

## READING LIST

### Geography/Geosciences 523: Advanced Paleoecology Fall 2020

The readings below are organized by class topic and are flagged as primary or supplemental readings. Each class is listed as a Discussion, Lab, or Lecture, with somewhat different expectations for each; see syllabus for more information. In general, you are always expected to have read the primary readings, while the supplemental readings are entirely optional and simply represent other good papers that come to mind.

I will post all readings as PDFs to Canvas. I can also arrange paper copies to be printed for interested students; this may be particularly helpful for classes meeting outside. If you would like paper copies printed, please let me know.

I may update this reading list as new readings come to mind, but will only make changes with at least a week's notice.

#### **9/7: Introduction to Class and Quaternary Paleoecology [Lecture]**

[No readings!]

#### **9/7: Paleoclimatology Primer [Lecture]**

##### Primary Readings:

Zachos, J., Pagani, M., Sloan, L., Thomas, E. & Billups, K. (2001) Trends, rhythms, and aberrations in global climate 65 Ma to present. *Science*, 292, 686-693.

Clark, P. U., Shakun, J. D., et al. (2012) Global climate evolution during the last deglaciation. *Proceedings of the National Academy of Sciences* 109:E1134-E1142.

##### Supplemental Readings:

Ruddiman, W.F. (2014) *Earth's Climate: Past and Future*, 3rd edn. Macmillan.

Bradley, R.S. (1999) *Paleoclimatology: Reconstructing Climates of the Quaternary*, 2nd edn. Academic Press, San Diego.

Bond, G., Broecker, W., Johnsen, S., McManus, J., Labeyrie, L., Jouzel, L., and Bonani, G. (1993) Correlations between climate records from North Atlantic sediments and Greenland ice. *Nature* 365:143-147.

COHMAP Members. (1988) Climatic changes of the last 18,000 years: observations and model simulations. *Science* 24:1043-1052.

Hays, J.D., Imbrie, J. & Shackleton, N.J. (1976) Variations in the Earth's orbit: Pacemaker of the ice ages. *Science*, 194, 1121-1132.

Shuman, B. N., and Marsicek, J. (2016) The structure of Holocene climate change in mid-latitude North America. *Quaternary Science Reviews* 141:38-51.

#### **9/9: Neotoma Explorer [Lab]**

##### Primary Readings:

Williams, J.W., Grimm, E.G., et al., 2018. The Neotoma Paleoecology Database: A multi-proxy, international community-curated data resource. *Quaternary Research* 89, 156-177.

#### Supplemental Readings:

- Brewer, S., Jackson, S.T., Williams, J.W., 2012. Paleoecoinformatics: Applying geohistorical data to ecological questions. *Trends Ecol. Evol.* 27, 104-112.
- Williams, J.W., Kaufman, D.S., Newton, A., Von Gunten, L., 2018. Building open data: Data stewards and community-curated data resources. *PAGES Magazine* 26, 50-51.

#### **9/14: Why study the past? [Discussion]**

##### Primary Readings:

- Fordham, D.A. et al. (2020) Using paleo-archives to safeguard biodiversity under climate change. *Science* 369 (6507), eabc5654.
- Kidwell, S. M. 2015. Biology in the Anthropocene: Challenges and insights from young fossil records. *Proceedings of the National Academy of Sciences* 12:4922-4929.
- Williams, J. W., J. L. Blois, J. L. Gill, L. M. Gonzales, E. C. Grimm, A. Ordonez, B. Shuman, and S. Veloz. 2013. Model systems for a no-analog future: Species associations and climates during the last deglaciation. *Annals of the New York Academy of Sciences* 1297:29-43.

##### Supplemental Readings:

- Deevey, E. S., Jr. 1969. Coaxing history to conduct experiments. *Bioscience* 19:40-43.
- Dietl, G. P., and K. W. Flessa. 2011. Conservation paleoecology: Putting the dead to work. *Trends in Ecology & Evolution* 26:30-37.
- Jackson, S. T., and J. L. Blois. 2015. Community ecology in a changing environment. *Proceedings of the National Academy of Sciences* 112:4915-4921.

