A biogeographic contrast of invasive *Bromus tectorum* abundance and management in native vs. non-native ranges

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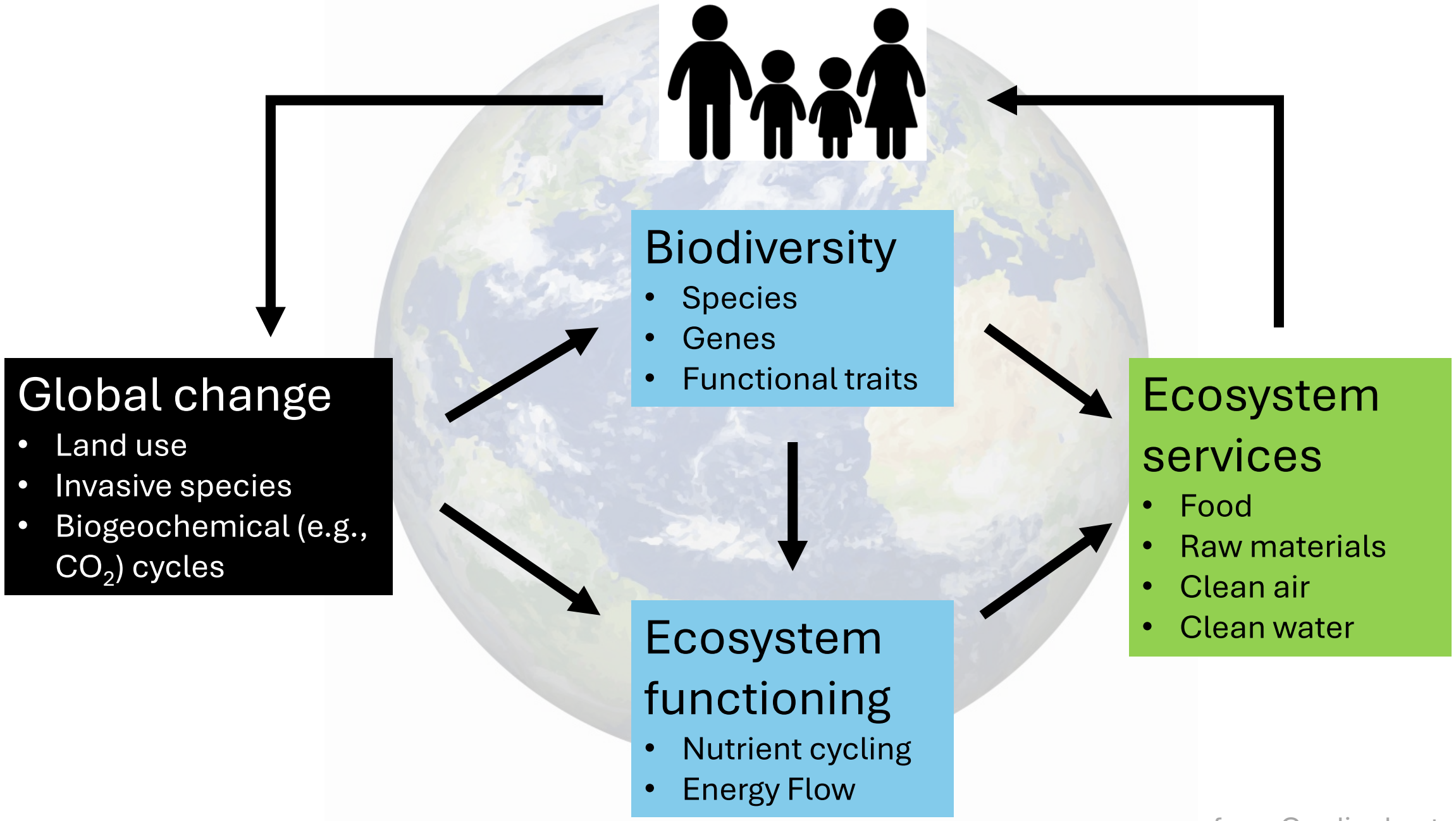
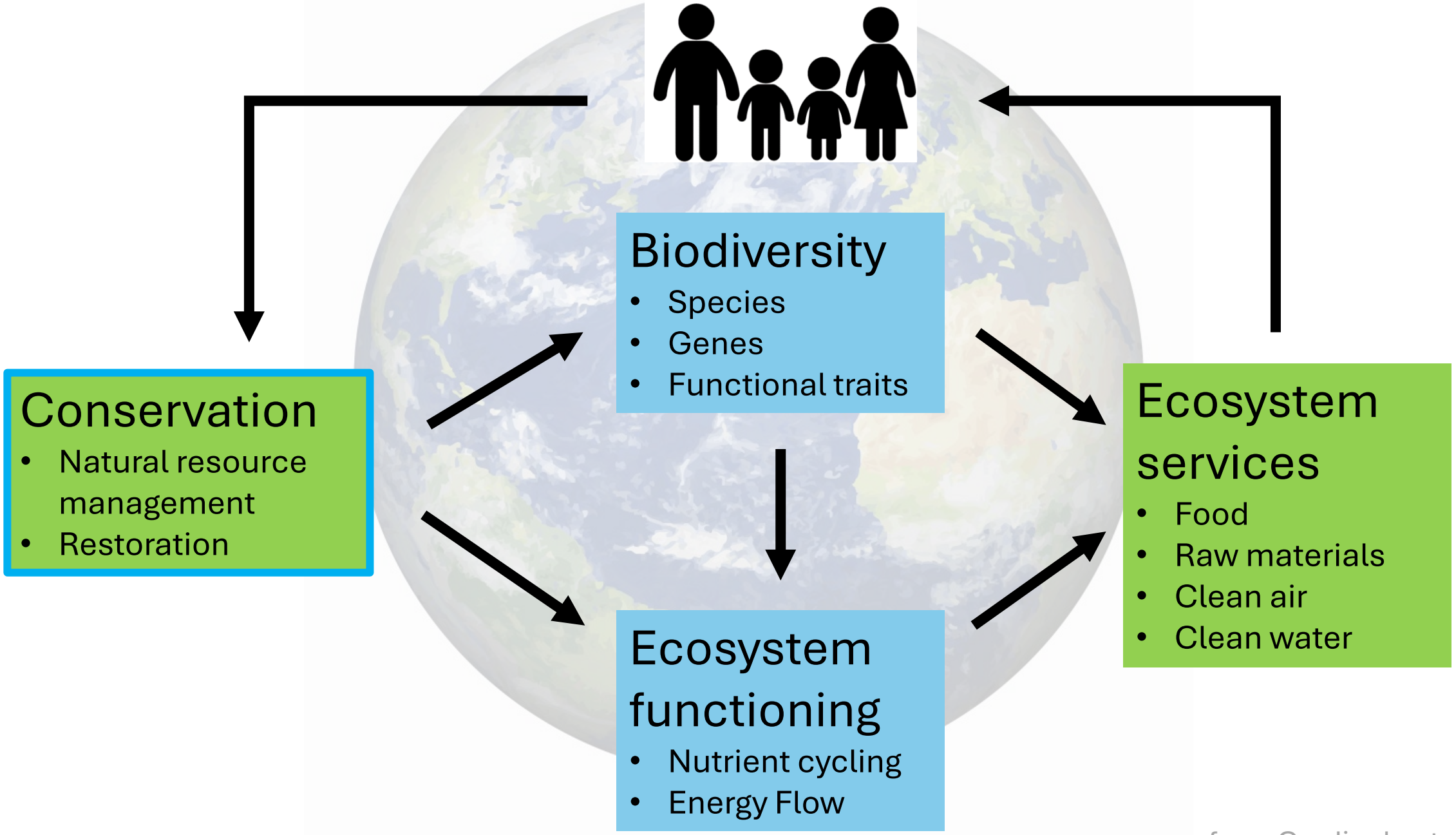


