*International Journal of Wildland Fire* 26(4), 287–295
doi: 10.1071/WF16152_AC
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## Supplementary material

# Spatial scales influence long-term response of herbivores to prescribed burning in a savanna ecosystem

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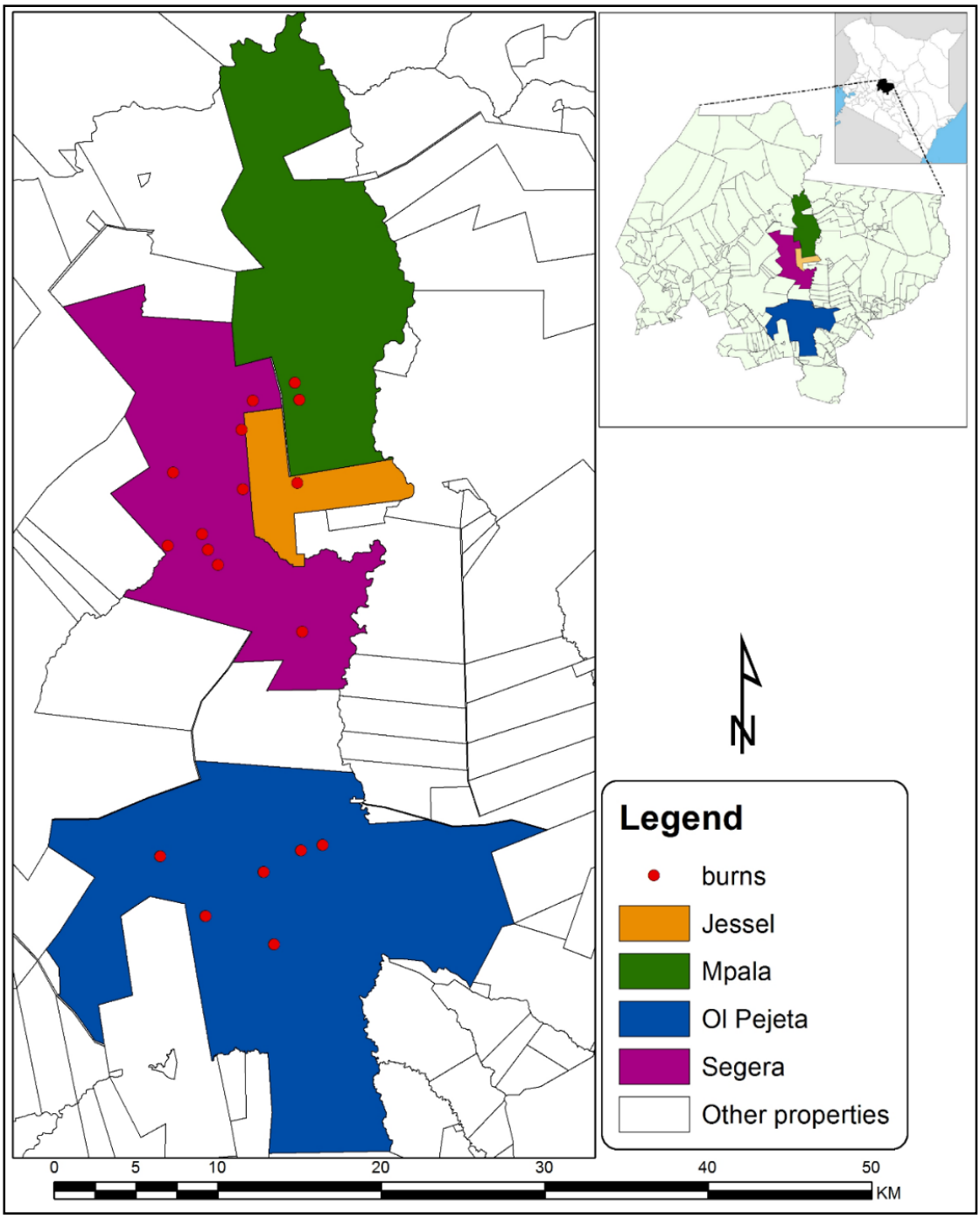


**Fig. S1.** Map of the study area showing the location of the burned plots in Mpala research Centre, Segera ranch, Jesel ranch, and Ol Pejeta conservancy in Laikipia County.