#### **9/16: Introduction to R & RStudio [Lab]**

- Owen, W.J. (2010) The R Guide. <https://cran.r-project.org/doc/contrib/Owen-TheRGuide.pdf>
- Venables, W. N., Smith, D. R., and the R Core Team (2020, v. 4.0.2) An Introduction to R <https://cran.r-project.org/doc/manuals/r-release/R-intro.pdf>
- <https://stackoverflow.com/> is a good place to search for answers to 'how to' questions.

#### **9/21: Zoom Lens. Vegetation Dynamics across Space and Time [Discussion]**

##### Primary Readings:

- Webb, T., III. 1993. Constructing the past from late-Quaternary pollen data: Temporal resolution and a zoom lens space-time perspective. Pages 79-101 in S. M. Kidwell and A. K. Behrensmeyer, editors. *Taphonomic Approaches to Time Resolution in Fossil Assemblages*. Paleontological Society, Knoxville, TN.
- Wolkovich, E. M., Cook, B. I., McLauchlan, K. K., and Davies, T. J. (2014) Temporal ecology in the Anthropocene. *Ecology Letters* 17:1365-1379.
- Delcourt, H. R., and Delcourt, P. A. (1988) Quaternary landscape ecology: Relevant scales in space and time. *Landscape Ecology* 2:23-44.

##### Supplemental Readings:

- McDowell, P. F., Webb, T., III, and Bartlein, P. J. (1990) Long-term environmental change. Pages 143-162 in B. L. Turner II, W. C. Clark, R. W. Kates, J. F. Richards, J. T. Mathews, and W. B. Meyer, editors. *The Earth as Transformed by Human Action*. Cambridge University Press, Cambridge.

#### **9/23: Age-Depth Modelling [Lab]**

#### Primary Readings:

- Bronk Ramsey, C., 2008. Radiocarbon dating: Revolutions in understanding. *Archaeometry* 50, 249-275. **Read through p. 260; second half of paper is optional (from 'Assessing the Organism's Place' onwards.)**
- Blaauw, M., 2010. Methods and code for 'classical' age-modelling of radiocarbon sequences. *Quaternary Geochronology* 5, 512-518.

#### Supplemental Readings:

- Blaauw, M., Christen, J.A., 2011. Flexible paleoclimate age-depth models using an autoregressive gamma process. *Bayesian Analysis* 6, 1-18.
- Blaauw, M., Christen, J. A., Bennett, K. D., and Reimer, P. J. (2018) Double the dates and go for Bayes — Impacts of model choice, dating density and quality on chronologies. *Quaternary Science Reviews* 188:58-66.
- Blaauw, M., Christen, J.A., 2013. Bacon Manual - v2.2.
- Parnell, A.C., Haslett, J., Allen, J.R.M., Buck, C.E., Huntley, B., 2008. A flexible approach to assessing synchronicity of past events using Bayesian reconstructions of sedimentation history. *Quaternary Science Reviews* 27, 1872-1885.

### **9/28: Pollen and Depositional Processes [Discussion]**

#### Primary Readings:

- Jackson, S.T. (1994) Pollen and spores in Quaternary lake sediments as sensors of vegetation composition: theoretical models and empirical evidence. *Sedimentation of Organic Particles* (ed. by A. Traverse), pp. 253-286. Cambridge University Press, Cambridge.
- Dawson, A., Paciorek, C.J., McLachlan, J.S., Goring, S., Williams, J.W., Jackson, S.T., 2016. Quantifying pollen-vegetation relationships to reconstruct forests using 19th-century forest composition and pollen data. *Quaternary Science Reviews* 137, 156-175.

