Native and invasive species are functionally similar in Mediterranean-climate ecosystems

Jennifer Funk, Rachel Standish, Will Stock and Fernando Valladares

Common traits of invaders
"live fast, die young"

Centaurea melitensis –
Star-thistle

Rapid growth rates

Phenotypic plasticity

Sexual and asexual reproduction

Early sexual maturity

High reproductive output

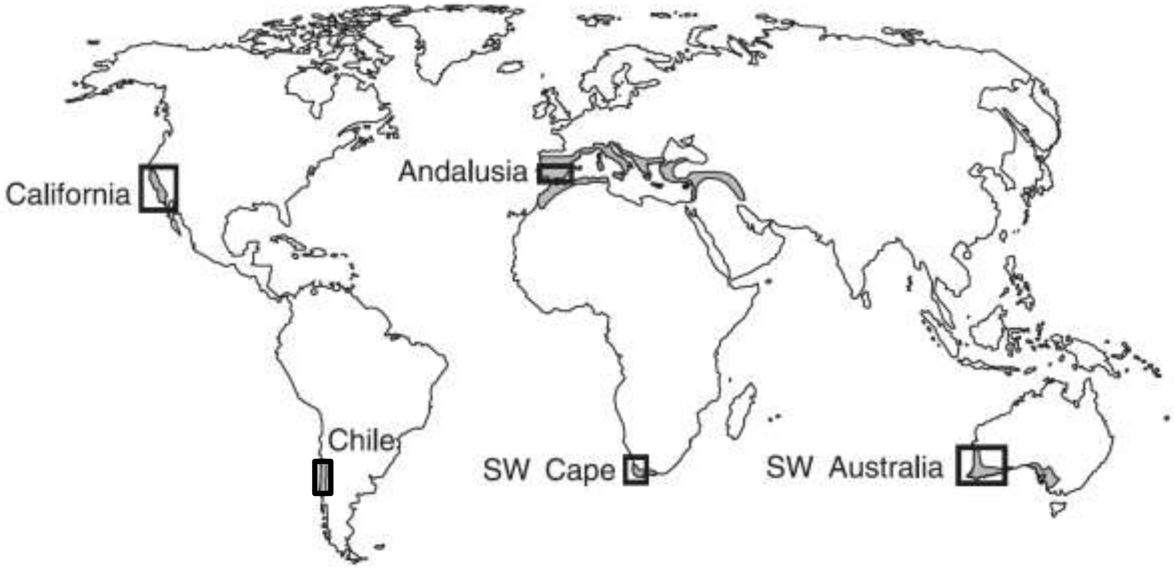
A tale of two grasslands
Resource availability affects community-level traits

Serpentine
Resource conservation traits

Non-serpentine
Resource acquisition traits

Resource conservation traits	Resource acquisition traits
Thick/small leaves (high LMA)	Thin/large leaves (low LMA)
Low photosynthetic rate	High photosynthetic rate
Low leaf nutrient content	High leaf nutrient content
High resource use efficiency	Low resource use efficiency
Slow growth rate	Fast growth rate
High root:shoot	Low root:shoot

Mediterranean-climate ecosystems



Study Question

Do native and invasive species in Mediterranean-climate ecosystems have similar traits due to abiotic pressures?

Region	Vegetation type	Vegetation class
California	Coastal sage scrub	Shrubland
	Serpentine grassland	Grassland
Chile	Sclerophyll woodland	Woodland
South Africa	Acid-sands fynbos	Shrubland
	Renosterveld	Shrubland
Spain	Coastal grassland	Grassland
Western Australia	Banksia woodland	Woodland
	Coastal banksia woodland	Woodland

