Oikos

WLB-00475

Bruggeman, J. E., Swem, T., Andersen, D. E., Kennedy, P. L. and Nigro, D. 2018. Incorporating productivity as a measure of fitness into models of breeding area quality of Arctic peregrine falcons. – Wildlife Biology 2018: wlb.00475

Appendix 1

Assessment of the predictive capability of the Arctic peregrine falcon intensity of nest-site use model

Methods

Because there are no formal validation measures for ZINB models, we assessed the predictive capability of our model using GIS-derived statistics summarizing measures of predicted intensity of use for each nest-site location as follows. We defined circles around each nest-site location in GIS using the location's measure of precision as the radius and calculated two statistics: 1) maximum predicted intensity of use for raster pixels within the circle; and 2) sum of predicted intensity of use for all raster pixels within the circle divided by circle area. We classified nest-site locations into categories of high and low predicted use for each of the two statistics with high and low use defined by predicted intensity of use ≥ mean and < mean, respectively. We also classified nest-site locations into categories of high and low observed use with the mean as a separating measure.

We then placed nest-site locations into four categories for each statistic: 1) high observed use, high predicted use; 2) high observed use, low predicted use; 3) low observed use, high predicted use; and 4) low observed use, low predicted use. We also determined the portion of the sampling universe predicted to have use, but not observed as used by Arctic peregrines by first adding predicted use for all raster pixels in the sampling universe to obtain the total predicted intensity of use. We calculated the total predicted intensity of use for observed nest-site locations by adding predicted use for all raster pixels within each of the 108 circles. We then divided total use for observed nest-site locations by total use for the sampling universe to obtain the total proportion of predicted intensity of use accounted for by observed nest sites.

Results

Of the 108 nest-site locations, between 17.6–21.3% were classified as high observed use/high predicted use and 33.3% were classified as low observed use/low predicted use for the two summary statistics (Table A1). Average productivity in observed nest sites ranged between 0–4

young and total productivity (i.e. sum of annual productivity over 24 years) in observed nest sites ranged between 0–56 young (Table A1). Eleven observed nest sites classified as low use never produced any young over the 24-year study; no observed high-use nest sites failed to produce young. Total proportion of predicted intensity of use accounted for by observed nest sites across the sampling universe was 0.35.

Table A1. Number of observed nest sites, mean average productivity and standard error (SE), range in average productivity, mean total productivity and SE, and range in total productivity for four categories of observed and model-predicted intensity of Arctic peregrine falcon nest-site use along the Colville River, AK, USA during 1981-2002, 2005 and 2011 for each of two GIS-derived statistics (maximum predicted intensity of use; sum of predicted intensity of use adjusted for area).

Observed / predicted use category	No. nest sites	Mean average productivity ± SE	Average productivity range	Mean total productivity ± SE	Total productivity range
Statistic[a]		Maximum predicted intensity of use			
High / high	23	1.15 ± 0.122	0.50 – 3.3	20.0 ± 2.34	7 – 56
High / low	36	1.30 ± 0.077	0.70 – 2.2	23.6 ± 1.94	11 – 51
Low / high	13	0.970 ± 0.205	0.00 – 2.2	5.53 ± 1.29	0 – 14
Low / low	36	0.987 ± 0.161	0.00 – 4.0	5.67 ± 0.996	0 – 24
Statistic[a]		Sum of predicted intensity of use adjusted for area			
High / high	19	1.22 ± 0.141	0.50 – 3.3	21.4 ± 2.63	8 – 56
High / low	40	1.26 ± 0.074	0.58 – 2.2	22.6 ± 1.84	7 – 51
Low / high	13	0.788 ± 0.190	0.00 – 2.2	4.84 ± 1.09	0 – 11
Low / low	36	1.05 ± 0.162	0.00 – 4.0	5.92 ± 1.02	0 – 24

[a] GIS statistics were calculated by defining circles around each nest-site location using the location's estimated measure of precision as the radius and determining the maximum predicted intensity of use for raster pixels within the circle and the sum of predicted intensity of use for all raster pixels within the circle divided by circle area.

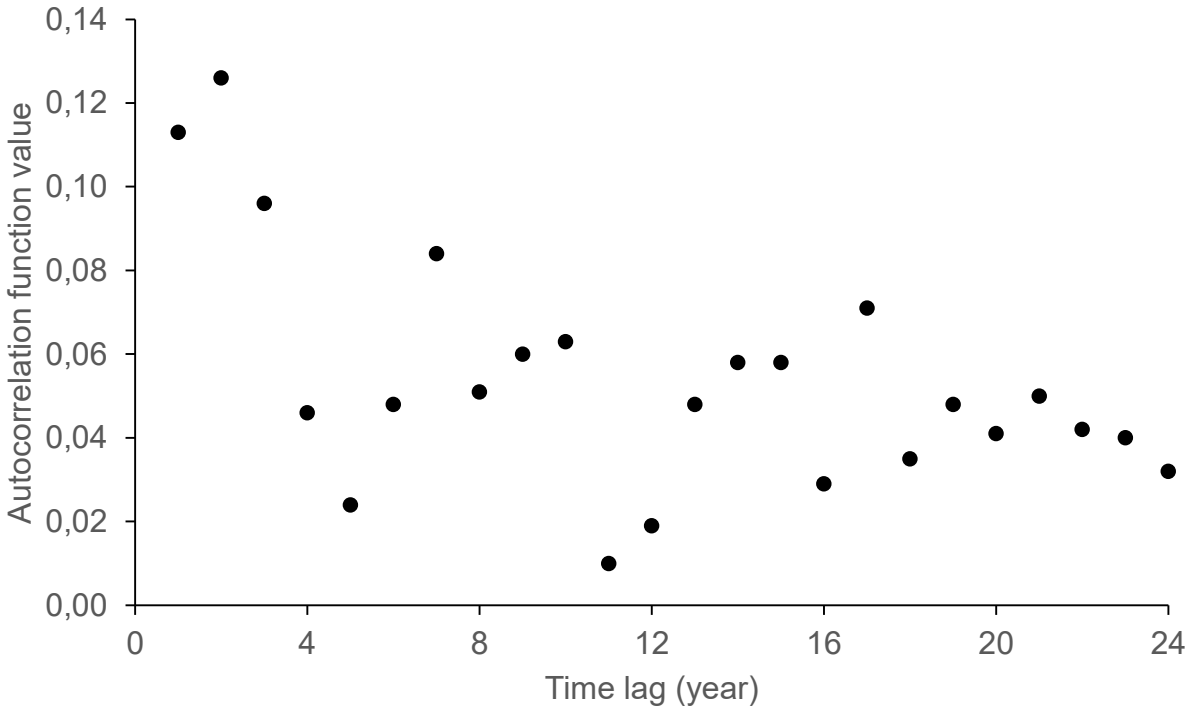

Figure A1. Relationship between the autocorrelation function value of residuals and time lag (no. of years) for the model examining productivity as a function of year without accounting for repeated territory observations.

Appendix 2

Maps of predicted intensity of Arctic peregrine falcon nest-site use along the Colville River in the Colville River Special Area, Alaska, USA

The maps are ordered from west (upriver) to east (downriver) such that Fig. A1 depicts predicted intensity of nest-site use at the westernmost edge of our study area and Fig. A23 depicts the easternmost edge of our study area.

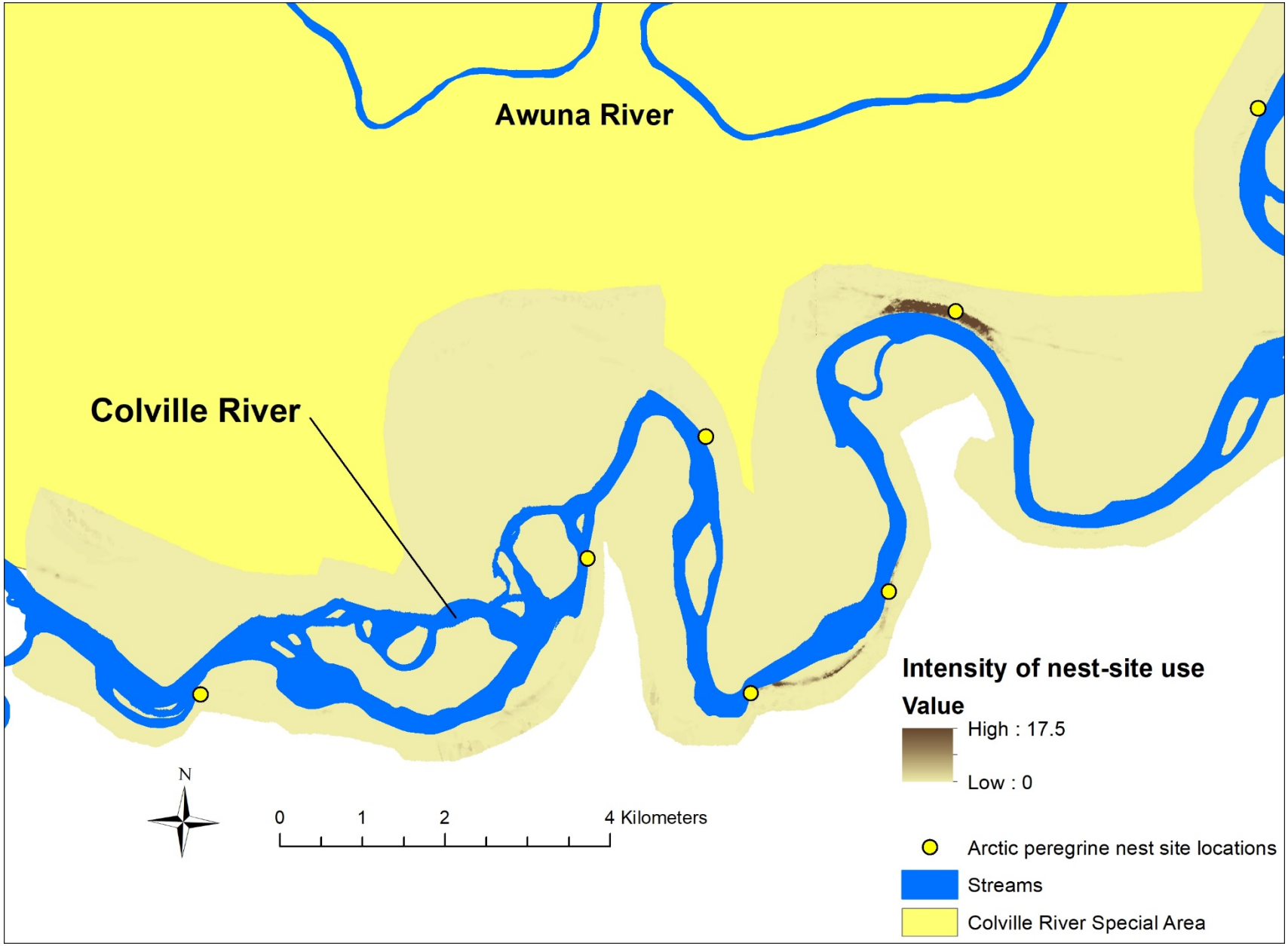

Figure A1. Predicted intensity of Arctic peregrine falcon nest-site use along the Colville River, AK, USA.

