Zero-sum dynamics are distinct from energy being at steady state, energetic compensation over time, and compensatory fluctuations.

Zero-sum dynamics are when the species present compete strongly for a pool of resources and species abundances expand to exploit whatever resources are left unused, whether because another species has declined in abundance or because the amount available has increased. The key thing is that if you were to remove a species for some reason, other species would absorb the unused resources. This means that resource use *relative to the resources available* is constant and is more stable than the abundances of species. This can be accomplished via community-wide overlap in resource-use traits (but possible differentiation along other axes), via functional equivalence of all species (i.e. neutrality), or via like-for-like functional redundancy between pairs or other subsets of the community.

If species a) cannot all access the same resources or b) are strongly limited by factors other than resource availability, zero-sum dynamics will not be as strong or as consistent. In this case, removing a species means that a subset of resources then go unused. Meaning factors other than the resource pool are constraining other species.

I feel like there’s an important distinction between functional replacement happening after a long time lag and highly contingent on the matching of species’ traits with the environment and the regional pool, and a resource-based zero sum dynamic where species slot in to absorb what’s available. At Portal, the niche differences seem to be so strong that other species generally cannot substitute for kangaroo rats; even PB (based on my gut) seems to be a poor analog over the test of time. Maintaining a consistent energy flux between manipulated and control plots appears highly contingent on environmental conditions and dispersal; for the most part, non-kangaroo rat species are not engaged in a close zero-sum with kangaroo rats. (Spatial scale may play a part in this – maybe there are too many krats around, but if the manipulation occurred at a large enough scale, we would see analogs slot in more readily)

If the maintenance of resource use:resource availability is contingent on trait matching and dispersal, it means the resilience of the system/stability of resource use is more fragile than if there is more fluid compensation within the community. May mean we don’t expect systems to bounce back readily from species losses.

Manipulations differ from real-life species loss in that the conditions leading to the ‘atural’ loss of some species may be related to other relevant things. Like, acidification or habitat destruction is also doing a number on everything else. As opposed to a clean removal of kangaroo rats, happening because we feel like it and not because the system is changing in a way that disadvantages kangaroo rats.

The total amount of energy may fluctuate year to year and may even change directionally.

Similarly, populations may fluctuate synchronously or antisynchronously.