#### Supplemental Readings:

- Davis, M.B. (1963) On the theory of pollen analysis. *American Journal of Science*, 261, 897-912.
- Davis, M.B., Moeller, R.E. & Ford, J. (1984) Sediment focusing and pollen influx. *Lake Sediments and Environmental History: Studies in Palaeolimnology and Palaeoecology in Honour of Winifred Tutin* (ed. by E.Y. Haworth and J.W.G. Lund), pp. 261-293. University of Minnesota Press, Minneapolis.
- Dawson, A., Paciorek, C.J., Goring, S., Jackson, S., McLachlan, J., Williams, J.W., 2019. Quantifying trends and uncertainty in prehistoric forest composition in the upper Midwestern United States. *Ecology* doi: 10.1002/ecy.2856
- Prentice, I.C. (1988) Records of vegetation in time and space: the principles of pollen analysis. *Vegetation History* (ed. by B. Huntley and T. Webb, lii), pp. 17-42. Kluwer Academic Publishers, Dordrecht.
- Seppä, H., Alenius, T., Muukkonen, P., Giesecke, T., Miller, P.A. & Ojala, A.E.K. (2009) Calibrated pollen accumulation rates as a basis for quantitative tree biomass reconstructions. *The Holocene*, 19, 209-220.

### **9/30: neotoma R Package; Making a Pollen Diagram [Lab]**

#### Primary Readings:

Goring, S., Dawson, A., Simpson, G., Ram, K., Graham, R.W., Grimm, E.C., Williams, J.W., 2015. *neotoma*: A Programmatic Interface to the Neotoma Paleoecological Database. *Open Quaternary* 1, 1-17.

### **10/5: Foundations: Niches, Gradients, Individualism, & Associations [Discussion]**

#### Primary Readings:

Gleason, H. A., 1917, The structure and development of the plant association: Bulletin of the Torrey Botanical Club, v. 44, p. 463-481.

Hutchinson, G. E. (1957) Concluding remarks. *Cold Spring Harbor Symposia on Quantitative Biology* 22:425-427.

Davis, M.B., 1981. Quaternary history and the stability of forest communities, in: West, D.C., Shugart, H.H., Botkin, D.B. (Eds.), *Forest Succession*. Springer-Verlag, New York, pp. 132-177.

#### Supplemental Readings:

Gleason, H. A., 1926, The individualistic concept of the plant association: Bulletin of the Torrey Botanical Club, v. 53, p. 7-26.

Good, R. D. O., 1931, A theory of plant geography: *New Phytologist*, v. 30, p. 11-171.

Williams, J.W., Shuman, B.N., Webb, T., III, Bartlein, P.J., Leduc, P.L., 2004. Late Quaternary vegetation dynamics in North America: Scaling from taxa to biomes. *Ecological Monographs* 74, 309-334.

### **10/7 Dissimilarity Analyses and Rates of Change [Lab]**

#### Primary Readings:

Simpson, G.L., 2007. Analogue methods in palaeoecology: Using the analogue package *Journal of Statistical Software* 22, 1-29.

Shuman, B., Bartlein, P.J., Webb, T., III, 2005. The magnitudes of millennial and orbital-scale climatic change in eastern North America during the Late Quaternary. *Quaternary Science Reviews* 24, 2194-2206.

#### Supplemental Readings:

Lotter, A.F. et al. (1992) Rates of change and chronological problems during the late-glacial period. *Climate Dynamics* 6, 233-239.

Overpeck, J.T., Webb, T., III, Prentice, I.C., 1985. Quantitative interpretation of fossil pollen spectra: dissimilarity coefficients and the method of modern analogs. *Quaternary Research* 23, 87-108.

### **10/12: Novelty and No-Analogs [Discussion]**

#### Primary Readings:

Jackson, S. T., and Overpeck, J. T., 2000, Responses of plant populations and communities to environmental changes of the late Quaternary: *Paleobiology*, v. 26 (Supplement), p. 194-220.

Williams, J. W., and Jackson, S. T., 2007, Novel climates, no-analog communities, and ecological surprises: *Frontiers in Ecology and the Environment*, v. 5, p. 475-482.

Finsinger, W., Giesecke, T., Brewer, S., and Leydet, M. (2017) Emergence patterns of novelty in European vegetation assemblages over the past 15 000 years. *Ecology Letters* 20:336–346.