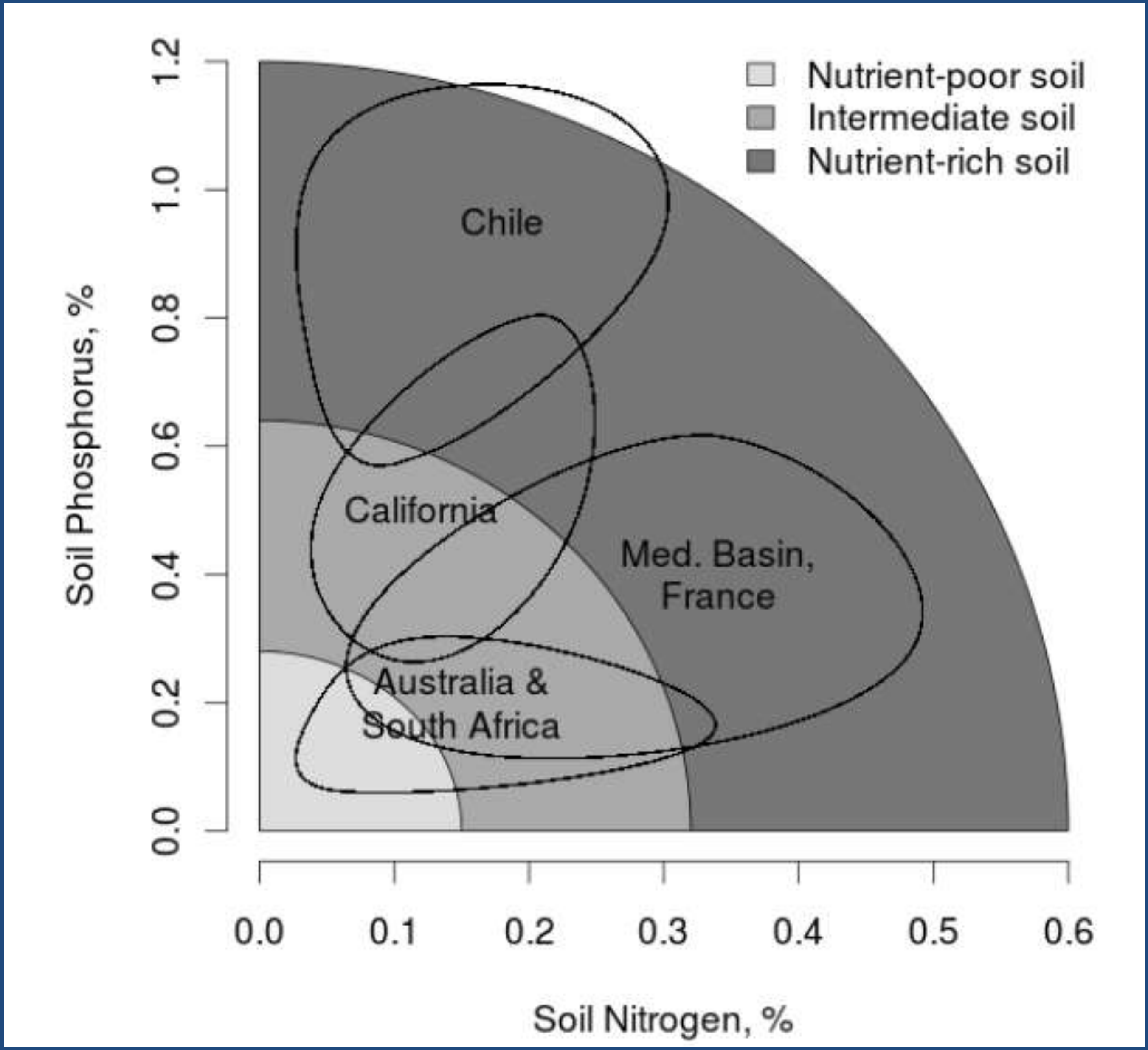


Figure from Dallman (1998) and DiCastri (1991)

Water and nutrient acquisition

Root depth
Specific root length (length/area)
Leaf mass per unit area
Seed mass
Life form
Nutrient acquisition strategy
(mycorrhizal, N-fixing, specialized roots, none)

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Photosynthetic phosphorus-use efficiency