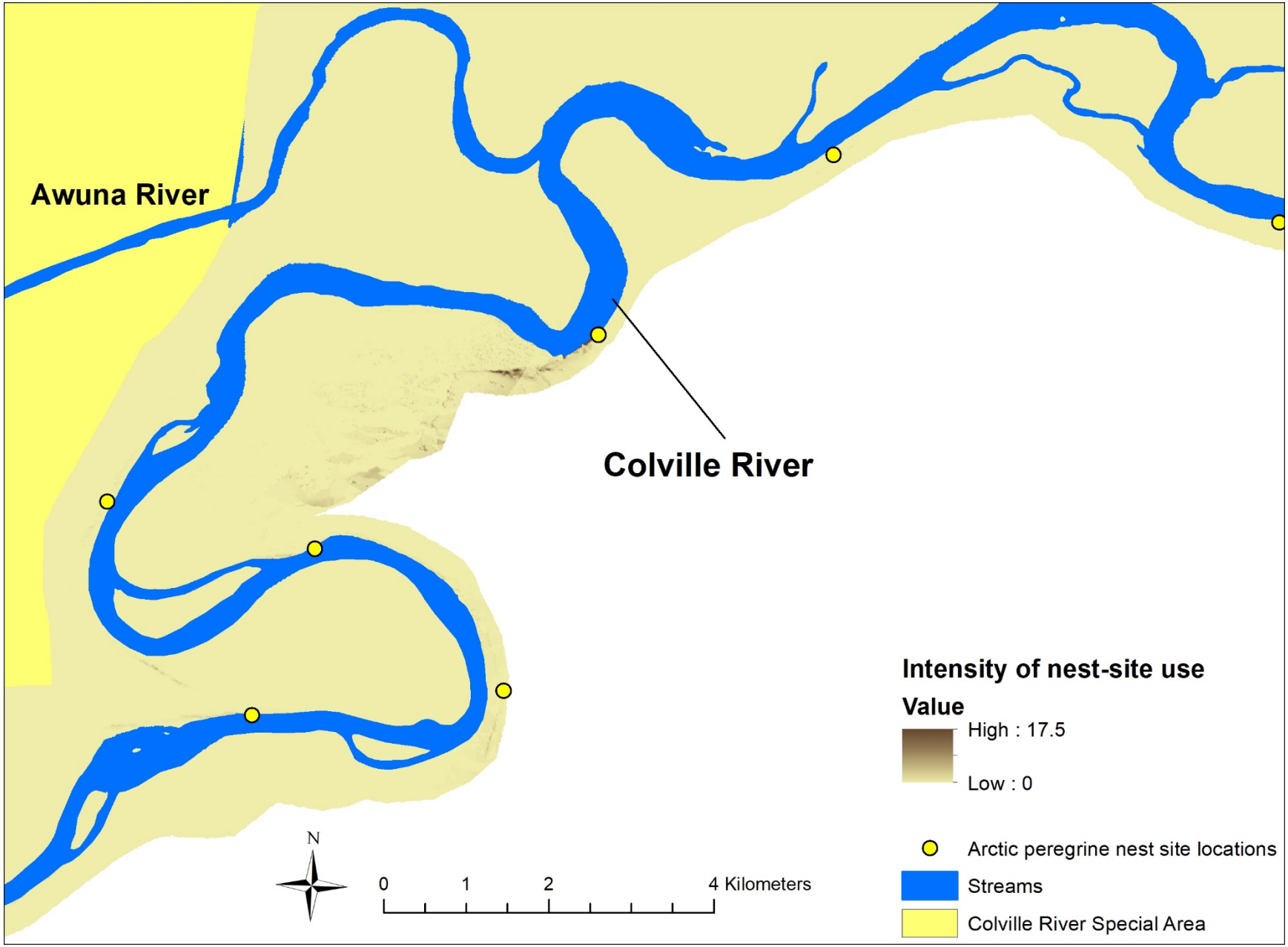

Figure A2. Predicted intensity of Arctic peregrine falcon nest-site use along the Colville River, AK, USA.

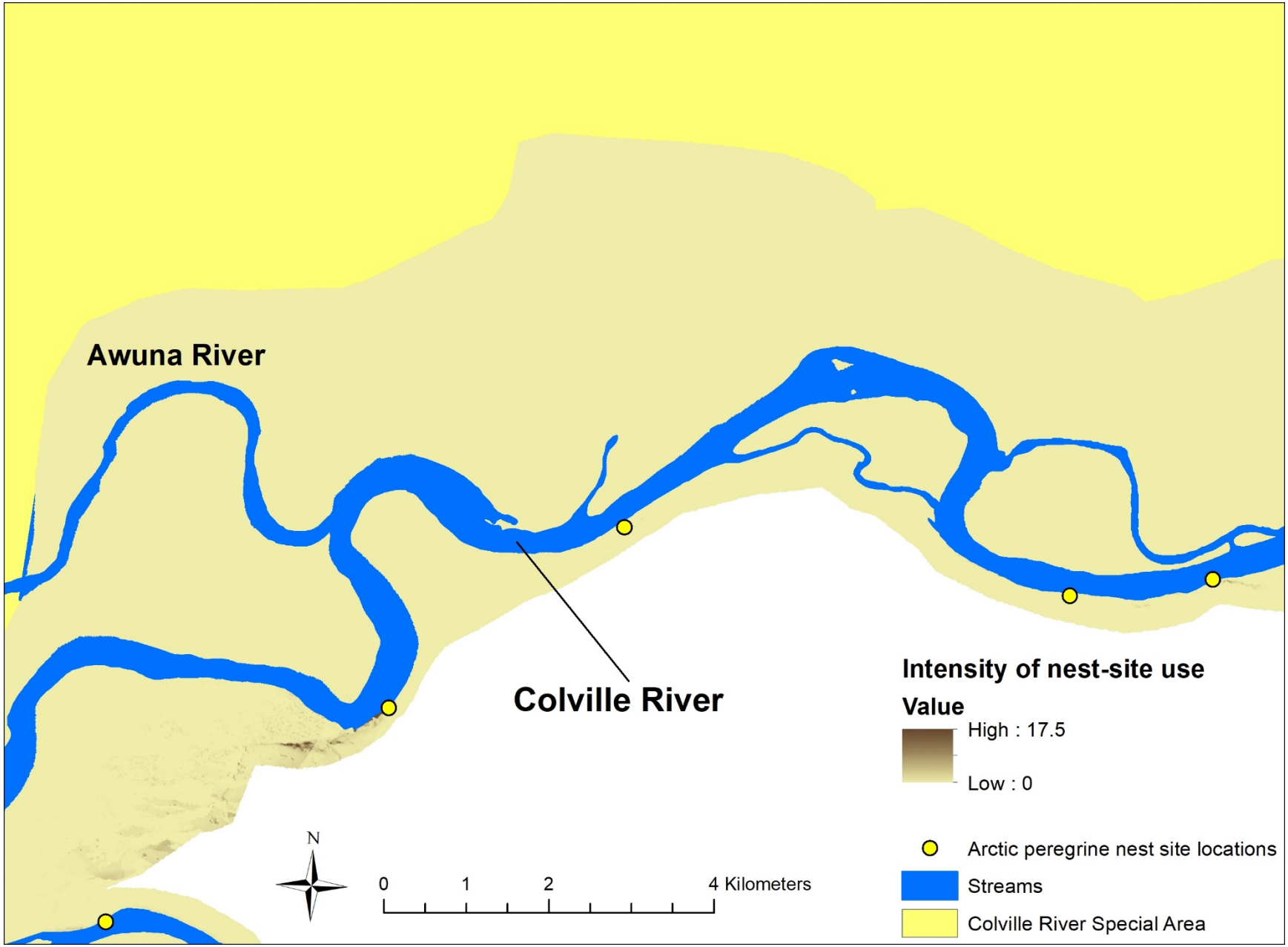

Figure A3. Predicted intensity of Arctic peregrine falcon nest-site use along the Colville River, AK, USA.

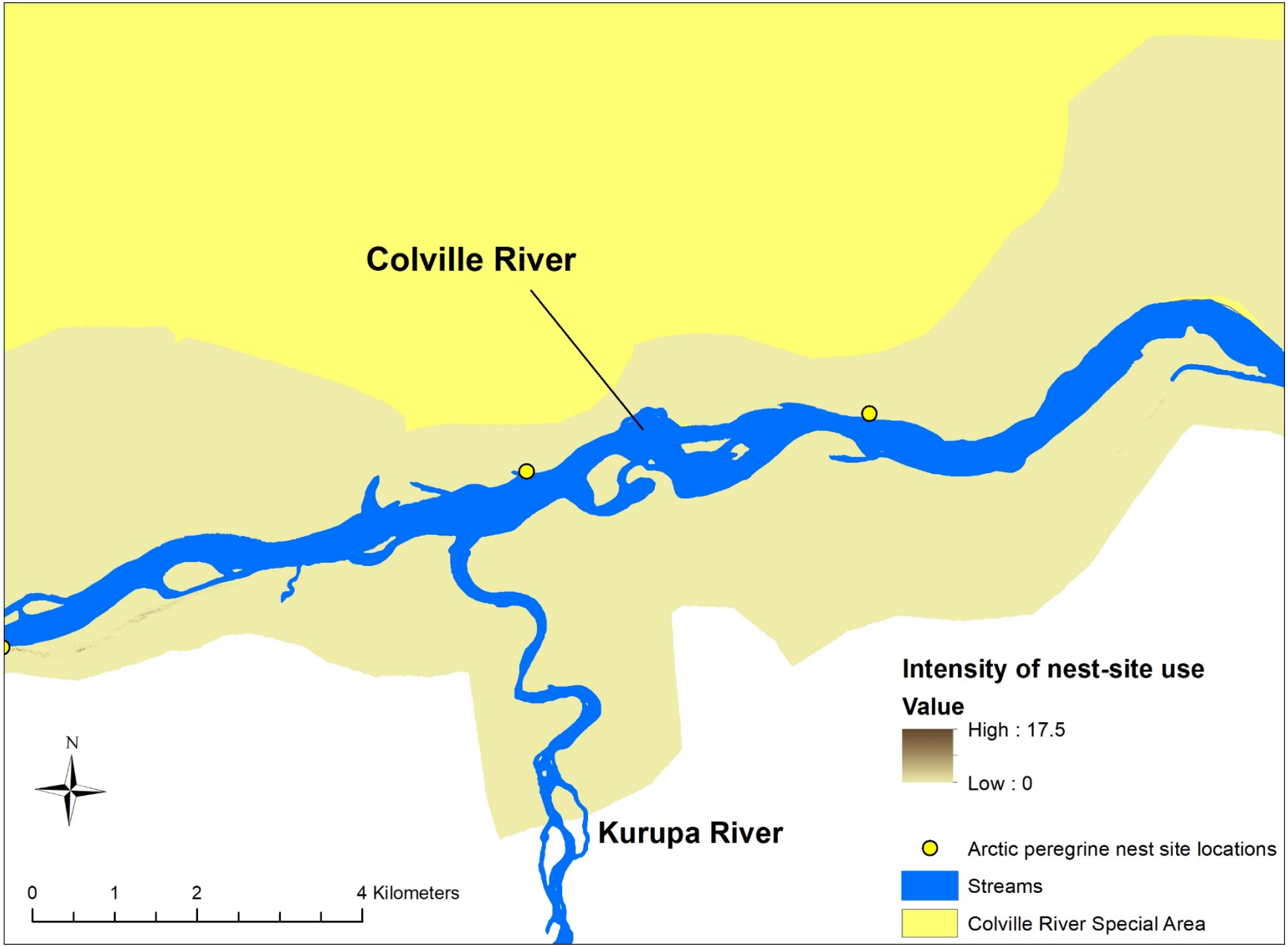

Figure A4. Predicted intensity of Arctic peregrine falcon nest-site use along the Colville River, AK, USA.

