American bison (*Bison bison*) were once keystone organisms of prairie ecosystems across North America (Coppedge and Shaw, 1998). While population sizes have been significantly reduced since European colonization, bison still express native behaviours present before their decline, specifically with regard to foraging. Being the largest mammal of North America, bison require immense amounts of forage to sustain their mass (Hecker *et al.*, 2021). Central to bison ecology is the foraging behaviour they exhibit (Mooring *et al*., 2005).

Rutley and Hudson (2001) were interested in observing how much time bison spend foraging and so conducted an observational study, finding that in warmer temperatures bison quickly alternated between foraging and resting bouts throughout the day. As temperatures cooled, bout frequency declined while bout length increased, culminating in winter with two foraging bouts in daylight and one at midnight. Bergman *et al.* (2001) further observed that bison minimized the length of each foraging bout by selecting younger forage containing more energy per gram than older forage. Fortin *et al.* (2001) found that this behaviour only acts to minimize foraging time and does not maximize long-term energy intake. Together these observational studies demonstrate bison foraging behaviours evolved in tandem with herd movements. Bison evolved to consume large amounts of forage in short periods of time to ensure they met their nutritional demands while compensating for unpredictable herd movements.

Not all bison live in herds, however. Males separate from females after four years and become progressively more solitary in a process called “sexual segregation” (Mooring *et al.*, 2005). Berini and Badgley (2017) collected observations and fecal samples of sexually segregated bison in several herds to determine the differences in their diet quality. After observations and fecal samples were collected, they found males consumed significantly less nutritious forage than females. Mooring *et al*. (2005) several years earlier determined this difference, after examining fecal samples for nutrient concentrations, to be most pronounced in early spring and summer, prior to the mating season. Post *et al.* (2001) had also previously examined bison feces composition, finding that members of female herds ate, proportionally, plants higher in digestible energy more often than solitary males. Collectively, these studies showcased how foraging behaviour is closely linked with sexual segregation. Forage preferences likely arose from sexual dimorphism, as males’ larger body and gut sizes are capable of fermenting highly fibrous forage that females cannot consume into usable energy (Mooring *et al.*, 2005). Males sexually segregating their diets reduces competition for the highly digestible and nutritious forage females require to meet the increased demands of pregnancy and lactation (Post *et al.*, 2001).

Environmental factors can influence the strength of divergence between sexually segregated diets. Recognizing this, Coppedge *et al*. (1998) analyzed female herd fecal samples on a natural tallgrass prairie to determine the species composition of their diet, finding that sedges and grasses were consumed at or above their proportion on the

landscape while forbs (non-grass herbs) were highly selected against. In the same year, Coppedge and Shaw (1998) observed female herd and solitary male use on burned grassland, discovering that while all bison preferred grazing on recent burns, female herds grazed them most often. Older burns were generally avoided as they yielded less energy per gram than newer ones. In tandem, these studies indicate selection of favourable habitat enhances bison diet segregation. In contrast, Jung (2015) looked at fecal plant composition in late winter and found constrained forage availability narrowed the amount of segregation in bison diets. Hecker *et al.* (2021) expanded on this finding, collating fecal nutrient composition data from across North America, discovering diets in northern latitudes were more constrained than southern diets. Both findings suggest colder climates restrict forage availability and reduce the amount of diet segregation in bison.

Research into bison foraging behaviour has shown grazing activities and diet preference are dictated by sex, season, habitat, and time of day, however, what remains to be studied is just as important as what has been uncovered. Very little research has been done on bison diets in late autumn and early winter (Hecker *et al.*, 2021), or on wild bison feeding schedules. Future research will have to address this gap in knowledge to further our understanding of bison foraging behaviour.

References:

Bergman, C. M., Fryxell, J. M., Gates, C. C., & Fortin, D. (2001). Ungulate foraging strategies: energy maximizing or time minimizing? *Journal of Animal Ecology*, *70*, 289-300. https://doi.org/10.1111/j.1365-2656.2001.00496.x

Berini, J. L., & Badgley, C. (2017). Diet segregation of American bison (*Bison bison*) of Yellowstone National Park (Wyoming, USA). *BMC Ecology*, *17*(1), 27. https://doi.org/10.1186/s12898-017-0137-9

Coppedge, B. R., Leslie, D. M., & Shaw, J. H. (1998). Botanical composition of bison diets on tallgrass prairie in Oklahoma. *Journal of Range Management*, *51*, 379-382. https://doi.org/10.2307/4003321

Coppedge, B. R., & Shaw, J. H. (1998). Bison grazing patterns on seasonally burned grassland prairie. *Journal of Range Management*, *51*, 258-264. https://doi.org/10.2307/4003408

Fortin, D., Fryxell, J. M., & Régis, P. (2002). The temporal scale of foraging decisions in bison. *Ecology*, *83*(4), 970-982. https://doi.org/10.1890/0012-9658(2002)083[0970:TTSOFD]2.0.CO;2

Hecker, L. J., Coogan, S. C. P., Nielsen, S. E., & Edwards, M. A. (2021). Latitudinal and seasonal plasticity in American bison *Bison bison* diets. *Mammal Review*, *51*(2), 193-206. https://doi.org/10.1111/mam.12229

Jung, T. S. (2015). Winter diets of reintroduced bison (*Bison bison*) in northwestern Canada. *Mammal Research*, *60*, 385-391. https://doi.org/10.1007/s13364-015-0240-2

Mooring, M. S., Reisig, D. D., Osborne, E. R., Kanallakan, A. L., Hall, B. M., Schaad, E. W., Wiseman, D. S., & Huber, R. R. (2005). Sexual segregation in bison: A test of multiple hypotheses. *Behaviour*, *142*(7), 897-927. https://doi.org/10.1163/1568539055010110

Post, D. M., Armburst, T. S., Horne, E. A., & Goheen, J. R. (2001). Sexual segregation results in differences in content and quality of bison (*Bos bison*) diets. *Journal of Mammalogy*, *82*(2), 407-413. https://doi.org/10.1644/1545-1542(2001)082%3C0407:SSRIDI%3E2.0.CO;2

Rutley, B. D., & Hudson, R. J. (2001). Activity budgets and foraging behavior of bison on seeded pastures. *Journal of Range Management*, *54*(3), 218-225. https://doi.org/10.2307/4003237