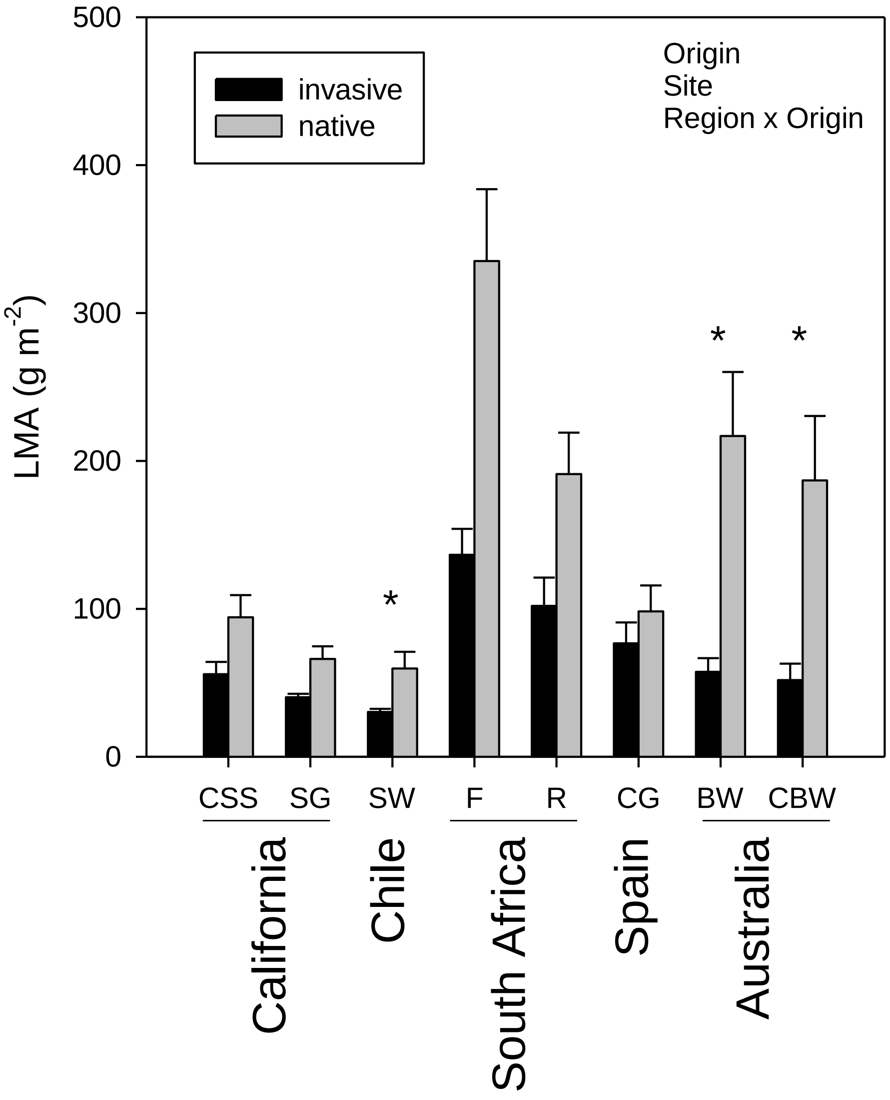
Light acquisition

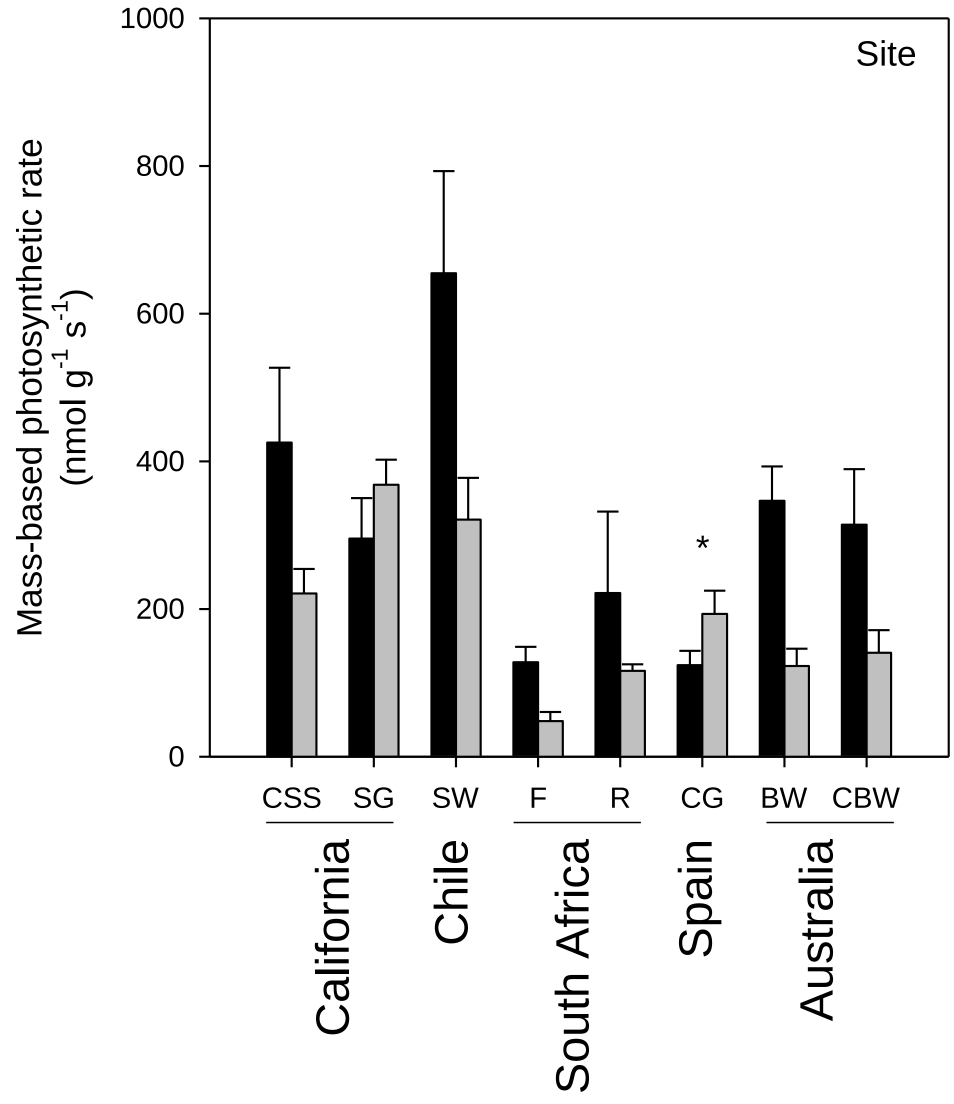
Height

	Region	Site (Region)	Origin	Origin x Region	Origin x Site (Region)
LMA	+	***	***	***	
Height		***		+	
Seed mass			+	*	
SRL		***			
