Song et al

This paper examines the effect of N addition on species change in a temperate steppe ecosystem and reports some interesting data confirming the sensitivity of herbs and the ability of grasses to respond positively to N deposition, up to 30 times the ambient N deposition, in the temperate steppe, an important ecosystem. The study highlights the rapid response in forbs, but also indicates despite very large doses there is the potential for recovery, with the soil data showing how nitrate moves down the soil profile with time. The paper is interesting, timely and generally well written but would benefit from including more information and detail on both the soils and availability of other nutrients particularly P, the climate and the species of forbs.

An indication of how these N loadings compare with the range of N deposition to similar steppe ecosystems would be useful to put the study into context. Given the richness in forb species I presume the ecosystem is considered N limited? The results demonstrate clearly the plant responses with respect to forbs and grasses but leave the reader rather frustrated as to the underpinning processes and what is driving change. It would be helpful to know if P availability is likely to be important and whether the grass species are mycorrhizal? Given the soil pH, the main form of N in the soil would be nitrate and thus both the forbs and grasses would be conditioned to nitrate uptake, these points need to be brought out in the discussion of the 15N data. The data presented in fig 2 suggest the huge increase in grass biomass would have made conditions very difficult for the forbs which quickly accumulated N, which if they were starved of light may have also affected the activity of the nitrate reductase enzyme.

I would like to see the method of N application described in more detail, was the N added in solution or dry to the foliage? I presume the inputs started in 2005. Background N deposition was relatively modest by comparison with the inputs and it would be useful to know the ratio of dry to wet deposition and if wet whether the majority falls in precipitation and how the quite low precipitation rates are distributed. Not all readers will be familiar with these types of ecosystems and in order to understand how these systems respond to N it is important to understand the relationship between N inputs and moisture. Does the rain fall evenly or as heavy showers that would be likely to leach the nitrate down the profile and is the timing related to demand for growth. Likewise more information on the forbs would be good, are they all perennials and what is their rooting depth and was a particular genera lost? What is meant by fencing off in 2001 to preserve the grazing disturbance, were grazers excluded?

I found the paper raised many unanswered questions concerning what was driving the response and I found the description of the soil changes rather confusing. Given the relatively high ….neutral soil pH I would have expected much of the ammonium to be nitrified until the fall in pH acted to feedback on this, some soil pH data would be helpful. Im a little puzzled as to why denitrification leads to nitrate enrichment, measures of the denitrification fluxes and soil moisture rather than just citing the Tilsner study would be helpful to understanding what is happening to the N.

The %N concentrations seem quite low on the whole for grasses, though I appreciate Im not very familiar with the species described. Do the authors mean N use efficiency? I would suggest that the authors are describing an increased ability in grasses to upregulate their ability to use the additional N to fix carbon, increase their productivity and potentially shade out the forbs? A conceptual model

showing how the authors believe the discrimination between ^{14} and ^{15} N enrichment would help to clarify the text.

Specific comments:

Abstract L5 change temperature to temperate

P 5068 L19 change level to load…Critical Levels relate to gaseous pollutants ..the authors are discussing the effect of a N load and for clarity it is preferable not to use level.

Fig 2 again I wonder if the message would be clearer if the axes for forbs and grasses were kept the same

Fig 3 you could try plotting the cover of the forbs and grasses in relation to the total N load ie the sum of each years loadings this would help us examine the relationship between forb and grass cover.

Fig 4 the y axis on D is wrongly labelled as grass should be forb

Fig 5 why have the relationships excluded the higher N loading? Dose responses could also be included for some of the other metrics as they help the reader to appreciate the nature of the responses.

Fig 6 would be clearer if the y axes were kept the same for 10 and 20 cm.