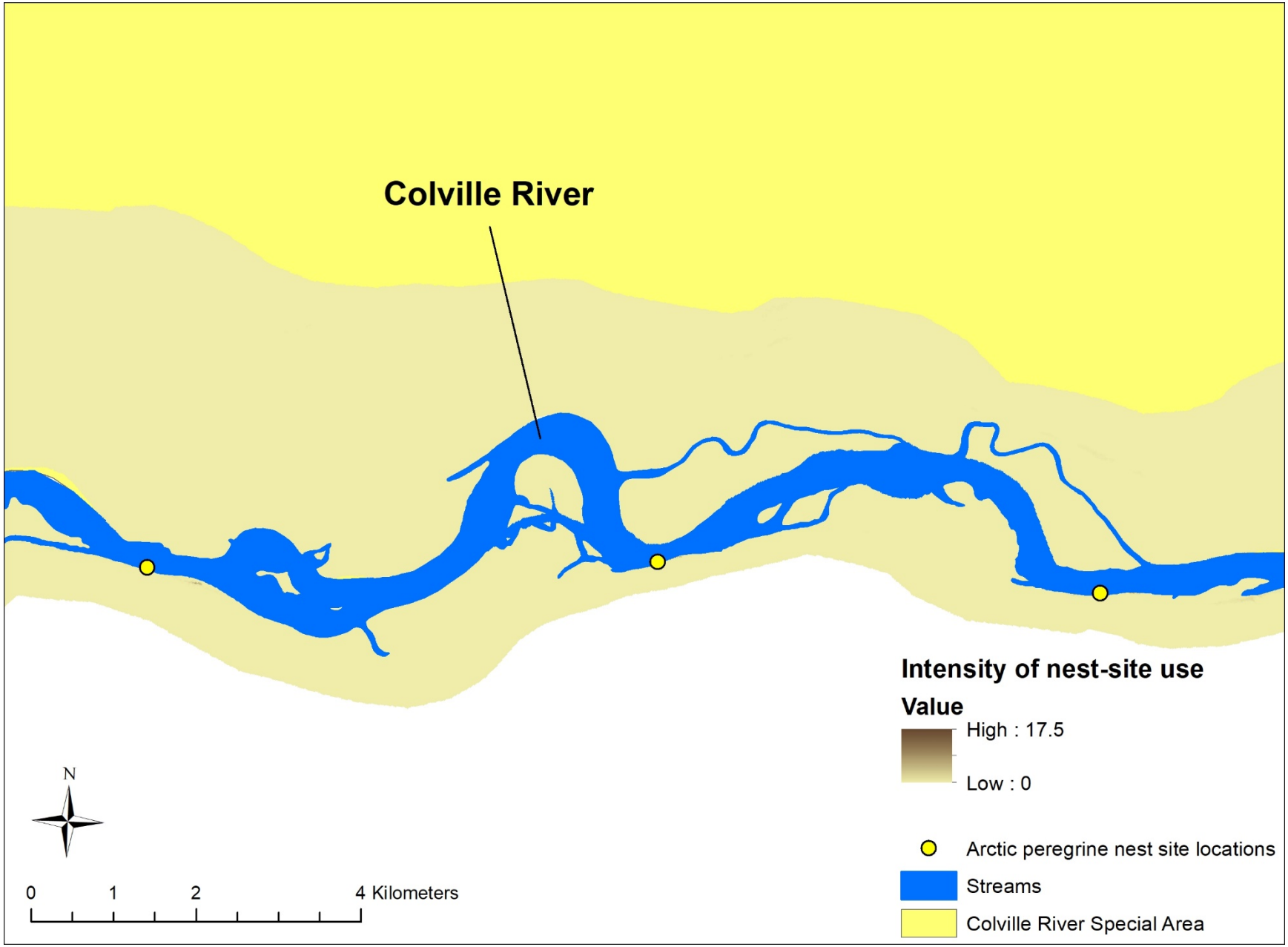

Figure A5. Predicted intensity of Arctic peregrine falcon nest-site use along the Colville River, AK, USA.

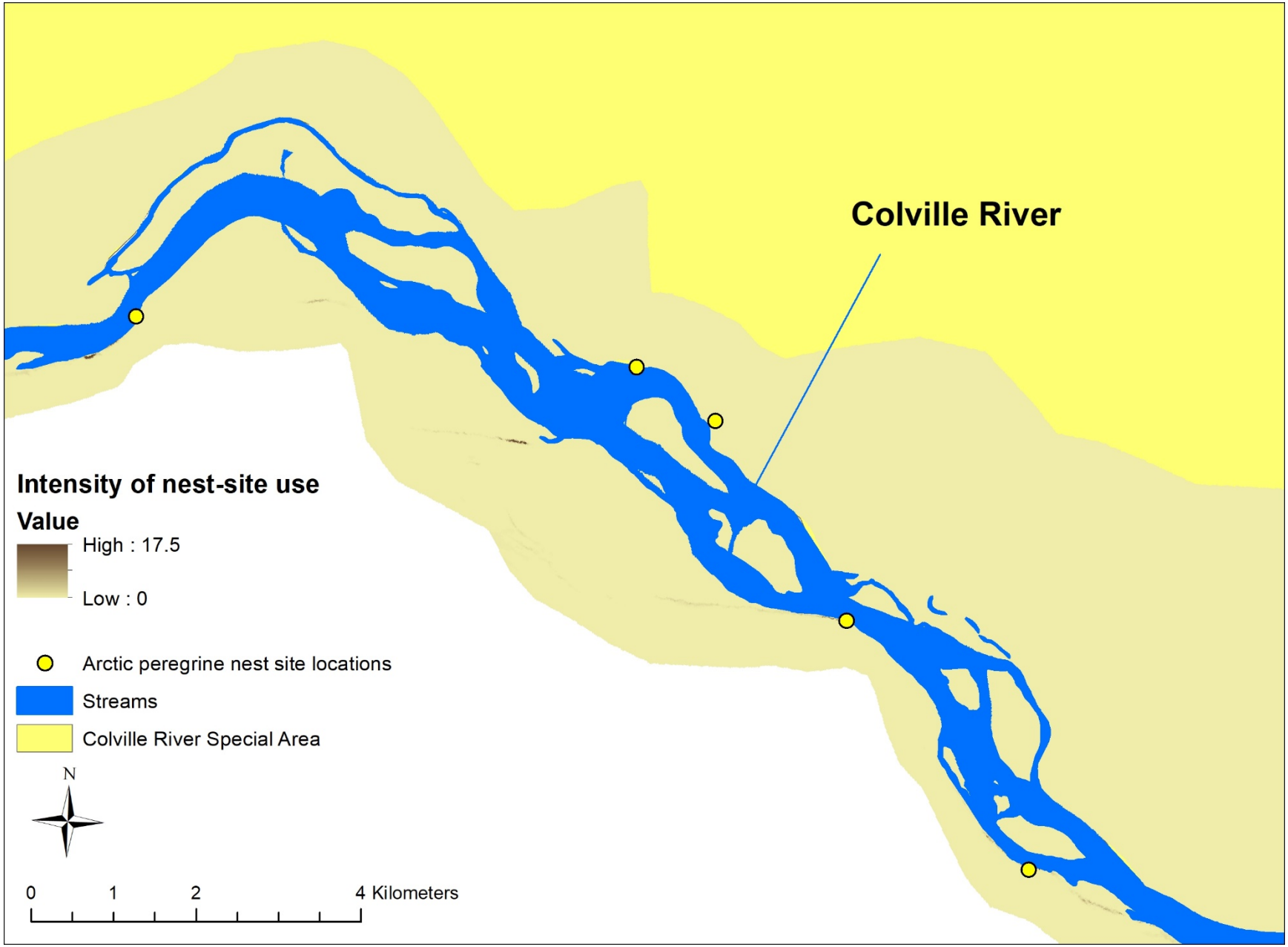

Figure A6. Predicted intensity of Arctic peregrine falcon nest-site use along the Colville River, AK, USA.

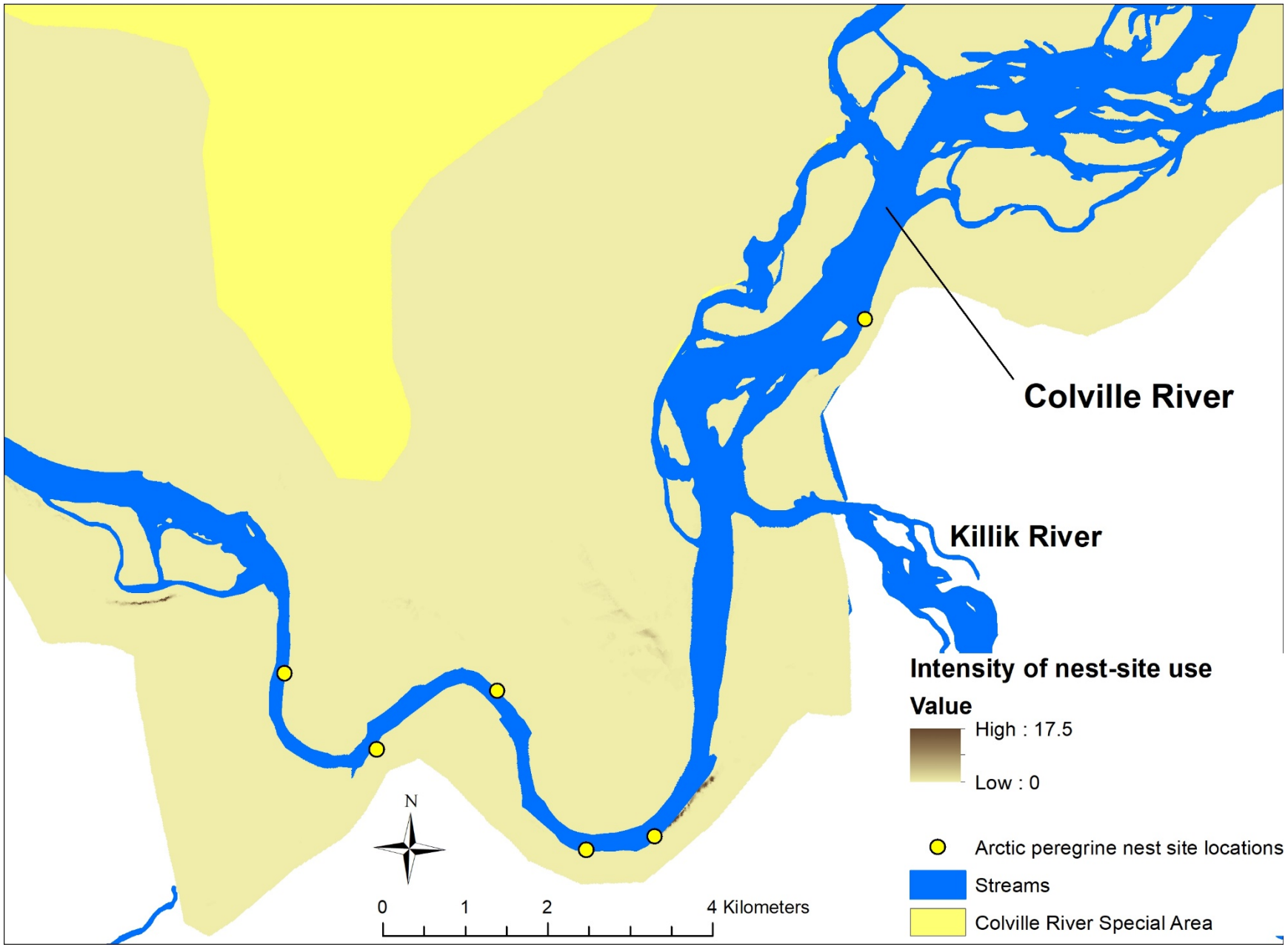

Figure A7. Predicted intensity of Arctic peregrine falcon nest-site use along the Colville River, AK, USA.