from Cardinale et al. 2012

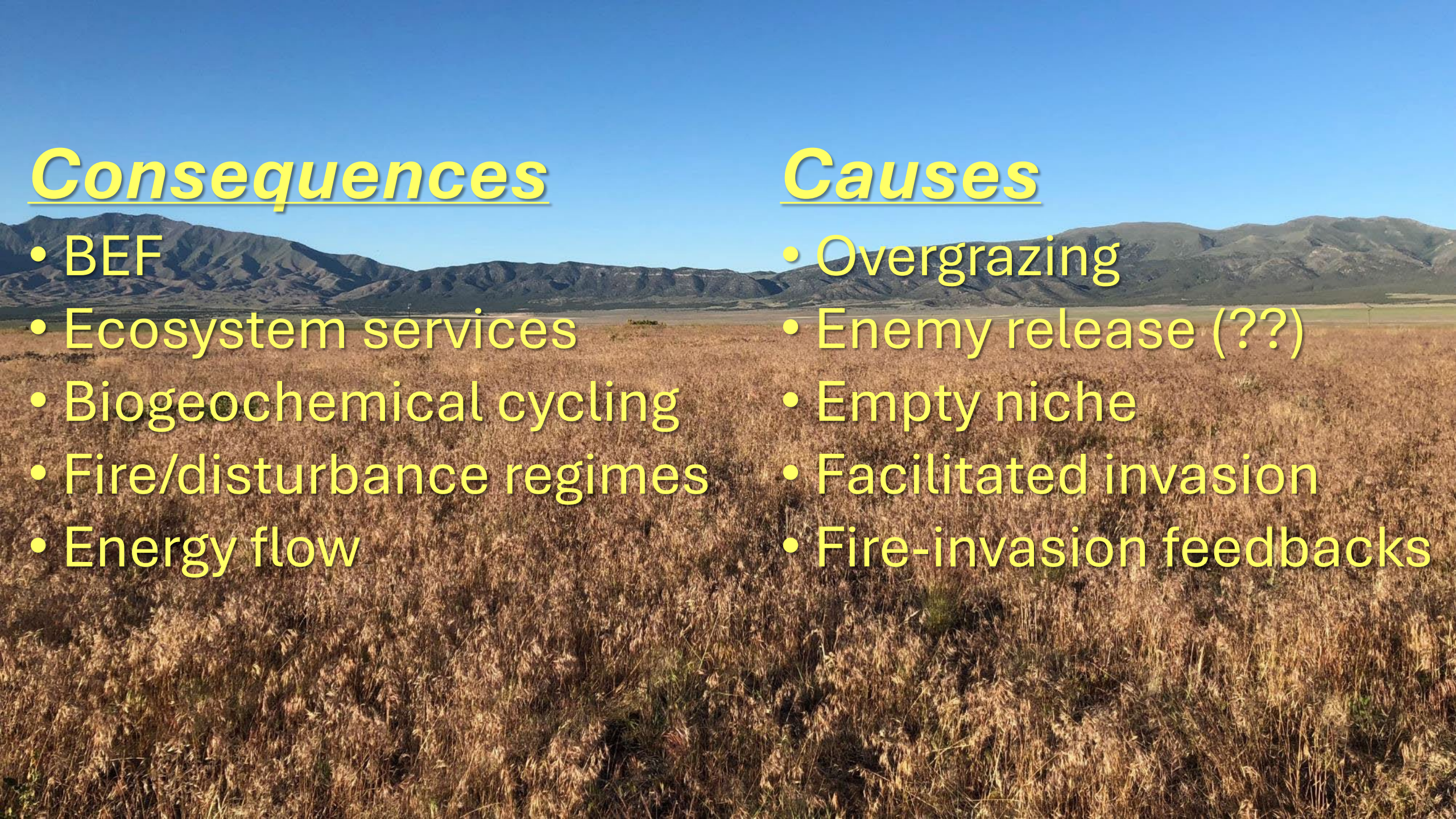


from Cardinale et al. 2012









Consequences

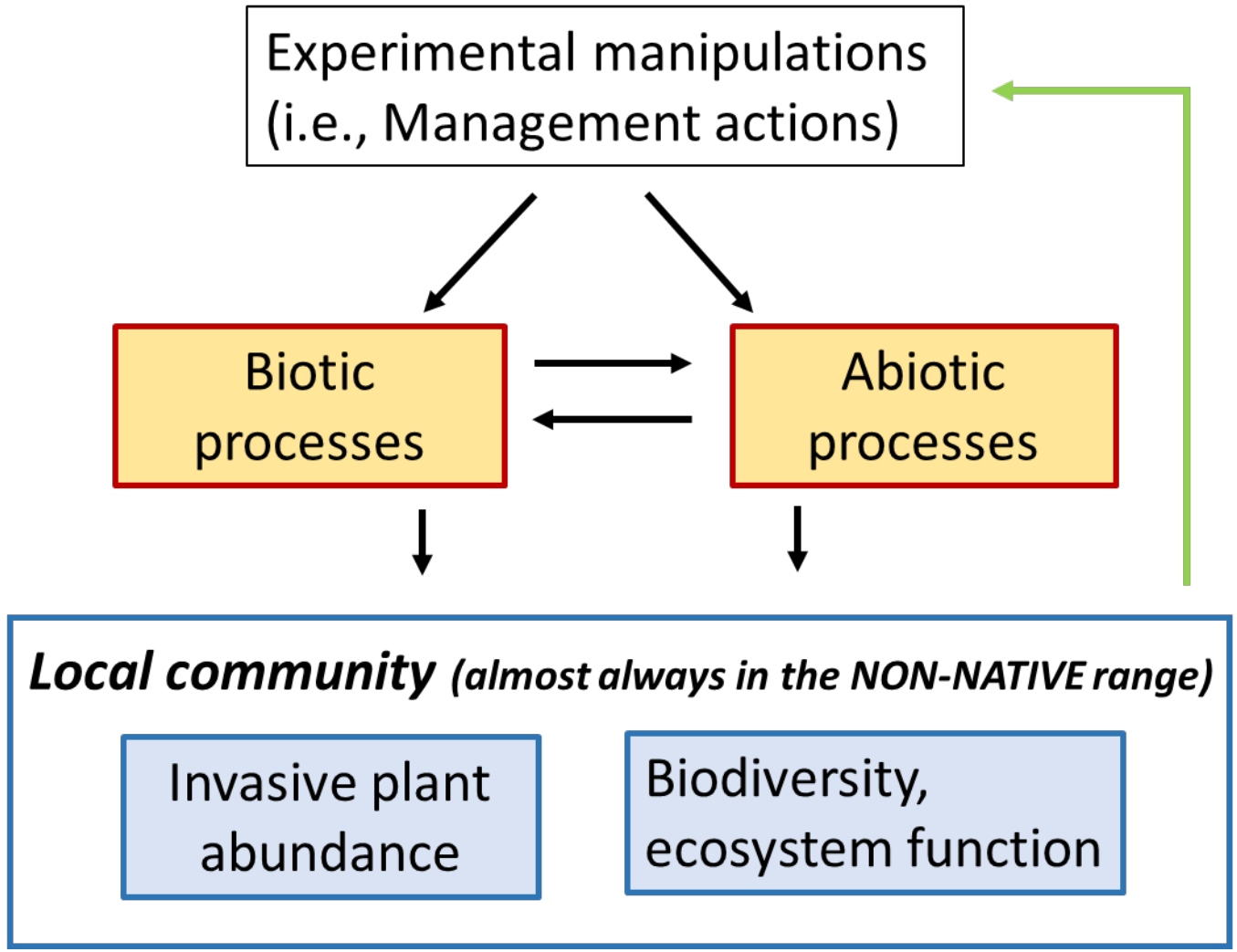
- BEF
- Ecosystem services
- Biogeochemical cycling