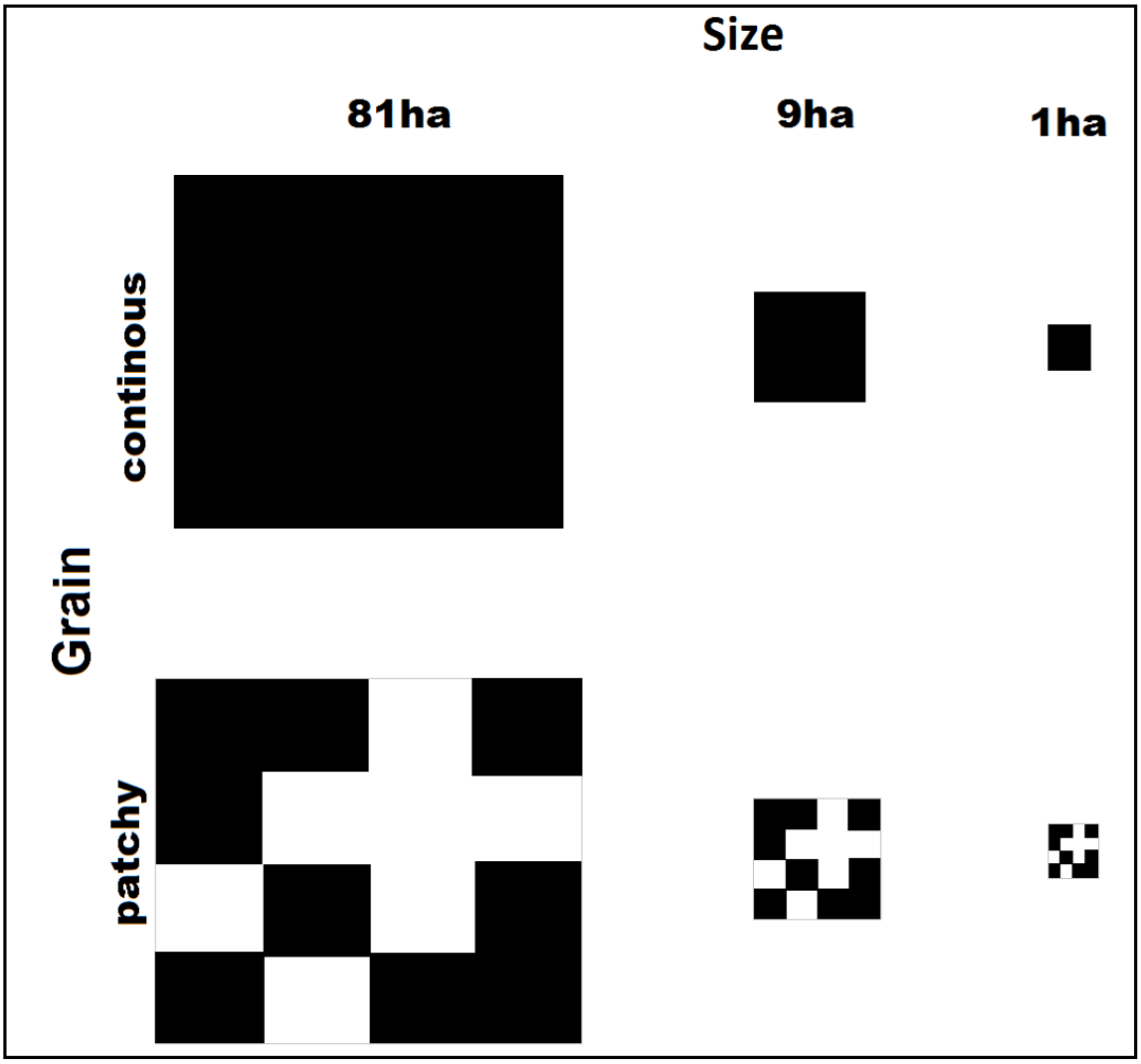


**Fig. S2.** Schematic diagram illustrating burns of different spatial extents (1-, 9-, and 81-ha) and grain (continuous and patchy). The burned areas are shaded in solid black.