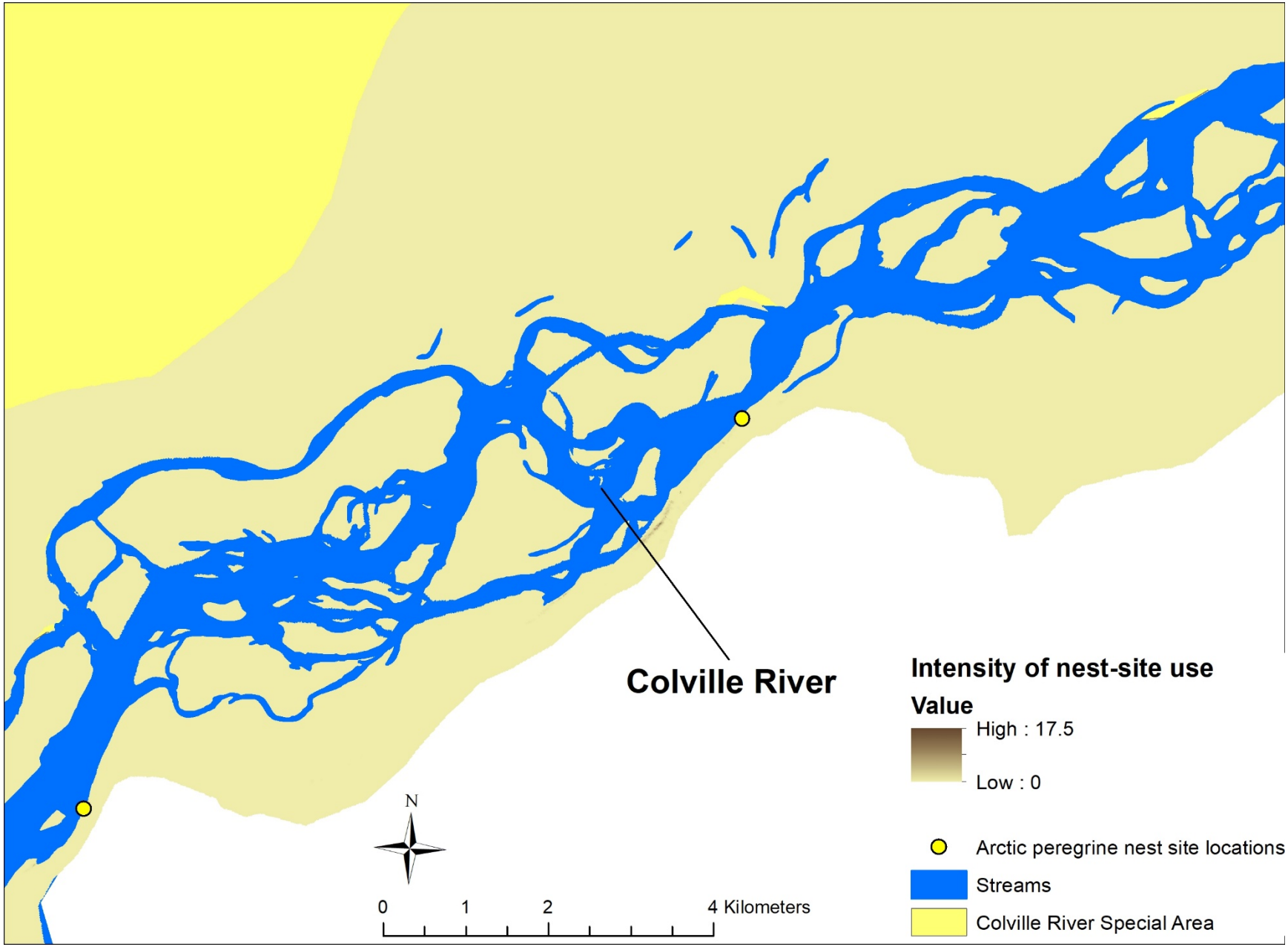

Figure A8. Predicted intensity of Arctic peregrine falcon nest-site use along the Colville River, AK, USA.

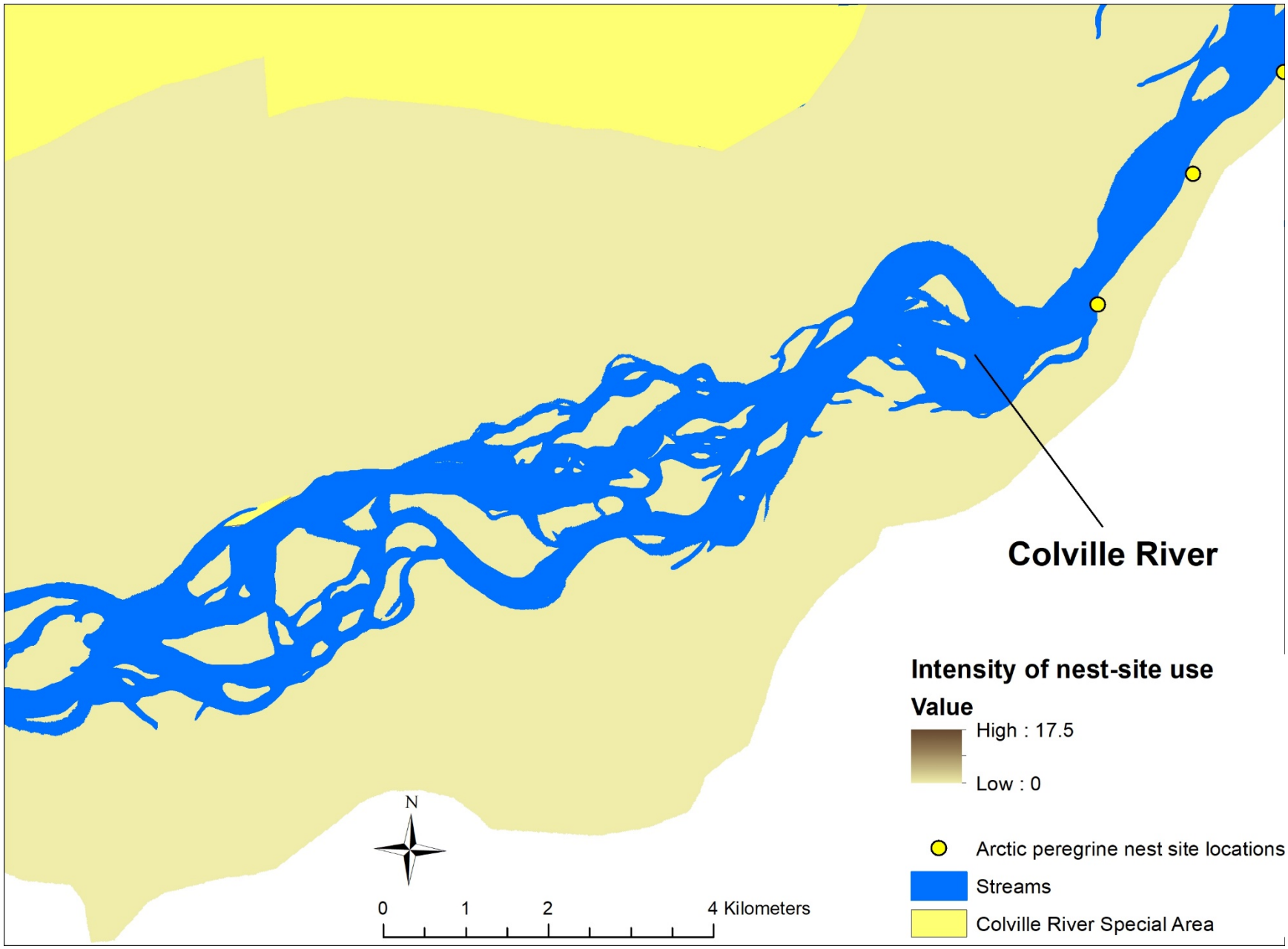

Figure A9. Predicted intensity of Arctic peregrine falcon nest-site use along the Colville River, AK, USA.

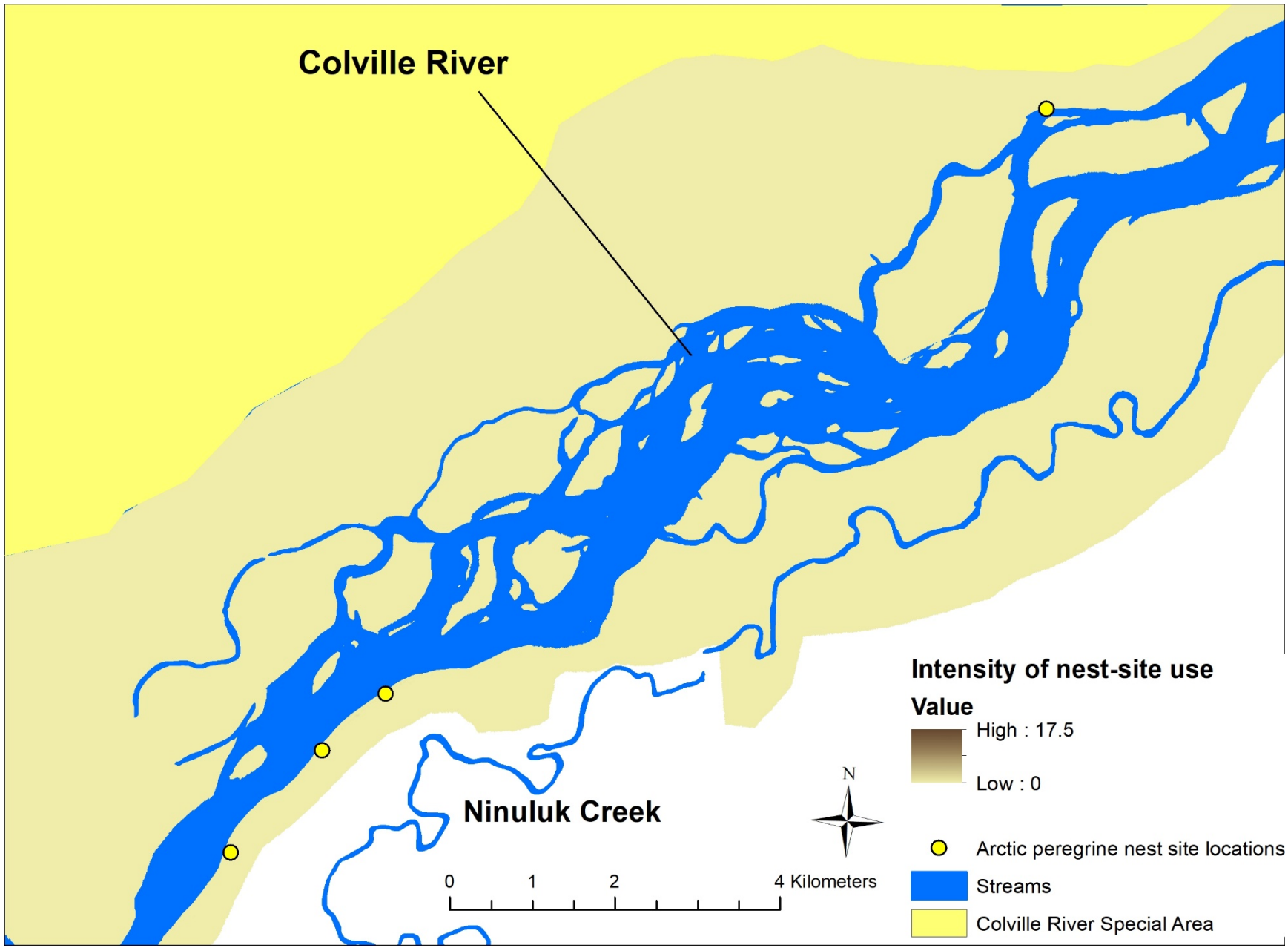

Figure A10. Predicted intensity of Arctic peregrine falcon nest-site use along the Colville River, AK, USA.

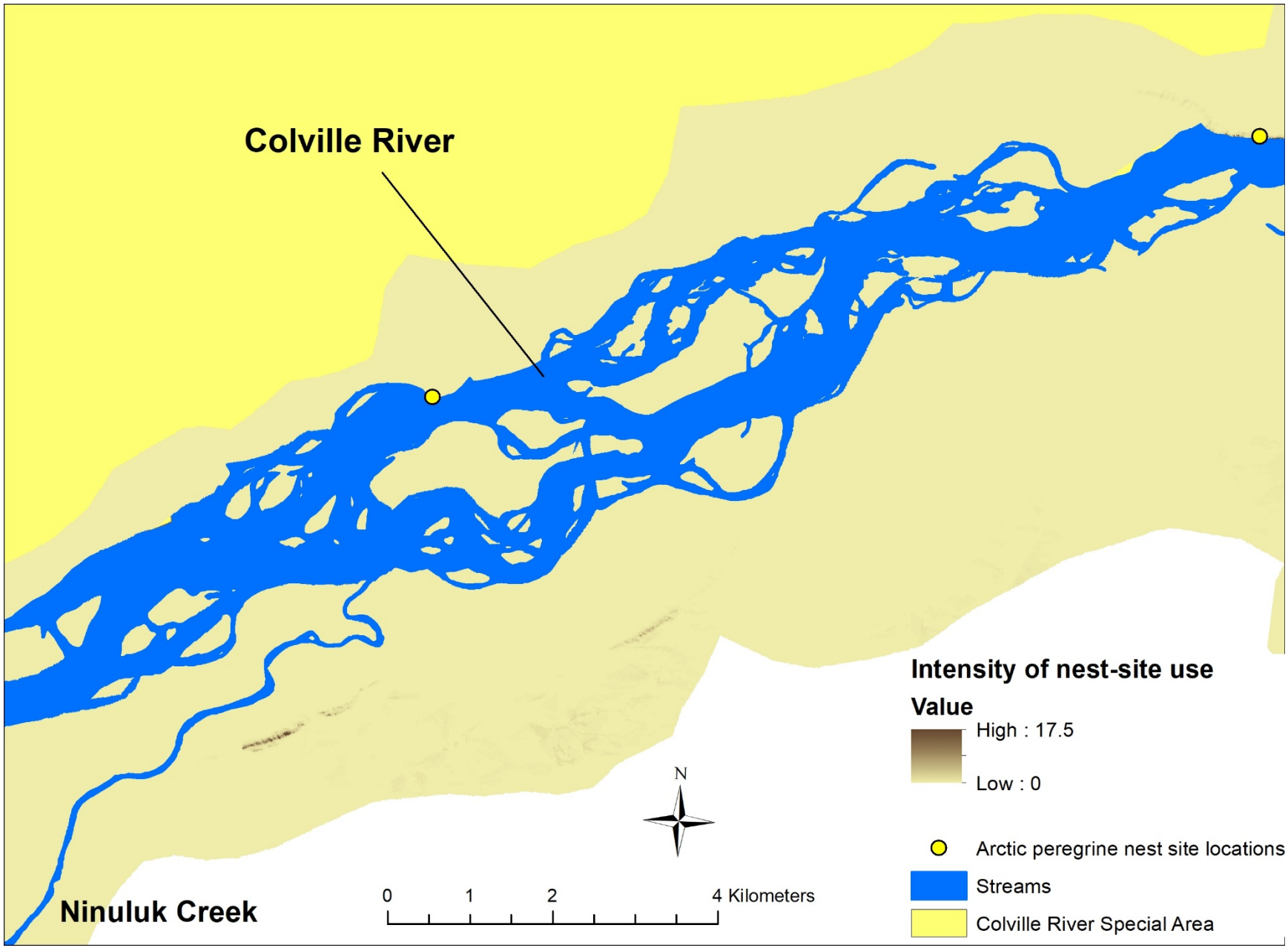

Figure A11. Predicted intensity of Arctic peregrine falcon nest-site use along the Colville River, AK, USA.