#### Supplemental Readings:

- Graham, R. W., 2005, Quaternary mammal communities: Relevance of the individualistic response and non-analogue faunas: *Paleontological Society Papers*, v. 11, p. 141-158.
- Radeloff, V.C., Williams, J.W., Bateman, B.L., Burke, K.D., Carter, S.K., Childress, E.S., Cromwell, K., Gratton, C., Hasley, A.O., Kraemer, B.M., Latzka, A.W., Marin-Spiotta, E., Meine, C.D., Munoz, S.E., Neeson, T.M., Pidgeon, A.M., Rissman, A.R., Rivera, R.J., Szymanski, L.M., Usinowicz, J., 2015. The rise of novelty in ecosystems. *Ecol. Appl.* 25, 2051-2068.
- Williams, J. W., Shuman, B. N., and Webb, T., III, 2001, Dissimilarity analyses of late-Quaternary vegetation and climate in eastern North America: *Ecology*, v. 82, p. 3346-3362.

### **10/14 Novel Climates and Communities [Lab]**

#### Primary Readings:

- Jackson, S.T., Williams, J.W., 2004. Modern analogs in Quaternary paleoecology: Here today, gone yesterday, gone tomorrow? *Annual Review of Earth and Planetary Sciences* 32, 495-537.

### **10/19: Equilibrium and Disequilibrium Dynamics: Rates of Forcing and Response [Discussion]**

#### Primary Readings:

- Webb, T., III, 1986, Is vegetation in equilibrium with climate? How to interpret late-Quaternary pollen data: *Vegetatio*, v. 67, p. 75-91.
- Svenning, J.-C., and Sandel, B., 2013, Disequilibrium vegetation dynamics under future climate change: *American Journal of Botany*, v. 100, p. 1266-1286.
- Williams, J.W., Ordonez, A., Svenning, J.-C., In review. A unifying framework for studying and managing climate-driven rates of ecological change. *Nature Ecology & Evolution*

#### Supplemental Readings:

- Blonder, B., Moulton, D. E., Blois, J., Enquist, B. J., Graae, B. J., Macias-Fauria, M., McGill, B., Nogué, S., Ordonez, A., Sandel, B., and Svenning, J.-C., 2017, Predictability in community dynamics: *Ecology Letters*, v. 20, no. 3, p. 293-306.
- Davis, M. B., 1986, Climatic instability, time lags, and community disequilibrium, in Diamond, J., and Case, T. J., eds., *Community Ecology*: New York, Harper & Row Publishers, p. 269-284.
- Prentice, I. C., Bartlein, P. J., and Webb, T., III, 1991, Vegetation and climate change in eastern North America since the last glacial maximum: *Ecology*, v. 72, p. 2038-2056.
- Ordonez, A., 2013, Realized climatic niche of North American plant taxa lagged behind climate during the end of the Pleistocene: *American Journal of Botany*, v. 100, p. 1255-1265.
- Ordonez, A., and Williams, J. W., 2013, Climatic and biotic velocities for woody taxa distributions over the last 16 000 years in eastern North America: *Ecology Letters*, v. 16, p. 773-781.

- Pither, J., Pickles, B. J., Simard, S. W., Ordonez, A., and Williams, J. W. (2018) Below-ground biotic interactions moderated the postglacial range dynamics of trees. *New Phytologist* 10.1111/nph.15203.
- Williams, J. W., Post, D. M., Cwynar, L. C., Lotter, A. F., and Levesque, A. J. (2002) Rapid and widespread vegetation responses to past climate change in the North Atlantic region. *Geology* 30:971-974.

### **10/21 Multivariate Ordination: Principal Component Analysis [Lab]**

#### Primary Readings:

- McKilup, S., Dyar, M.D., 2010. *Geostatistics Explained: An Introductory Guide for Earth Scientists*. Cambridge University Press, pp 270-285.
- Borcard, D., Gillet, F., Legendre, P., 2011. *Numerical Ecology with R*. Springer, New York. pp115-132.

#### Supplemental Readings:

### **10/26: Abrupt Ecological Change: Extrinsic or Intrinsic Drivers? [Discussion]**

#### Primary Readings:

- Ratajczak, Z., Carpenter, S.R., Ives, A.R., Kucharik, C.J., Ramiadantsoa, T., Stegner, M.A., Williams, J.W., Zhang, J., Turner, M.G., 2018. Abrupt change in ecological systems: inference and diagnosis. *Trends Ecol. Evol.* 33, 513-526.
- Scheffer, M., and Carpenter, S. R. (2003) Catastrophic regime shifts in ecosystems: linking theory to observation. *Trends in Ecology & Evolution* 18:648-656.
- Williams, J. W., Blois, J. L., and Shuman, B. N. (2011) Extrinsic and intrinsic forcing of abrupt ecological change: Case studies from the late Quaternary. *Journal of Ecology* 99:664-677.