**Table S1. Number of burned plots of different spatial extents (1–, 9–, and 81-ha) and grain (continuous and patchy)**

| Spatial extent of the burn (ha) | Grain of the burn | Number burned in 2004 | Number burned in 2005 | Total number of burns | Number of burns surveyed in both time periods (1–2 years after fire and 6–7 years after fire) |
|---|---|---|---|---|---|
| 1 | Continuous | 1 | 2 | 3 | 2 |
| | Patchy | 1 | 2 | 3 | 3 |
| 9 | Continuous | 1 | 3 | 4 | 3 |
| | Patchy | 1 | 2 | 3 | 3 |
| 81 | Continuous | 1 | 3 | 4 | 4 |
| | Patchy | 1 | | 1 | 1 |
| Total | | 6 | 12 | 18 | 16 |

**Table S2**. **Generalised linear model testing for (a) interactive effects of species and survey period on preference for the burned plots, and (b) species-specific changes in preference for the burns between the first and second survey period**

**(a) Model 1: preference ~ survey period + species**
**Model 2: preference ~ survey period * species**

| species | model | Df | LogLik | Chisq | Pr(>Chisq) |
|---|---|---|---|---|---|
| All | Model 1: | 11 | 54.72 | | |
| | Model 1: | 19 | 63.58 | 17.73 | 0.023 * |

**(b) Model 1: preference ~ 1**
**Model 2: preference ~ survey period**

| species | model | Df | LogLik | Chisq | Pr(>Chisq) |
|---|---|---|---|---|---|
| elephant | Model 1: | 2 | 10.80 | | |
| | Model 2: | 3 | 13.97 | 6.32 | 0.012 * |
| Zebra | Model 1: | 2 | 30.56 | | |
| | Model 2: | 3 | 31.31 | 1.5 | 0.220 |
| Eland | Model 1: | 2 | 3.13 | | |
| | Model 2: | 3 | 3.21 | 0.17 | 0.680 |
| Oryx | Model 1: | 2 | 12.69 | | |
| | Model 2: | 3 | 12.88 | 0.38 | 0.537 |
| Hartebeest | Model 1: | 2 | 2.75 | | |
| | Model 2: | 3 | 3.12 | 0.74 | 0.391 |
| Impala | Model 1: | 2 | 4.97 | | |
| | Model 2: | 3 | 6.57 | 3.21 | 0.073 . |
| Grant’s gazelle | Model 1: | 2 | 4.29 | | |
| | Model 2: | 3 | 6.70 | 4.82 | 0.028 * |
| Hare | Model 1: | 2 | 17.80 | | |
| | Model 2: | 3 | 18.17 | 0.73 | 0.392 |
| Warthog | Model 1: | 2 | 1.77 | | |
| | Model 2: | 3 | 2.43 | 1.32 | 0.251 |

**Table S3. Generalised linear model testing for (a) interactive effects of gut type, body weight and survey period on preference for the burned plots, and (b) independent effects of bodyweight on preference for the burns for each survey period**

**(a) Model: preference ~ gut type * survey period + ln(bodyweight) * survey period**

| | Estimate | Std.Error | z | Pr(>\|z\|) |
|---|---|---|---|---|
| (Intercept) | 2.60 | 0.39 | 6.65 | < 0.001 *** |
| Gut type | -0.59 | 0.25 | -2.41 | 0.016 * |
| Survey period | -1.25 | 0.52 | -2.41 | 0.016 * |
| Ln(bodyweight) | -0.38 | 0.072 | -5.35 | < 0.001*** |
| Gut type x survey period | 0.47 | 0.34 | 1.38 | 0.167 |
| Ln(bodyweight) x survey period | 0.21 | 0.095 | 2.18 | 0.029 * |

**(b) Model: Preference ~ ln(body weight)**

| Survey period | | Estimate | Std.Error | z | Pr(>\|z\|) |
|---|---|---|---|---|---|
| **First** | (Intercept) | 2.37 | 0.49 | 4.88 | < 0.001 *** |
| | bodyweight | -0.39 | 0.10 | -4.25 | < 0.001 *** |
| **Second** | (Intercept) | 1.29 | 0.34 | 3.79 | < 0.001 *** |
| | bodyweight | -0.18 | 0.06 | -2.74 | 0.006 ** |