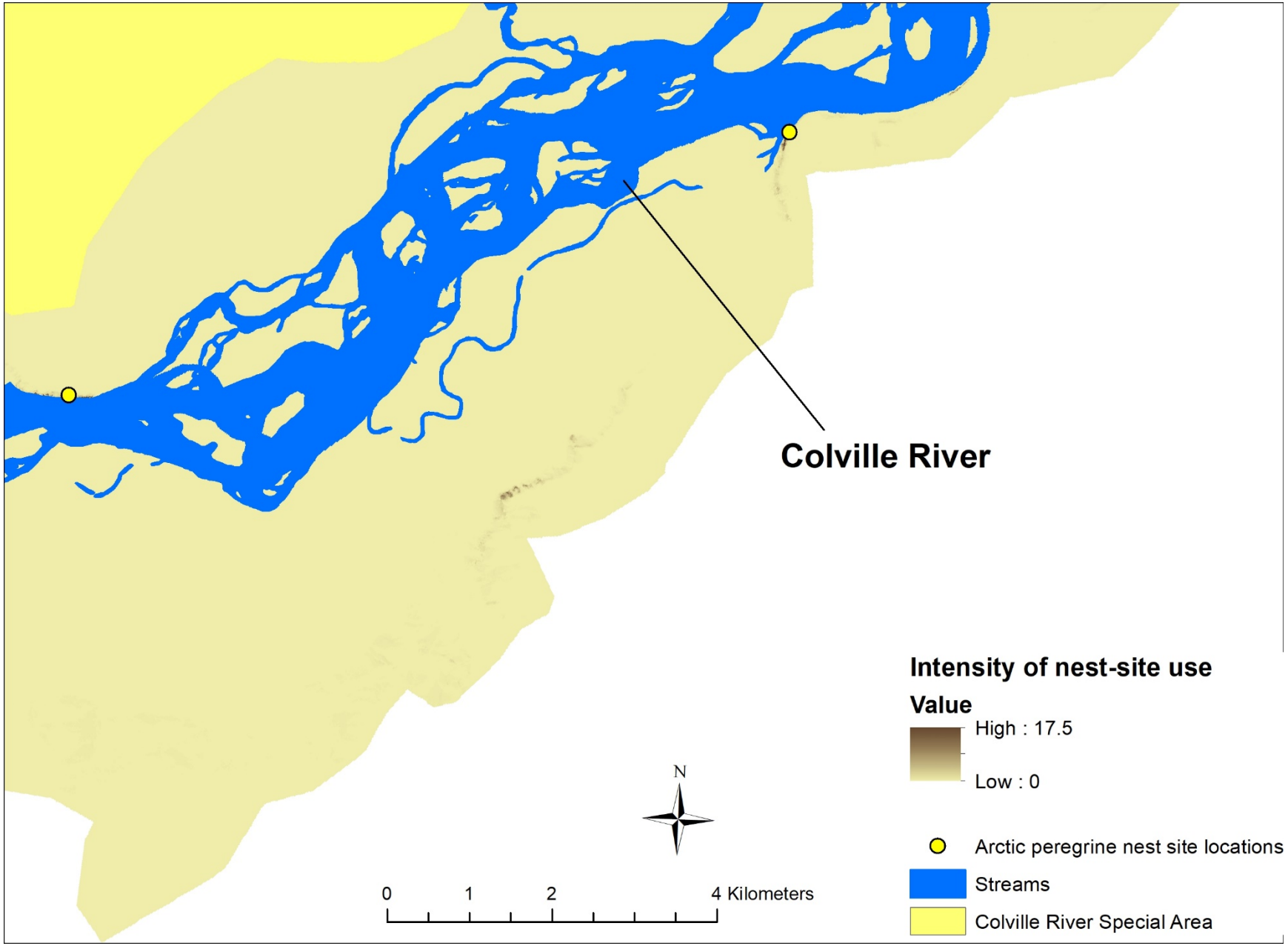

Figure A12. Predicted intensity of Arctic peregrine falcon nest-site use along the Colville River, AK, USA.

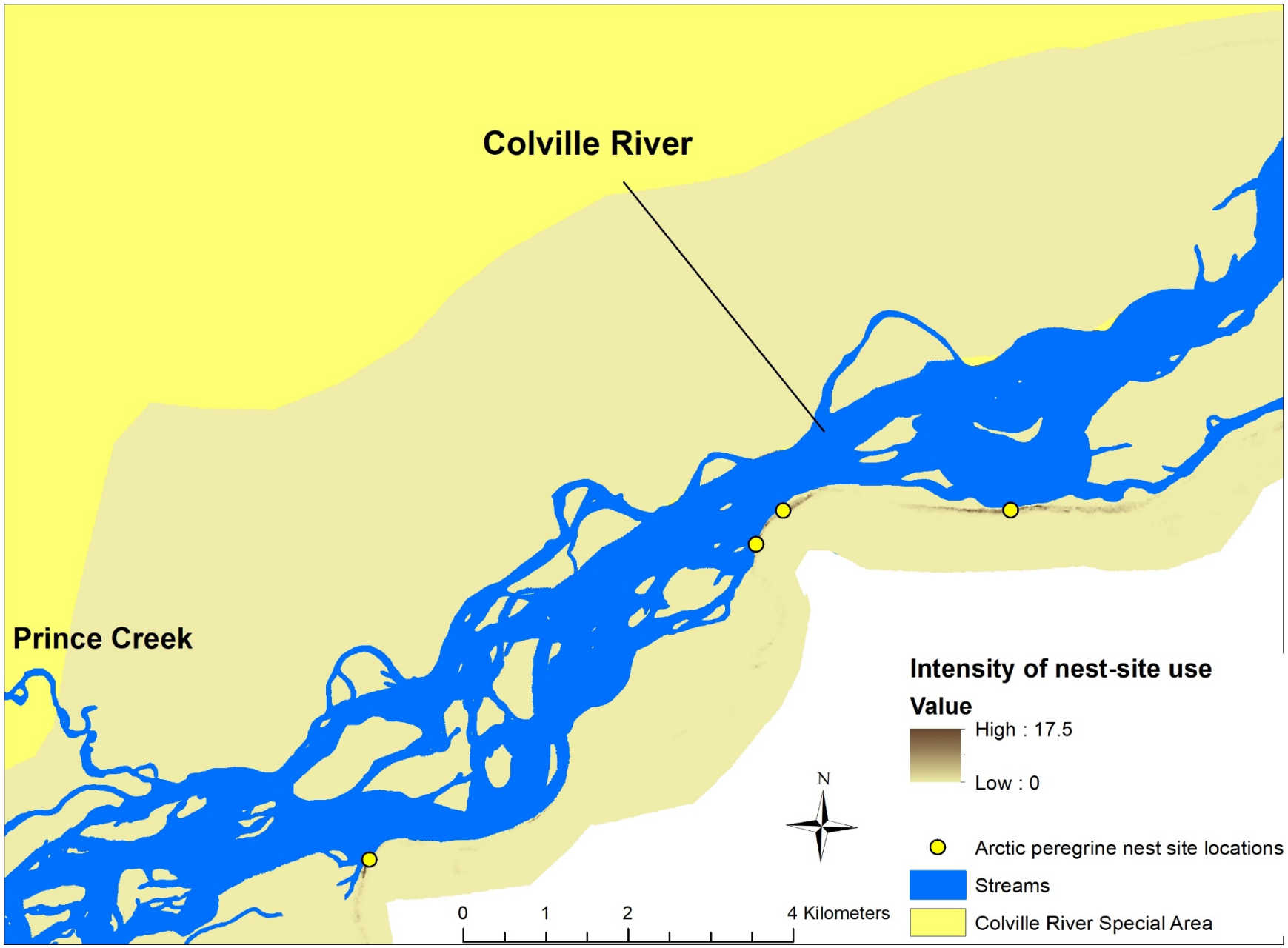

Figure A13. Predicted intensity of Arctic peregrine falcon nest-site use along the Colville River, AK, USA.

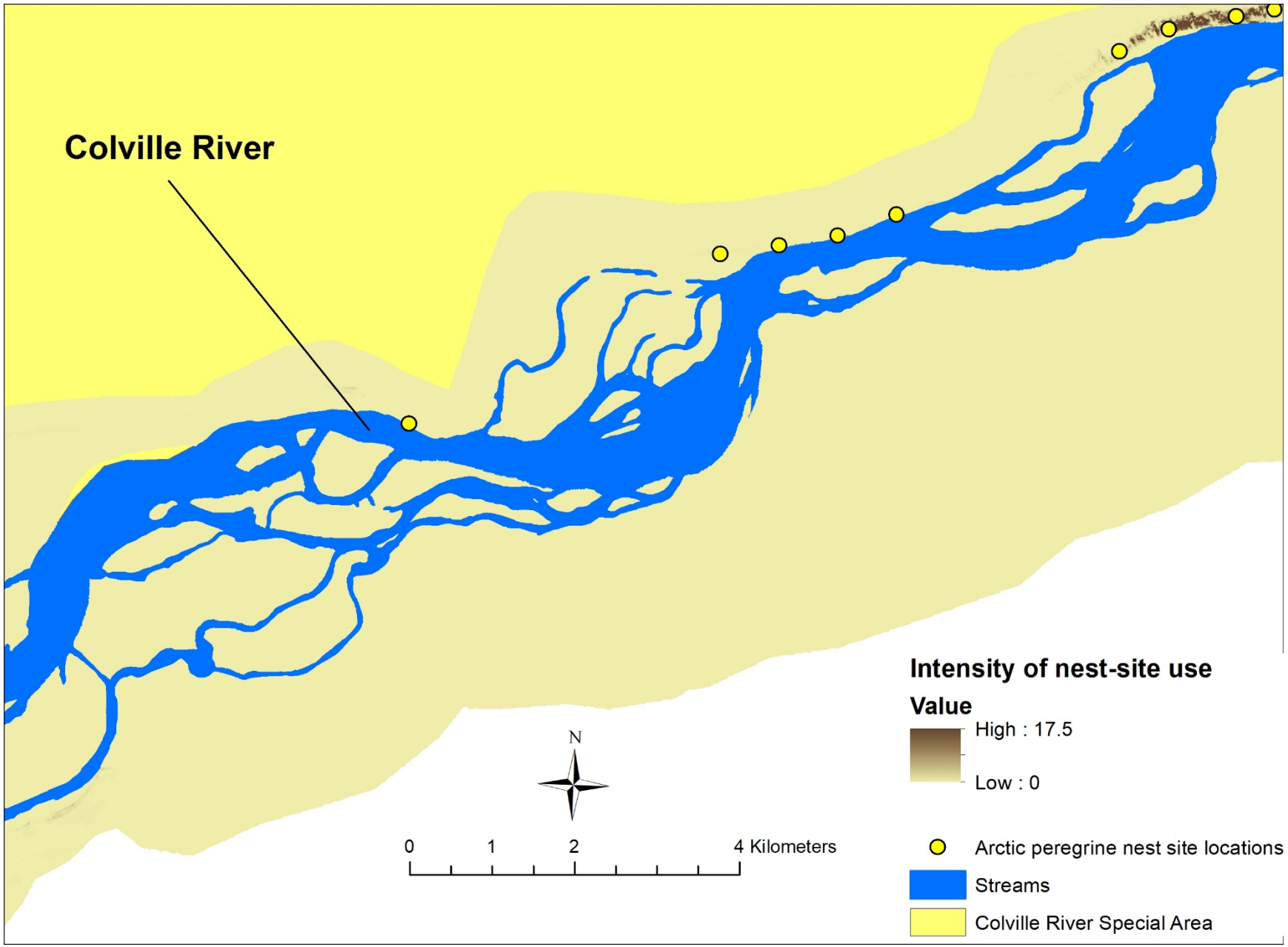

Figure A14. Predicted intensity of Arctic peregrine falcon nest-site use along the Colville River, AK, USA.