- Fire/disturbance regimes
- Energy flow

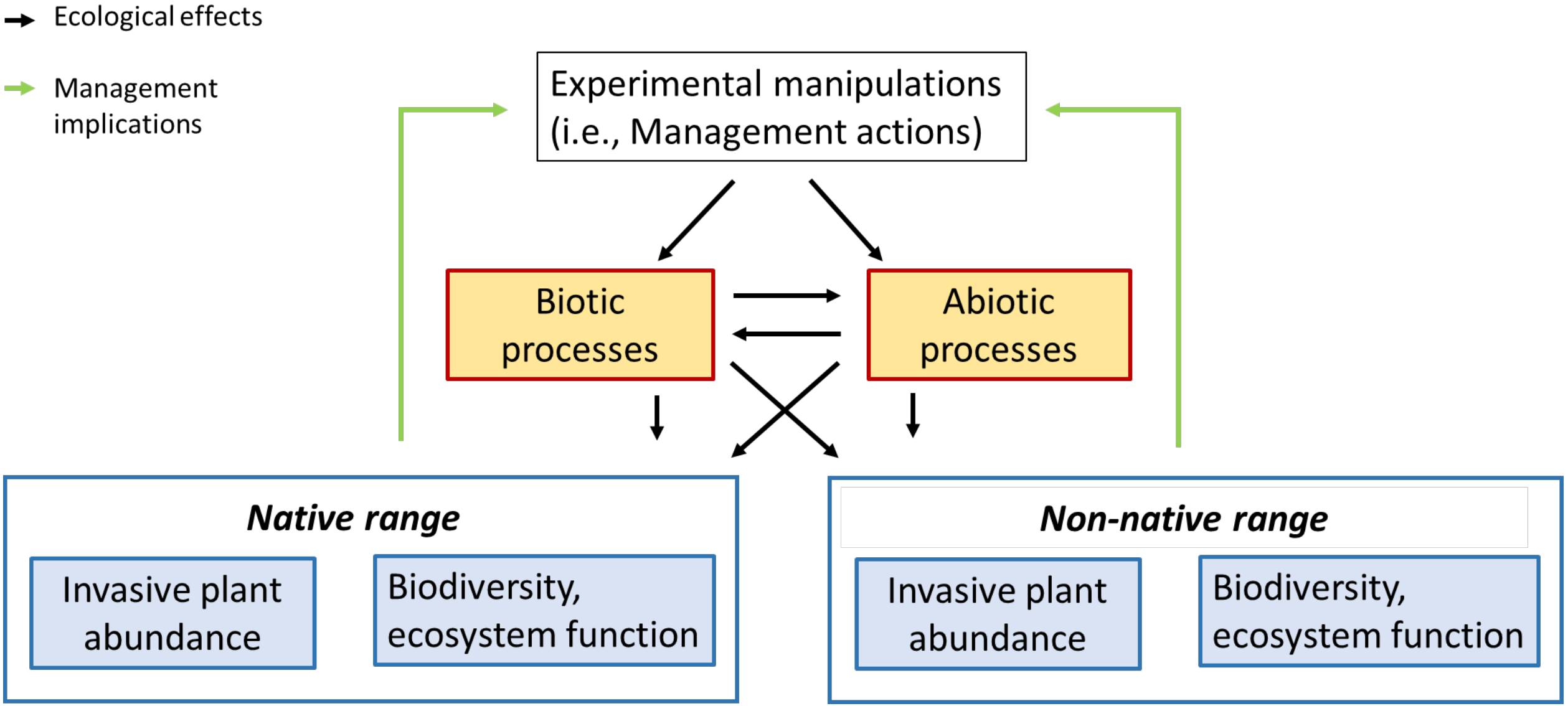
Causes

- Overgrazing
- Enemy release (??)
- Empty niche
- Facilitated invasion
- Fire-invasion feedbacks