**Table S4. Generalised linear model testing for changes in preference of the burns (between the first and second survey period) across burns of different spatial extents and grain**

**Model: Preference ~ extent * grain * survey period**

| | Estimate | Std.Error | z | Pr(>\|z\|) |
|---|---|---|---|---|
| (Intercept) | 1.7e-01 | 8.4e-02 | 2.10 | 0.036 * |
| extent | 4.4e-03 | 2.2e-03 | 1.99 | 0.047 * |
| grain | 1.8e-03 | 5.4e-04 | 3.35 | 0.001 ** |
| survey period | -3.4e-01 | 1.1e-01 | -2.93 | 0.003 ** |
| grain x extent | -2.4e-05 | 7.1e-06 | -3.37 | 0.001 ** |
| survey period x extent | 1.8e-02 | 3.2e-03 | 5.64 | < 0.001 ** |
| survey period x grain | 1.2e-03 | 7.7e-04 | 1.56 | 0.118 |
| survey period x grain x extent | -3.3e-05 | 1.0e-05 | -3.25 | 0.001 ** |

**Table S5. Linear model for the effects of spatial extents and grain on tree density**

**Model: Tree density ~ grain + extent**

| | | Df | SS | MS | F | Pr(>F) |
|---|---|---|---|---|---|---|
| **Trees shorter than 0.8m:** | grain | 1 | 624388 | 624388 | 1.36 | 0.257 |
| | extent | 1 | 205822 | 205822 | 0.45 | 0.511 |
| | Residuals | 19 | 8704067 | 458109 | | |
| **Trees taller than 0.8m:** | grain | 1 | 1563.7 | 1563.72 | 1.00 | 0.339 |
| | extent | 1 | 135.9 | 135.87 | 0.09 | 0.771 |
| | Residuals | 19 | 29592.1 | 1557.48 | | |

**Table S6. Linear model for the effects of spatial extent (size) and grain on changes in grass height across survey periods**

**Model: Grass height ~ survey period *grain + extent * survey period**

| | Df | SS | MS | F | Pr(>F) | |
|---|---|---|---|---|---|---|
| survey | 1 | 94.81 | 94.81 | 2.61 | 0.122 | |
| grain | 1 | 13.66 | 13.66 | 0.38 | 0.547 | |
| extent | 2 | 81.92 | 40.96 | 1.13 | 0.343 | |
| survey period x extent | 1 | 172.24 | 172.24 | 4.74 | 0.042 | * |
| survey period x extent | 2 | 37.47 | 18.74 | 0.52 | 0.605 | |
| Residuals | 20 | 726.11 | 36.31 | | | |

**Table S7. Generalised linear models testing the relationship between preference for the burns and grass height (grass), trees taller than 0.8m (above0.8), and trees shorter than 0.8m (below0.8m) across different herbivore species**

Models are ranked in a descending order based on $AIC_C$ weighted values. A total of 432 models, including the main effects and their interactions were fitted but only the top 9 models are listed here

| | model | $AIC_C$ | weights |
|---|---|---|---|
| 1 | preference ~ 1 + grass | -20.80 | 0.509 |
| 2 | preference ~ 1 + grass + species:grass | -16.75 | 0.067 |
| 3 | preference ~ 1 + below0.8m + below0.8m:grass | -15.59 | 0.037 |
| 4 | preference ~ 1 + species + grass | -15.05 | 0.028 |
| 5 | preference ~ 1 + grass + below0.8m:grass | -14.51 | 0.022 |
| 6 | preference ~ 1 + below0.8m:grass | -14.31 | 0.019 |
| 7 | preference ~ 1 + grass + below0.8m + below0.8m:grass | -14.25 | 0.019 |
| 8 | preference ~ 1 + species + grass + species:grass | -14.25 | 0.019 |
| 9 | preference ~ 1 + above0.8m + below0.8m + below0.8m:grass | -13.89 | 0.016 |
| ..... | | | |
| 53 | (Intercept only) preference ~ 1 | -7.41 | 0.001 |