#### Supplemental Readings:

- Grimm, E. C., 1984, Fire and other factors controlling the Big Woods vegetation of Minnesota in the mid-nineteenth century: *Ecological Monographs*, v. 54, p. 291-311.
- Hof, C., Levinsky, I., AraÚJo, M.B., Rahbek, C., 2011. Rethinking species' ability to cope with rapid climate change. *Global Change Biology* 17, 2987-2990.
- Ratajczak, Z., Carpenter, S. R., Ives, A. R., Kucharik, C. J., Ramiadantsoa, T., Stegner, M. A., Williams, J. W., Zhang, J., and Turner, M. G. (2018) Abrupt change in ecological systems: inference and diagnosis. *Trends in Ecology & Evolution* <https://doi.org/10.1016/j.tree.2018.04.013> (corrected proof).
- Seddon, A.W.R., Froyd, C.A., Witkowski, A., Willis, K.J., 2014. A quantitative framework for analysis of regime shifts in a Galápagos coastal lagoon. *Ecology* 95, 3046-3055.

### **10/28 Multivariate Ordination: Correspondence Analysis [Lab]**

#### Primary Readings:

- Borcard, D., Gillet, F., Legendre, P., 2011. *Numerical Ecology with R*. Springer, New York. pp 132-140

### **11/2 A Brief Detour to the PETM [Discussion]**

#### Primary Readings:

- Zeebe, R.E., Zachos, J.C., 2013. Long-term legacy of massive carbon input to the Earth system: Anthropocene versus Eocene. *Philosophical Transactions of the Royal Society of London A: Mathematical, Physical and Engineering Sciences* 371.

McInerney, F.A., Wing, S.L., 2011. The Paleocene-Eocene Thermal Maximum: A perturbation of carbon cycle, climate, and biosphere with implications for the future. *Annual Review of Earth and Planetary Sciences* 39, 489-516.

Gingerich, P.D., 2006. Environment and evolution through the Paleocene-Eocene thermal maximum. *Trends Ecol. Evol.* 21, 246-253.

Supplemental Readings:

DeConto, R.M., Galeotti, S., Pagani, M., Tracy, D., Schaefer, K., Zhang, T., Pollard, D., Beerling, D.J., 2012. Past extreme warming events linked to massive carbon release from thawing permafrost. *Nature* 484, 87-92.

Wing, S.L., Harrington, G.J., Smith, F.A., Bloch, J.I., Boyer, D.M., Freeman, K.H., 2005. Transient floral change and rapid global warming at the Paleocene-Eocene boundary. *Science* 310, 993-996.

Zachos, J.C., Röhl, U., Schellenberg, S.A., Sluijs, A., Hodell, D.A., Kelly, D.C., Thomas, E., Nicolo, M., Raffi, I., Lourens, L.J., McCarren, H., Kroon, D., 2005. Rapid acidification of the ocean during the Paleocene-Eocene Thermal Maximum. *Science* 308, 1611-1615.

Zachos, J.C., Wara, M.W., Bohaty, S., Delaney, M.L., Petrizzo, M.R., Brill, A., Bralower, T.J., Premoli-Silva, I., 2003. A transient rise in tropical sea surface temperature during the Paleocene-Eocene Thermal Maximum. *Science* 301, 1551-1554.

**11/4: General Additive Models (GAMs) [Lab]**

Primary Readings:

Simpson, G.L., 2018. Modelling palaeoecological time series using generalised additive models. *Frontiers in Ecology and Evolution* 6.

Supplemental Readings:

**11/9: The Quaternary Conundrum: Why are warming-driven extinctions rare? [Discussion]**

Primary Readings:

Botkin, D.B., Saxe, H., Araujo, M.B., Betts, R., Bradshaw, R.H.W., Cedhagen, T., Chesson, P., Dawson, T.P., Etterson, J.R., Faith, D.P., Ferrier, S., Guisan, A., Hansen, A.S., Hilbert, D.W., Loehle, C., Margules, C., New, M., Sobel, M.J., Stockwell, D.R.B., 2007. Forecasting the effects of global warming on biodiversity. *Bioscience* 57, 227-236.