Ecological effects

Management implications




Ecological effects
Management implications
Experimental manipulations (i.e., Management actions)
Biotic processes
Abiotic processes
Native range
Invasive plant abundance
Biodiversity, ecosystem function
Non-native range
Invasive plant abundance
Biodiversity, ecosystem function

Ecological effects

Management implications

Experimental manipulations (i.e., Management actions)

- Fungicide
- Insecticide
- Cattle exclusion
- Experimental fire
- Hoeing

Biotic processes

- Plant-fungal interactions
- Insect herbivory
- Cattle grazing

Abiotic processes

- Wildfire
- Soil disturbance

Native range

Brte abundance

Biodiversity, ecosystem functioning

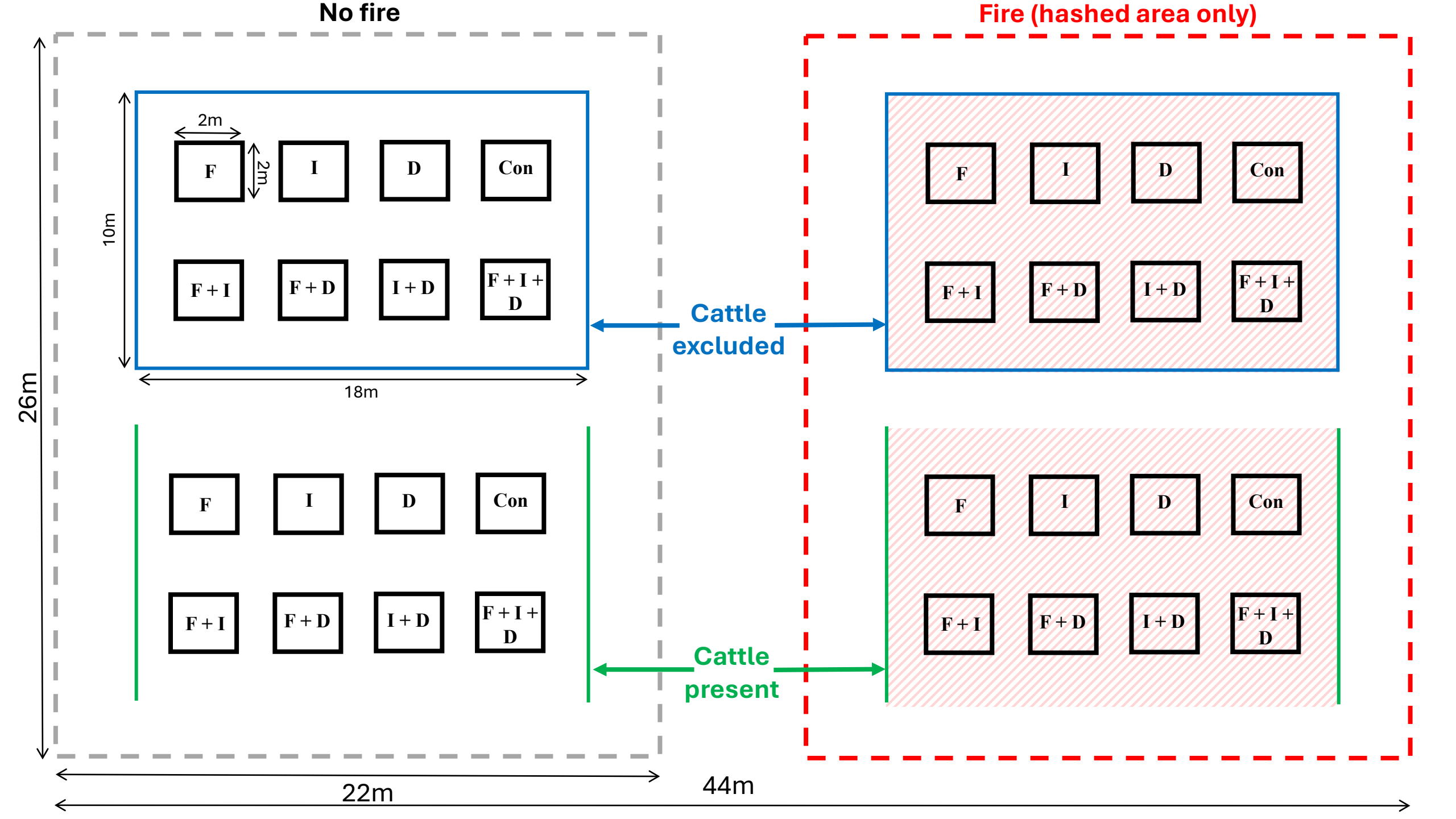
Non-native range

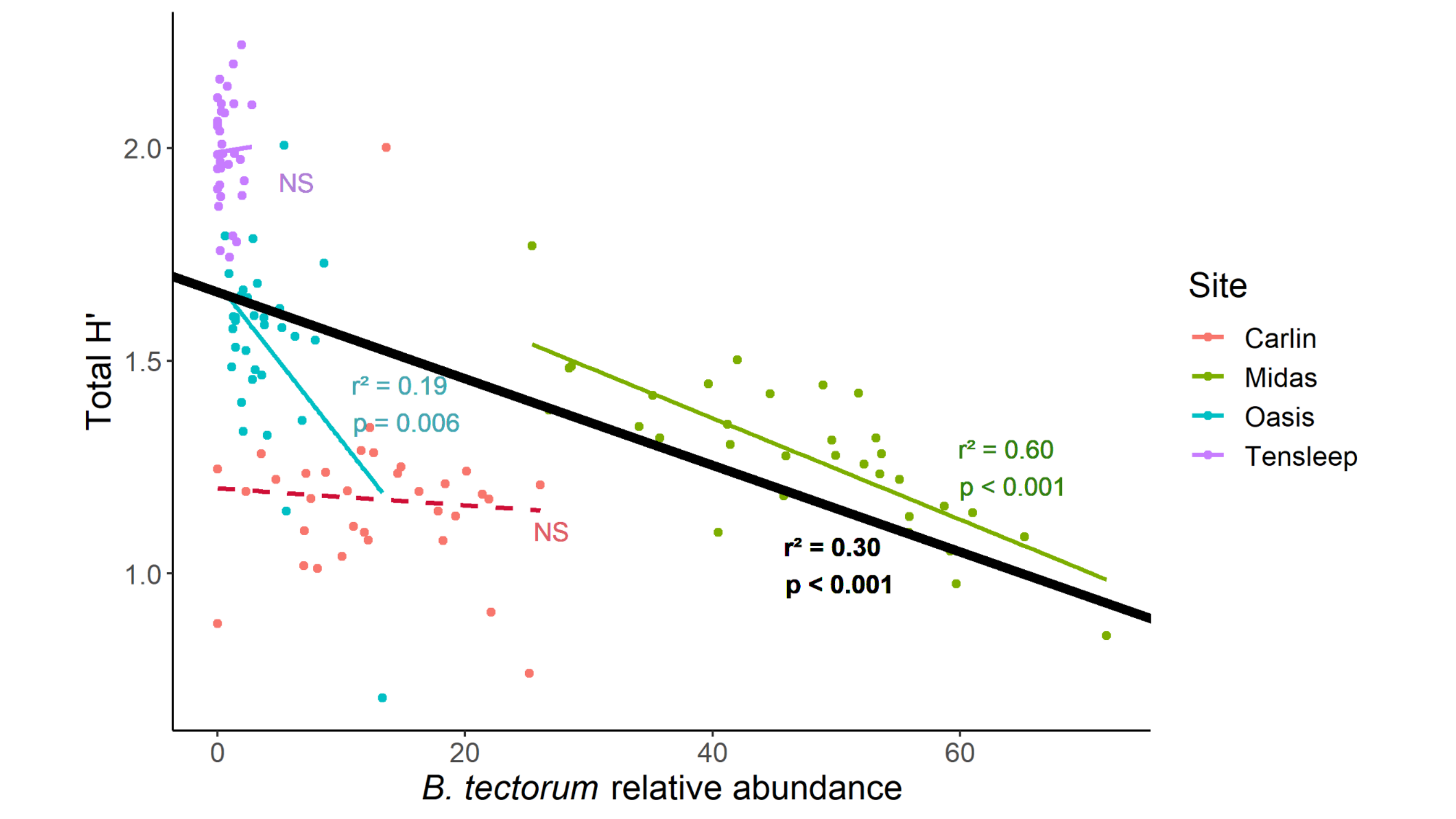
Brte abundance

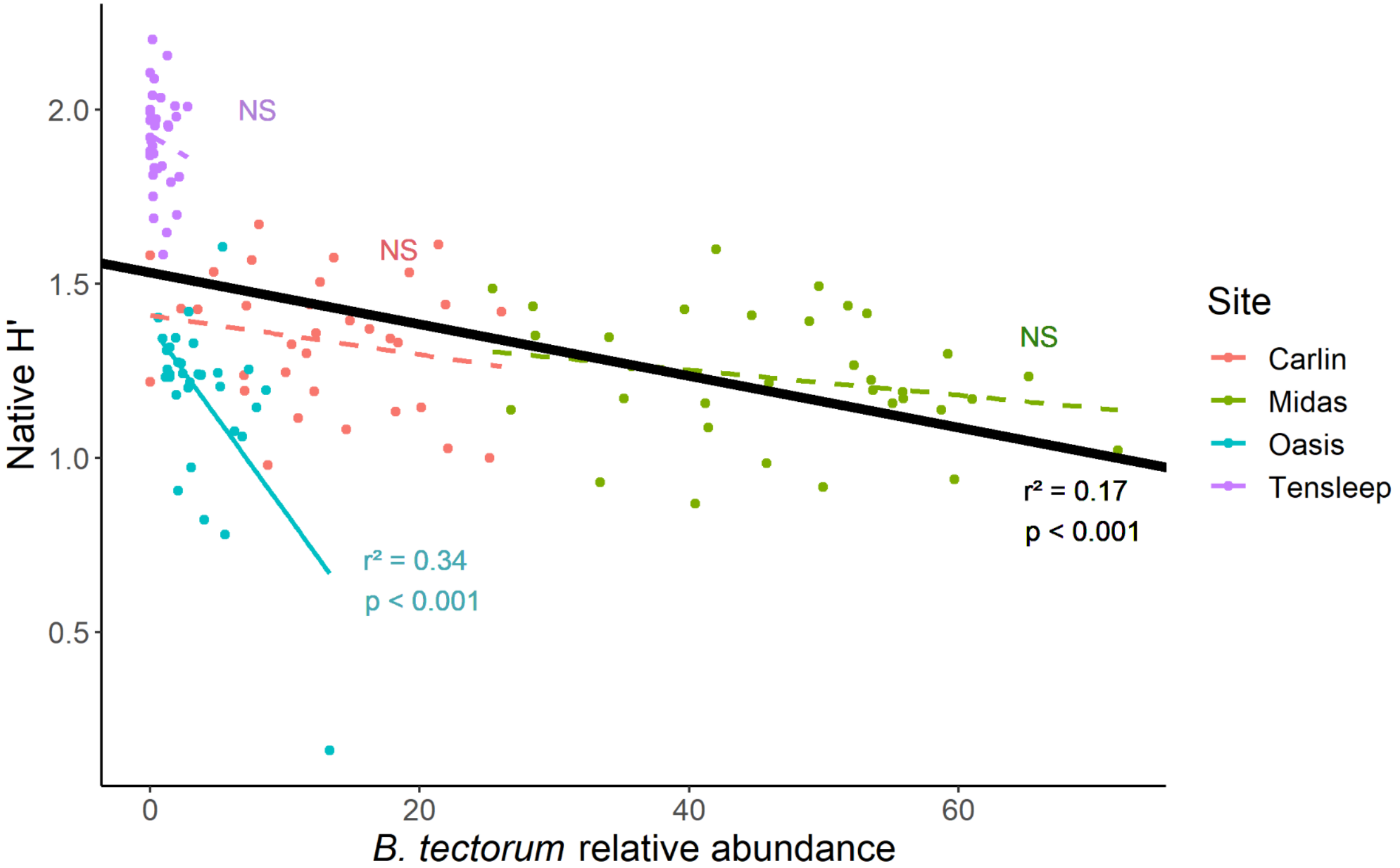
Biodiversity, ecosystem functioning

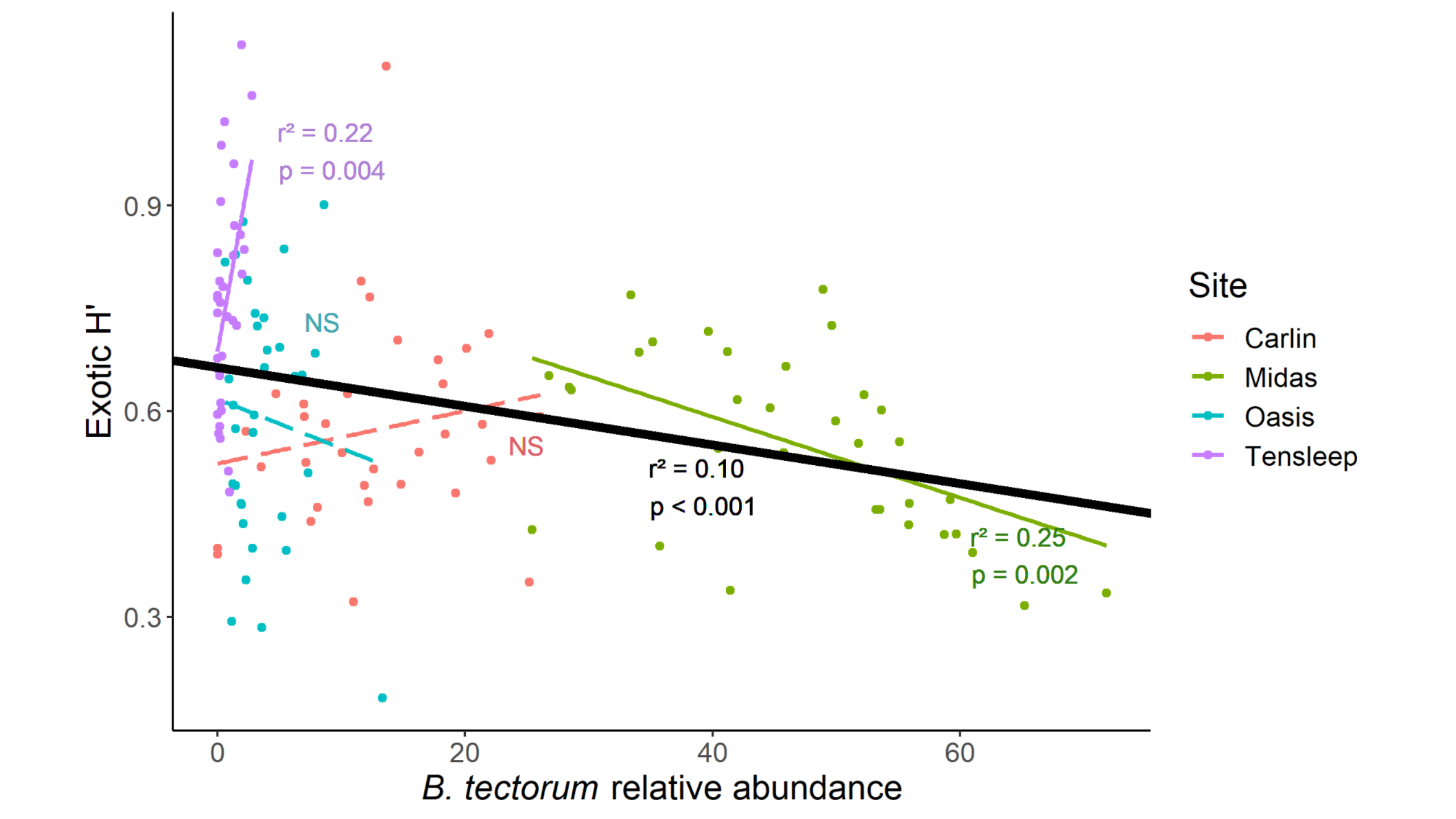
USDA

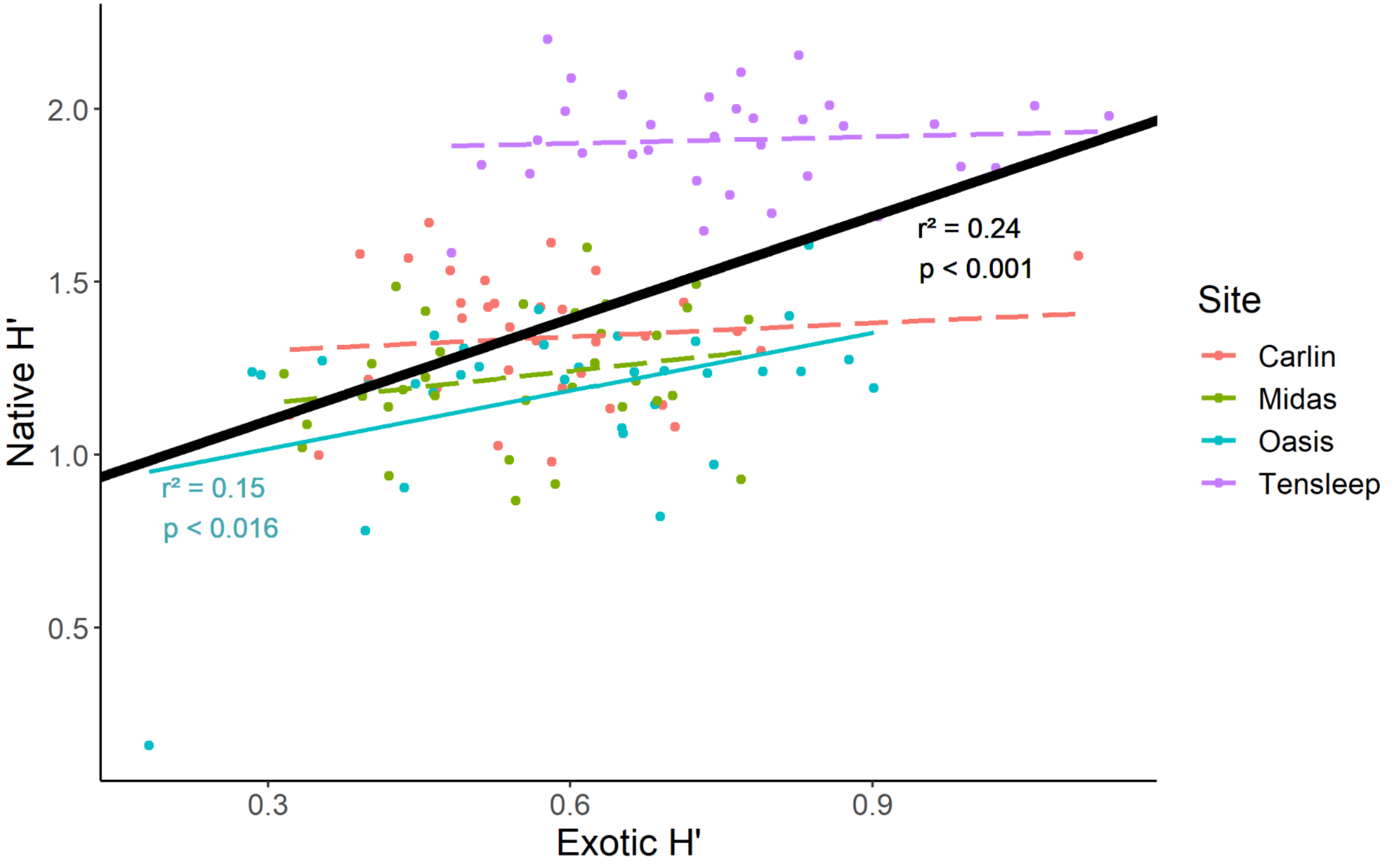

Canada
United States
Mexico
Cuba
Puerto Rico
Guatemala
Nicaragua
Venezuela
Guyana