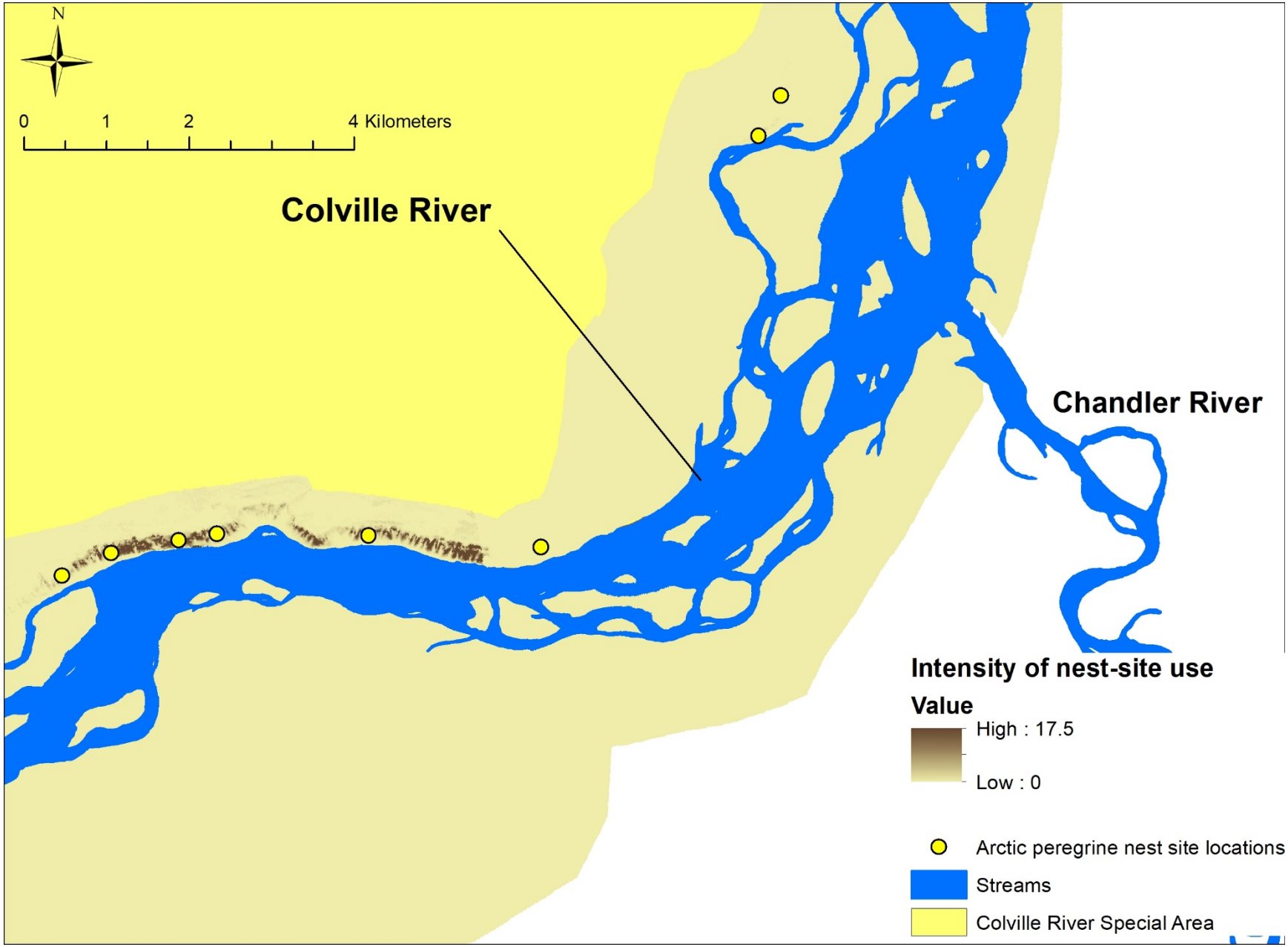

Figure A15. Predicted intensity of Arctic peregrine falcon nest-site use along the Colville River, AK, USA.

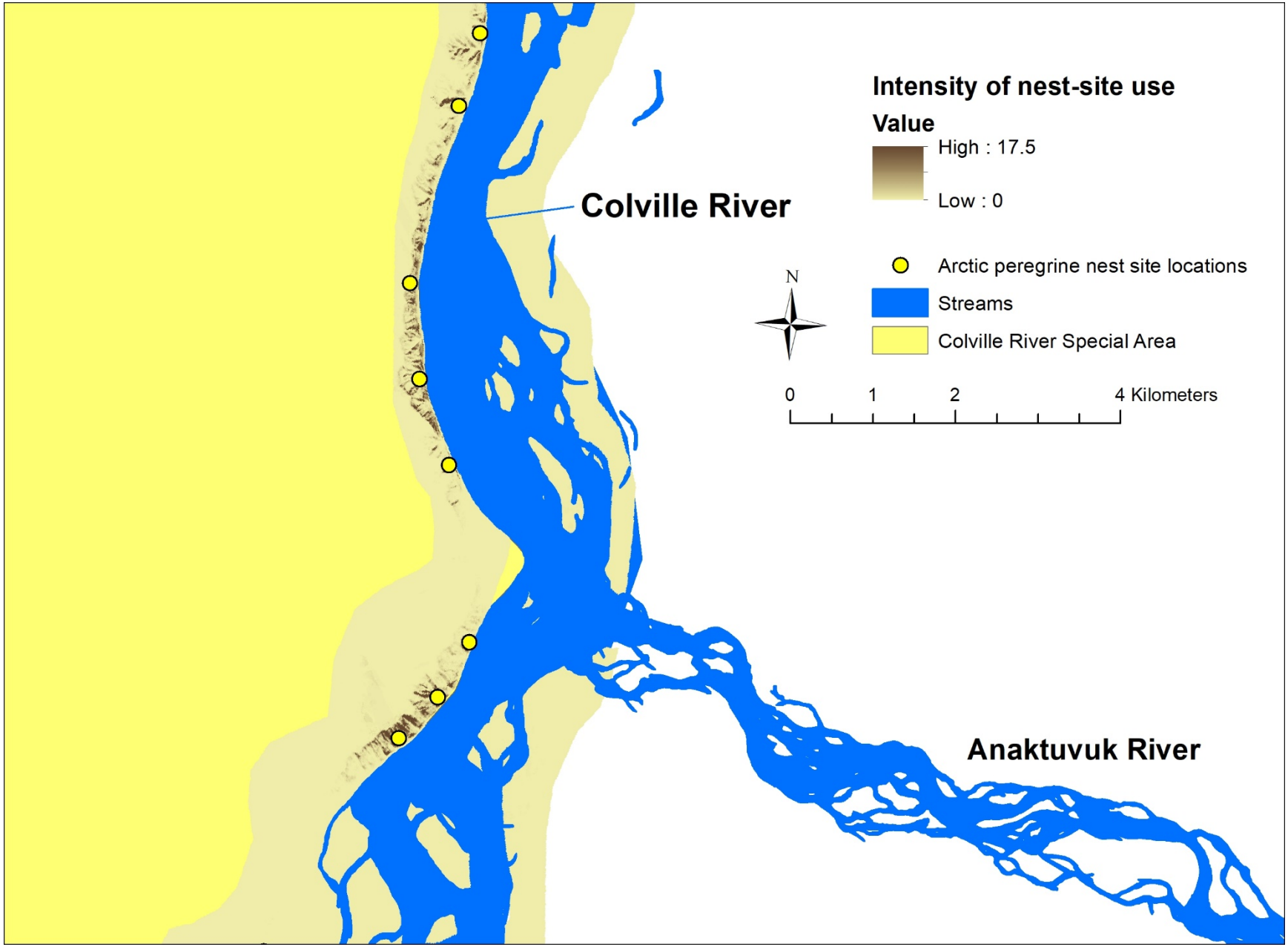

Figure A16. Predicted intensity of Arctic peregrine falcon nest-site use along the Colville River, AK, USA.

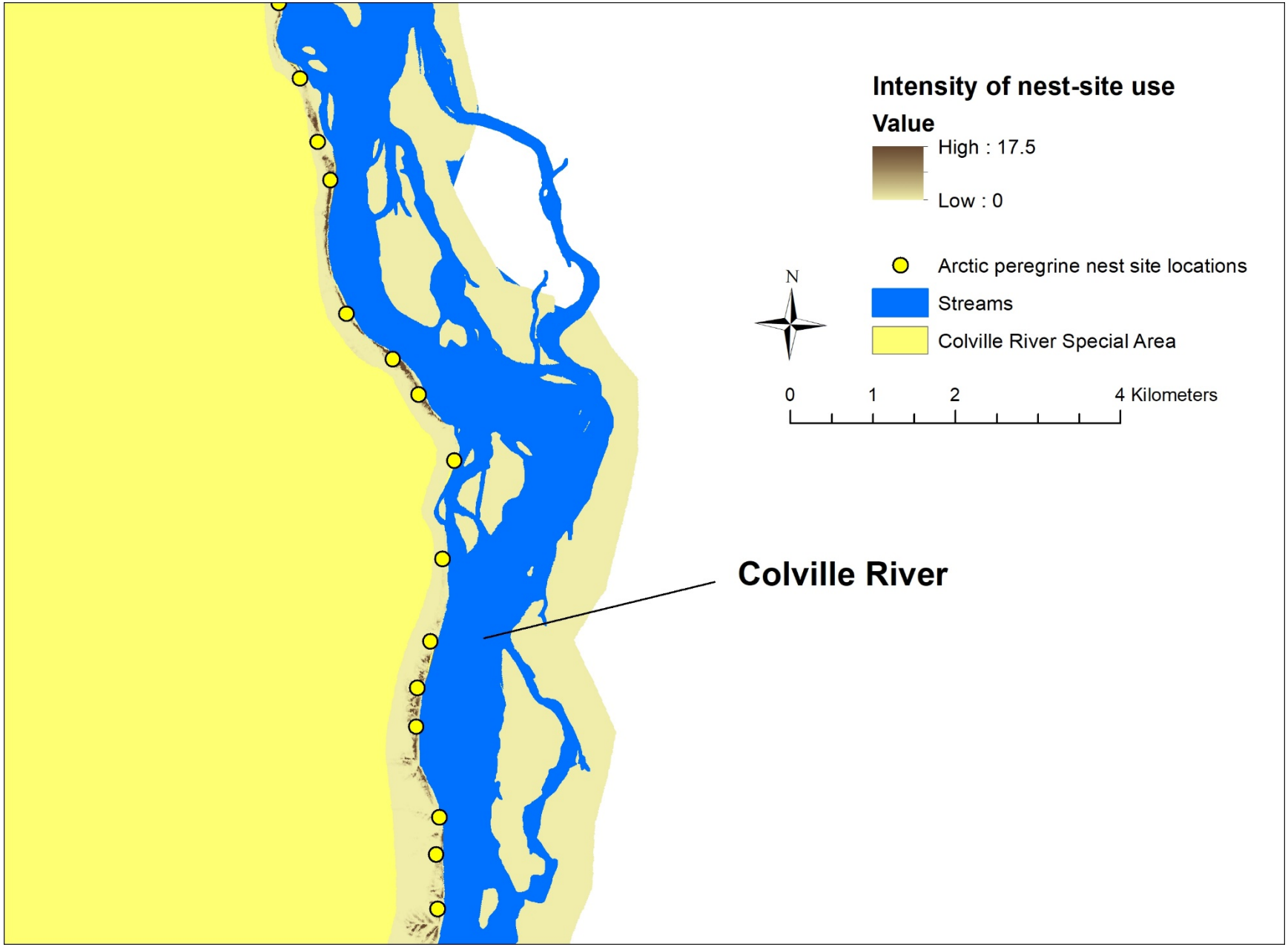

Figure A17. Predicted intensity of Arctic peregrine falcon nest-site use along the Colville River, AK, USA.

