.1 | 4e-07 |
| temp\_mean\_fall\_1 | 0.092 | 0.032 | 2.9 | 4e-03 |
| temp\_mean\_winter | -0.009 | 0.031 | -0.3 | 8e-01 |
| temp\_mean\_spring | -0.159 | 0.051 | -3.1 | 2e-03 |
| prcp\_mean\_summer\_1 | -0.018 | 0.014 | -1.3 | 2e-01 |
| prcp\_mean\_fall\_1 | 0.049 | 0.016 | 3.1 | 2e-03 |
| prcp\_mean\_winter | 0.043 | 0.020 | 2.1 | 4e-02 |
| prcp\_mean\_spring | 0.045 | 0.022 | 2.1 | 4e-02 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Estimate | Std..Error | z.value | Pr...z.2.. |
| mean\_N | 44.398 | 7.786 | 5.7 | 1e-08 |
| mu | 0.033 | 0.010 | 3.3 | 9e-04 |
| sigmaIID | 0.527 | 0.042 | 12.7 | 6e-37 |
| rhot | -0.053 | 0.208 | -0.3 | 8e-01 |
| sigmat | 0.763 | 0.132 | 5.8 | 7e-09 |
| theta | 1.000 | 0.000 | Inf | 0e+00 |
| log\_theta\_vec | 0.000 | 0.000 | NaN | NaN |
| log\_theta\_vec | -2.052 | 0.188 | -10.9 | 9e-28 |
| theta\_st | 0.129 | 0.024 | 5.3 | 1e-07 |
| SDinput\_st | 0.653 | 0.065 | 10.0 | 1e-23 |
| rho\_st | 0.981 | 0.006 | 168.8 | 0e+00 |
| forest | 1.120 | 0.155 | 7.2 | 5e-13 |
| surfcoarse | 0.042 | 0.083 | 0.5 | 6e-01 |
| temp\_mean\_fall\_1 | 0.022 | 0.113 | 0.2 | 8e-01 |
| temp\_mean\_winter | 0.054 | 0.106 | 0.5 | 6e-01 |
| temp\_mean\_spring | -0.679 | 0.161 | -4.2 | 2e-05 |
| prcp\_mean\_fall\_1 | 0.005 | 0.041 | 0.1 | 9e-01 |
| prcp\_mean\_winter | -0.011 | 0.046 | -0.2 | 8e-01 |
| prcp\_mean\_spring | -0.060 | 0.058 | -1.0 | 3e-01 |

The overall mean probability of detection was 0.740941 for adults and 0.6617185 for YOY, with random variance among sites and years of 0.0455212 and 0.0868778 for adults and YOY, respectively.

Compare values to where fall in relation to simulations

Plot Adult and YOY spatio-temporal decay functions



## Saving 5 x 4 in image