Google
Sweden
Norway
Finland
Ireland
Denmark
Germany
Poland
Belarus
Ukraine
France
Austria
Romania
Italy
Spain
Portugal
Türkiye
Kazakhstan
Turkmenistan
Syria
Iraq
Iran
Afghanistan
Tunisia
Morocco
Algeria
Libya
Egypt
Western Sahara
Saudi Arabia
Oman
Yemen
Mauritania
Mali
Niger
Chad
Sudan
Burkina Faso
Guinea
Nigeria
Ghana
Ethiopia


No fire
Fire (hashed area only)
2m
2m
10m
18m
F
I
D
Con
F + I
F + D
I + D
F + I + D
Cattle excluded
Cattle present
26m
22m
44m


Total H'
2.0
1.5
1.0
0
20
40
60
B. tectorum relative abundance
NS
r² = 0.19
p = 0.006
NS
r² = 0.60
p < 0.001
r² = 0.30
p < 0.001
Site
Carlin
Midas
Oasis
Tensleep


Native H'
2.0
1.5
1.0
0.5
0
20
40
60
B. tectorum relative abundance
NS
NS
NS
r² = 0.17
p < 0.001
r² = 0.34
p < 0.001
Site
Carlin
Midas
Oasis
Tensleep


r² = 0.22
p = 0.004
NS
NS
r² = 0.10
p < 0.001
r² = 0.25
p = 0.002
Exotic H'
0.9
0.6
0.3
0
20
40
60
B. tectorum relative abundance
Site
Carlin
Midas
Oasis
Tensleep


Native H'
2.0
1.5
1.0
0.5
0.3
0.6
0.9
Exotic H'
r² = 0.24
p < 0.001
r² = 0.15
p < 0.016
Site
Carlin
Midas
Oasis
Tensleep