Gill and Sax: Species extinctions during the Quaternary. In Revision

Svenning, J.-C., 2003. Deterministic Plio-Pleistocene extinctions in the European cool-temperate tree flora. *Ecology Letters* 6, 646-653.

Supplemental Readings:

Jackson, S.T., Weng, C., 1999. Late Quaternary extinction of a tree species in eastern North America. *Proceedings of the National Academy of Sciences* 96, 13847-13852.

Willis, K.J., MacDonald, G.M., 2011. Long-term ecological records and their relevance to climate change predictions for a warmer world. *Annual Review of Ecology, Evolution, and Systematics* 42, 267-287.

**11/11: Transfer Functions I [Lab]**

Primary Readings:

- Juggins, S., Birks, H.J.B., 2012. Quantitative environmental reconstructions from biological data, in: Birks, H.J.B., Lotter, A.F., Juggins, S., Smol, J.P. (Eds.), *Tracking Environmental Change Using Lake Sediments*. Springer, Dordrecht, pp. 431-494.
- Juggins, S., 2013. Quantitative reconstructions in paleolimnology: new paradigm or sick science? *Quaternary Science Reviews* 64, 20-32.

#### Secondary Readings:

- Birks, H.J.B., Heiri, O., Seppä, H., Björne, A.E., 2010. Strengths and weaknesses of quantitative climate reconstructions based on late-Quaternary biological proxies. *Open Ecology Journal* 3, 68-110.
- Imbrie, J., Kipp, N.G., 1971. A new micropaleontological method for quantitative paleoclimatology: application to a late Pleistocene Caribbean core, in: Turekian, K. (Ed.), *The Late Cenozoic Glacial Ages*. Yale University Press, New Haven, pp. 71-181.

### **11/16: Late Quaternary Megafaunal Extinctions: Causes & Consequences**

#### **[Discussion]**

#### Primary Readings:

- Barnosky, A.D., Koch, P.L., Feranec, R.S., Wing, S.L., Shabel, A.B., 2004. Assessing the causes of late Pleistocene extinctions on the continents. *Science* 306, 70-75.
- Gill, J. L. (2014) The ecological legacy of the late Quaternary extinctions of megaherbivores. *New Phytologist* 201:1163-1169.
- Smith, F.A., Elliott Smith, R.E., Lyons, S.K., Payne, J.L., 2018. Body size downgrading of mammals over the late Quaternary. *Science* 360, 310-313.

#### Secondary Readings:

- Barnosky, A.D., 2008. Megafauna biomass tradeoff as a driver of Quaternary and future extinctions. *Proceedings of the National Academy of Sciences* 105, 11543-11548.
- Doughty, C. E., 2013, Preindustrial Human Impacts on Global and Regional Environment: *Annual Review of Environment and Resources*, v. 38, p. 503-527.
- Doughty, C. E., Wolf, A., and Madhi, Y., 2013, The legacy of the Pleistocene megafauna extinctions on nutrient availability in Amazonia: *Nature Geoscience*, v. 6, p. 761-764.
- Gill, J. L., Williams, J. W., Jackson, S. T., Lininger, K., and Robinson, G. S., 2009, Pleistocene megafaunal collapse preceded novel plant communities and enhanced fire regimes: *Science*, v. 326, p. 1100-1103.
- Jeffers, E. S., Whitehouse, N. J., Lister, A., Plunkett, G., Barratt, P., Smyth, E., Lamb, P., Dee, M. W., Brooks, S. J., Willis, K. J., Froyd, C. A., Watson, J. E., and Bonsall, M. B. (2018) Plant controls on Late Quaternary whole ecosystem structure and function. *Ecology Letters* 21:814-825.
- Johnson, C. N., Rule, S., Haberle, S. G., Turney, C. S. M., Kershaw, A. P., and Brook, B. W., 2015, Using dung fungi to interpret decline and extinction of megaherbivores: problems and solutions: *Quaternary Science Reviews*, 110, 107-113.
- Koch, P.L., Barnosky, A.D., 2006. Late Quaternary extinctions: State of the debate. *Annual Review of Ecology, Evolution, and Systematics* 37, 215-250.
- Perrotti, A. G., and van Asperen, E. (2018) Dung fungi as a proxy for megaherbivores: opportunities and limitations for archaeological applications. *Vegetation History and Archaeobotany*.



