Putting bison to work: ecosystem effects of using European bison (Bison bonasus) as a restoration tool





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Introduction



Coastal dunes in Europe have become less dynamic because of costal defense, shrub encroachment following N deposition and lack of herbivores





Reconstruction of European bison range dynamics over the last 8000 years suggests a wider European distribution, including the Netherlands.

Can European bison be used as a restoration tool?

Expectation: Re-introduction of bison can fulfill two goals, the recovery of an endangered species and of an ecosystem process

Timeline of bison reintroduction in the Netherlands



Figure 1: The study area is located in the western area of the Netherlands, within the Zuid-Kennemerland National Park.





Figure 3: Bison re-introduction in the Kraansvlak

Figure 2: The timeline depicts bison reintroduction activities. Months correspond to time periods when new bison were added to the herd. Brown bison correspond to newly added animals, grey bison correspond to previously added bison, light grey bison correspond to bison fatalities, small sized bison correspond to newborns within the study area, and

Whole study area

Trees + Shrub: +8%

Sand blowout: +3%

Short grasses: +1%

Tall grasses: -8%

Bare sand: -3%

Land cover change: 2003-2009

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Figure 4: Land cover change based on automated classification of colorinfrared aerial photos with correct classification of 77.4% and 79.2% for 2003 and 2009 respectively. Pixel size is 50m2

Figure 7: Bison feeding preferences



Woody species were affected via debarking, twig and leaf consumption.



Figure 5: Land cover changes per class with or without the Figure 6: Land cover changes per classes of bison intensity of effect of bison

With: decrease in bare sand and increase in short grasses Without: Increase in woody and decrease in grey sand

Vegetation and bison intensity of use



High: decrease in woody; increase in short grasses **Medium:** decrease in tall grasses, increase in woody Low: decrease in bare sand and grasses and increase in woody



Figure 8: Locations of resting bison and land cover in 2003 and 20009. At the scale of the locations there can be observed an increase in sand patches despite the overall decrease in bare sand of the entire study area.

Resting locations seem associated with the increase in bare sand patches

Discussion and future directions

The goal of recovery of an endangered species has been accomplished, as the herd has reached stability and is successfully reproducing

Bison introduction is resulting in ecosystem changes. Preliminary results show: (1) Land cover changes mediated by bison and its intensity of use; (2) Feeding on grasses but also impacts on woody species via debarking and eating of twigs and leaves. (3) Resting sites seem to be promoting bare sand patches and potential restoration of landscape heterogeneity

Future work should elucidate the relative and cumulative impacts of these multiple behaviors on the ecosystem structure.