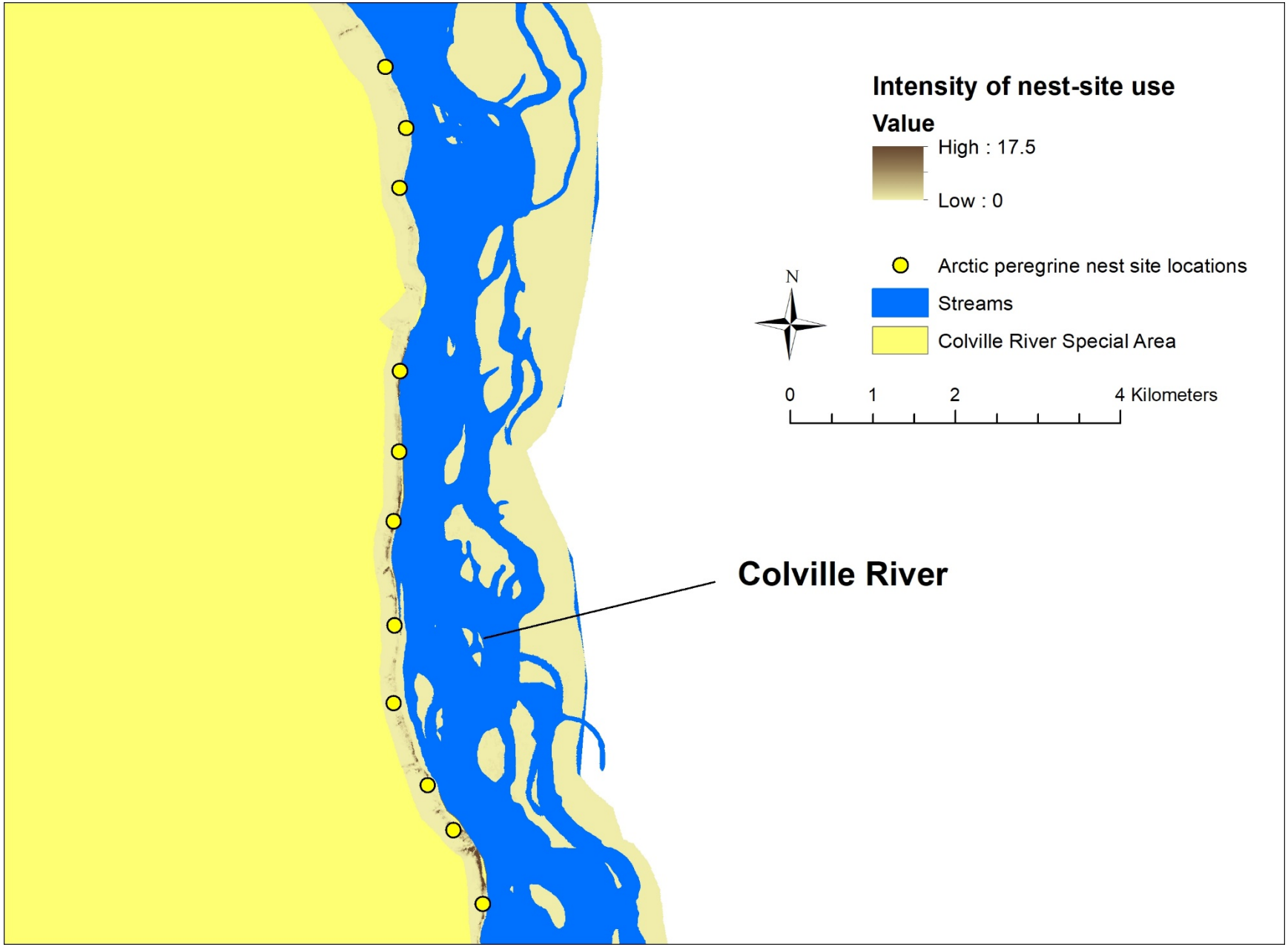

Figure A18. Predicted intensity of Arctic peregrine falcon nest-site use along the Colville River, AK, USA.

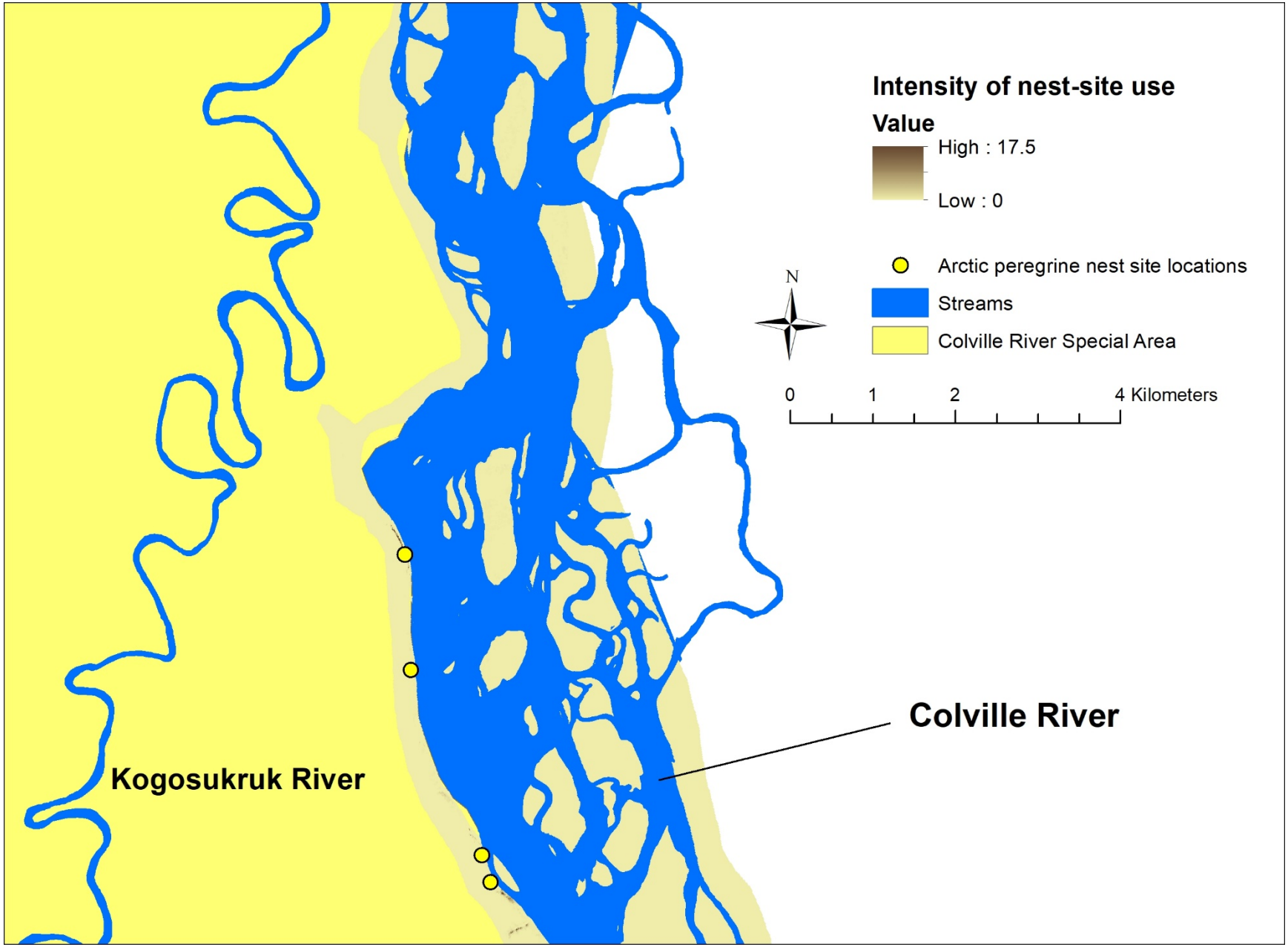

Figure A19. Predicted intensity of Arctic peregrine falcon nest-site use along the Colville River, AK, USA.

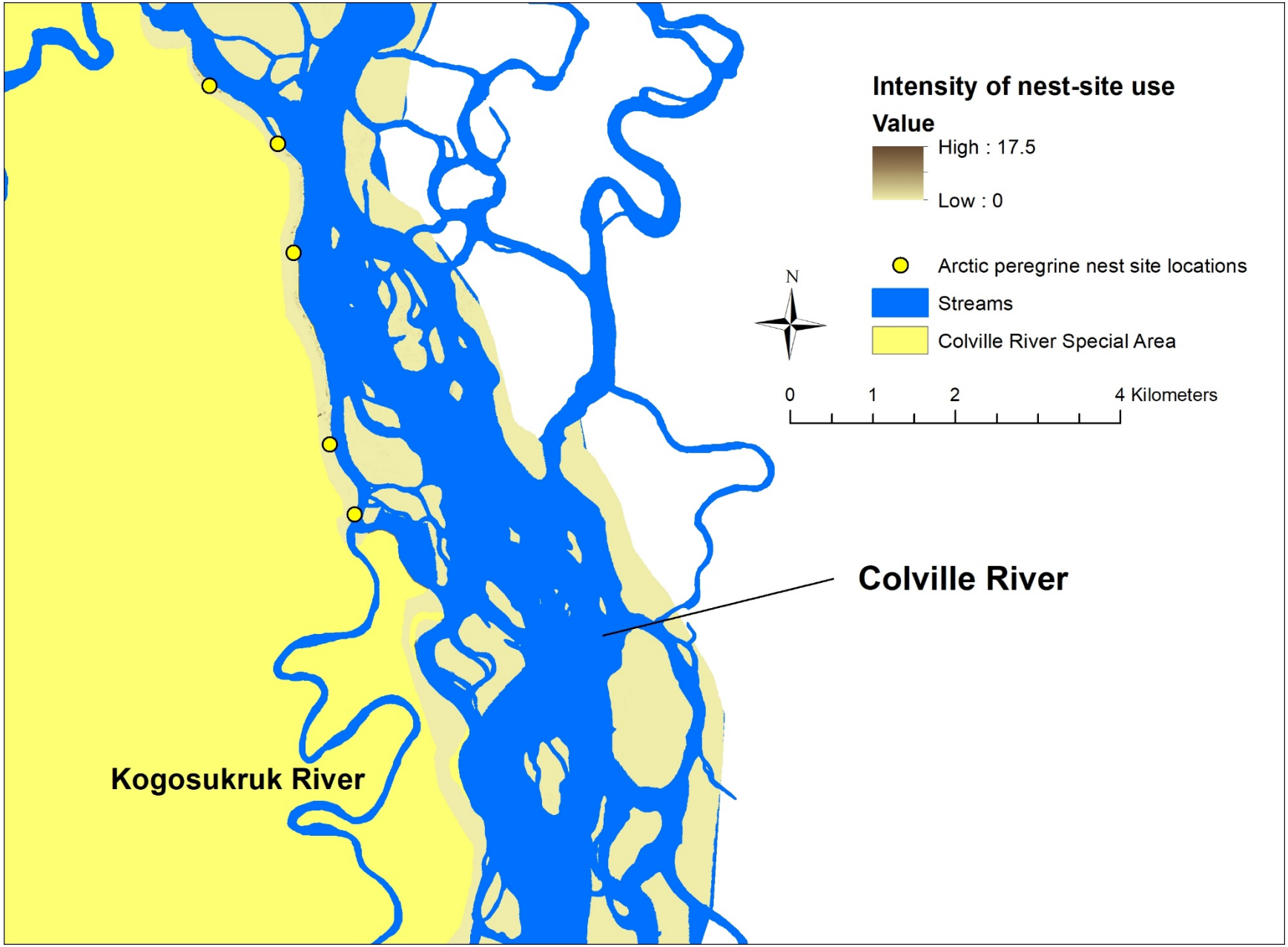

Figure A20. Predicted intensity of Arctic peregrine falcon nest-site use along the Colville River, AK, USA.