USDA


UNIVERSITY OF
MONTANA


U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT


NM
STATE
UNIVERSITY


NEVADA
GOLD MINES

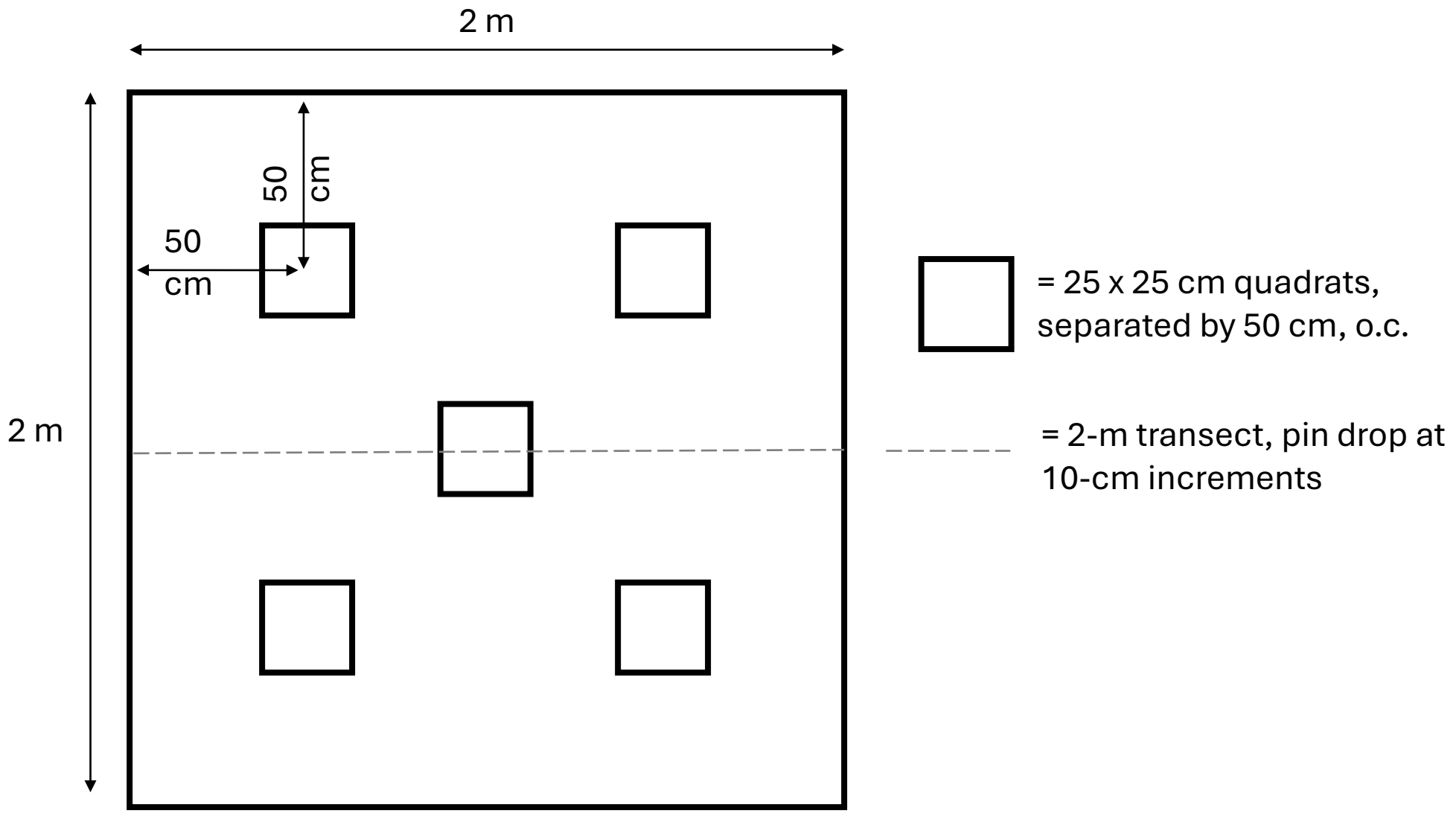

BRIGHAM YOUNG UNIVERSITY
FOUNDED
BYU
1875
PROVO, UTAH

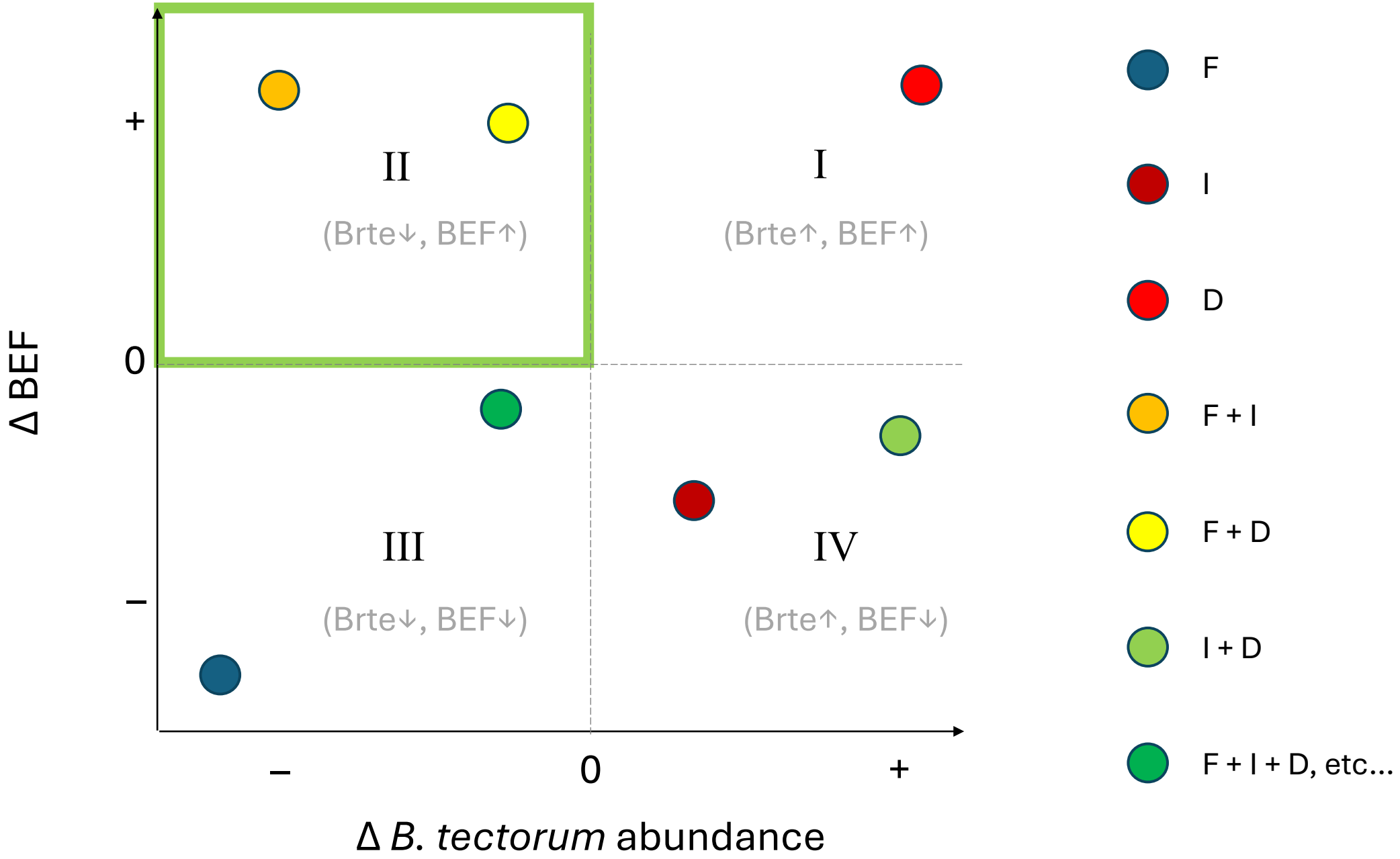

A M


BBCA
Biotechnology and Biological Control Agency


NDSU
TM


CABI


2 m
2 m
50 cm
50 cm
= 25 x 25 cm quadrats, separated by 50 cm, o.c.
= 2-m transect, pin drop at 10-cm increments


II
(Brte↓, BEF↑)
I
(Brte↑, BEF↑)
III
(Brte↓, BEF↓)
IV
(Brte↑, BEF↓)
+
0
–
Δ BEF
–
0
+
Δ B. tectorum abundance
Treatment combination
F
I
D
F + I
F + D
I + D
F + I + D, etc...