- Rule, S., Brook, B. W., Haberle, S. G., Turney, C. S. M., Kershaw, A. P., and Johnson, C. N., 2012, The aftermath of megafaunal extinction: Ecosystem transformation in Pleistocene Australia: *Science*, 335, 1483-1486.
- Saltr , F., Rodr guez-Rey, M., Brook, B.W., Johnson, C.N., Turney, C.S.M., Alroy, J., Cooper, A., Beeton, N., Bird, M.I., Fordham, D.A., Gillespie, R., Herrando-P rez, S., Jacobs, Z., Miller, G.H., Nogu s-Bravo, D., Prideaux, G.J., Roberts, R.G., Bradshaw, C.J.A., 2016. Climate change not to blame for late Quaternary megafauna extinctions in Australia. *Nature Communications* 7, 10511.
- Zimov, S. A., Churprymin, V. I., Oreshko, A. P., Chapin, F. S., III, Reynolds, J. F., and Chapin, M. C., 1995, Steppe-tundra transition: A herbivore-driven biome shift at the end of the Pleistocene: *American Naturalist*, v. 146, p. 765-793.

### **11/18: Transfer Functions II [Lab]**

[No additional readings]

### **11/23: Biodiversity Legacies of the Last Ice Age [Discussion]**

#### Primary Readings:

- Hewitt, G., 2000. The genetic legacy of the Quaternary ice ages. *Nature* 405, 907-913.
- Bemmels, J.B., Knowles, L.L., Dick, C.W., 2019. Genomic evidence of survival near ice sheet margins for some, but not all, North American trees. *Proceedings of the National Academy of Sciences* 116, 8431-8436.
- Sandel, B., Arge, L., Dalsgaard, B., Davies, R.G., Gaston, K.J., Sutherland, W.J., Svenning, J.C., 2011. The influence of late Quaternary climate-change velocity on species endemism. *Science* 334, 660-664.

#### Supplemental Readings:

- Svenning, J.-C., Skov, F., 2004. Limited filling of the potential range in European tree species. *Ecology Letters* 7, 565-573.
- Jaramillo-Correa, J.P., Beaulieu, J., Khassa, D.P., Bousquet, J., 2009. Inferring the past from the present phylogeographic structure of North American forest trees: seeing the forest for the genes. *Canadian Journal of Forest Research* 39, 286-307.
- Rangel, T.F., Edwards, N.R., Holden, P.B., Diniz-Filho, J.A.F., Gosling, W.D., Coelho, M.T.P., Cassemiro, F.A.S., Rahbek, C., Colwell, R.K., 2018. Modeling the ecology and evolution of biodiversity: Biogeographical cradles, museums, and graves. *Science* 361, eaar5452.

### **11/30: Vegetation and Fire [Discussion]**

#### Primary Readings:

- McLauchlan, K.K., Higuera, P.E., Miesel, J., Rogers, B.M., Schweitzer, J., Shuman, J.K., Tepley, A.J., Varner, J.M., Veblen, T.T., Adalsteinsson, S.A., Balch, J.K., Baker, P., Batllori, E., Bigio, E., Brando, P., Cattau, M., Chipman, M.L., Coen, J., Crandall, R., Daniels, L., Enright, N., Gross, W.S., Harvey, B.J., Hatten, J.A., Hermann, S., Hewitt, R.E., Kobziar, L.N., Landesmann, J.B., Loranty, M.M., Maezumi, S.Y., Mearns, L., Moritz, M., Myers, J.A., Pausas, J.G., Pellegrini, A.F.A., Platt, W.J., Roozeboom, J., Safford, H., Santos, F., Scheller, R.M., Sherriff, R.L., Smith, K.G., Smith, M.D., Watts, A.C., 2020. Fire as a fundamental ecological process: Research advances and frontiers. *J. Ecol.* n/a.

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