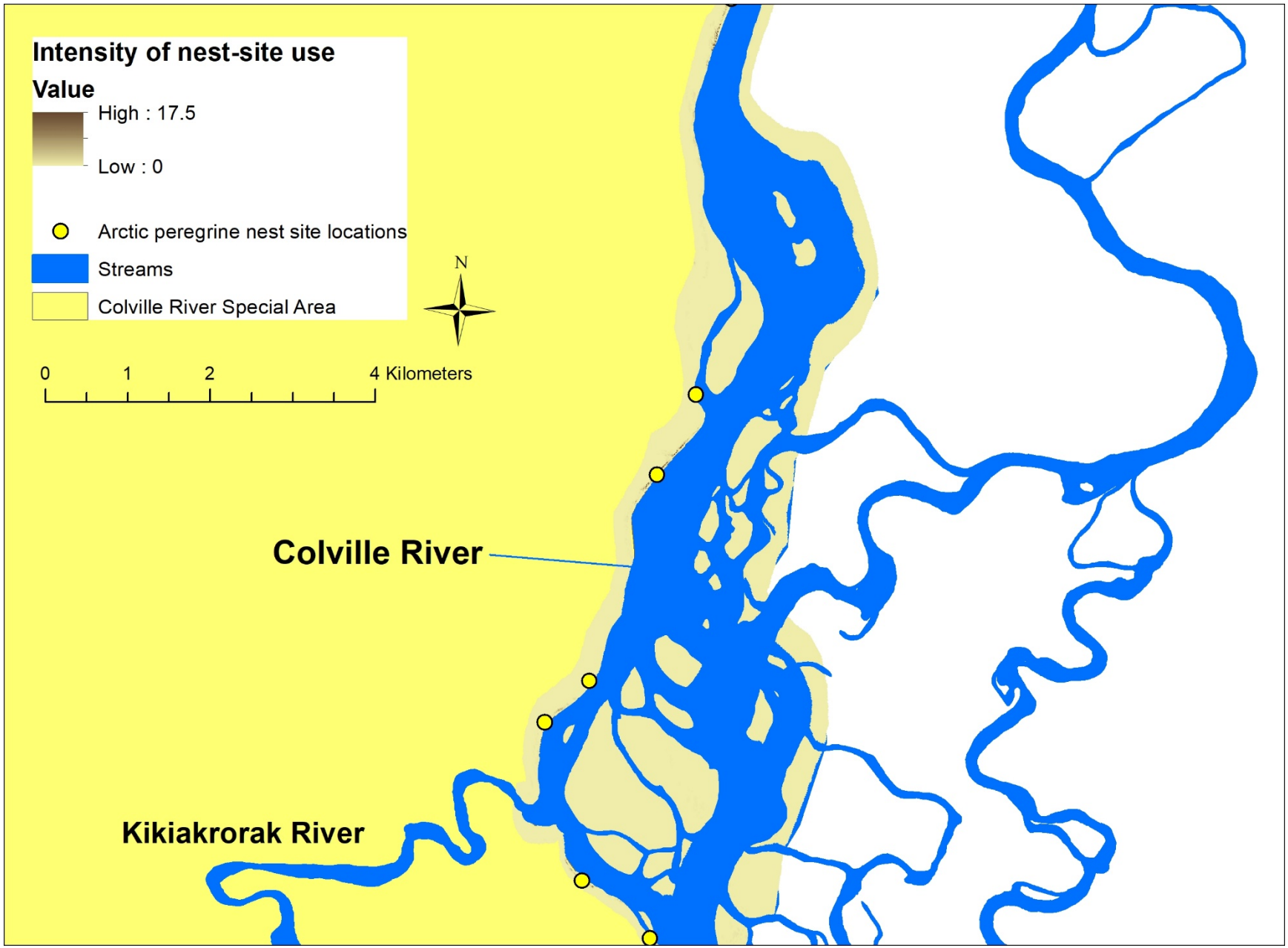

Figure A21. Predicted intensity of Arctic peregrine falcon nest-site use along the Colville River, AK, USA.

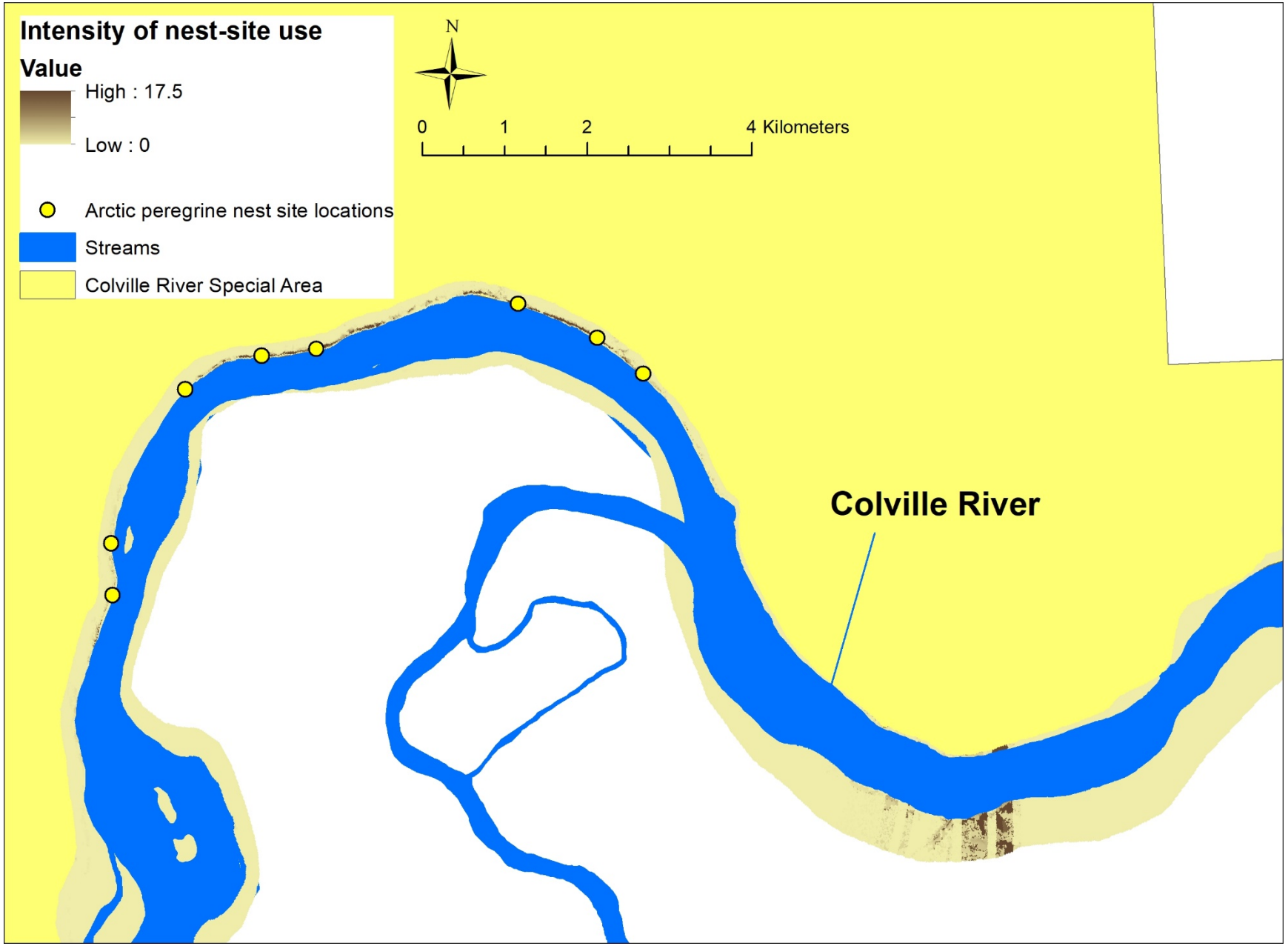

Figure A22. Predicted intensity of Arctic peregrine falcon nest-site use along the Colville River, AK, USA.

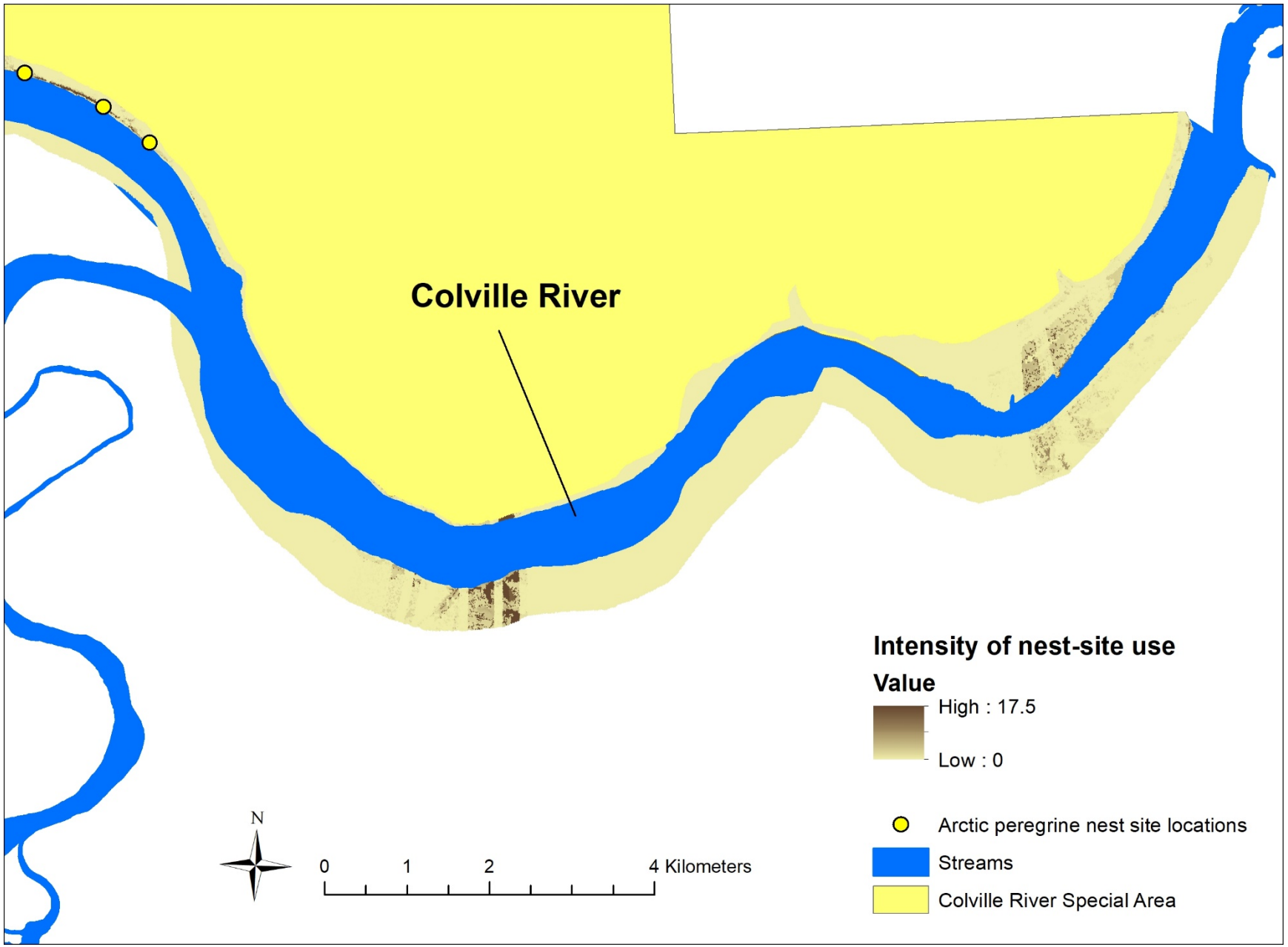

Figure A23. Predicted intensity of Arctic peregrine falcon nest-site use along the Colville River, AK, USA.