Aarea					*
Amass	+	*	+		
WUE		***			
Nmass		*			
Narea	+	*			
PNUE	+	*			
Pmass	*	***			*
Parea		***			
PPUE		***	+		

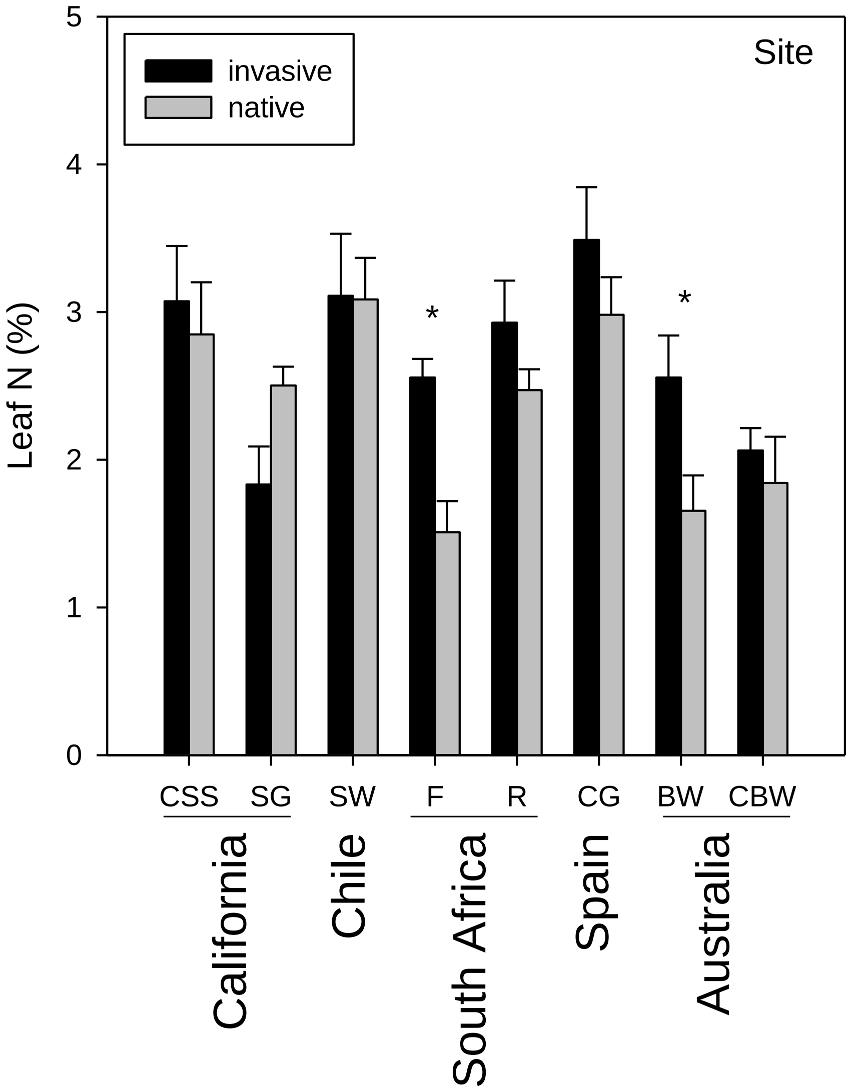
+ $P < 0.10$, * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$

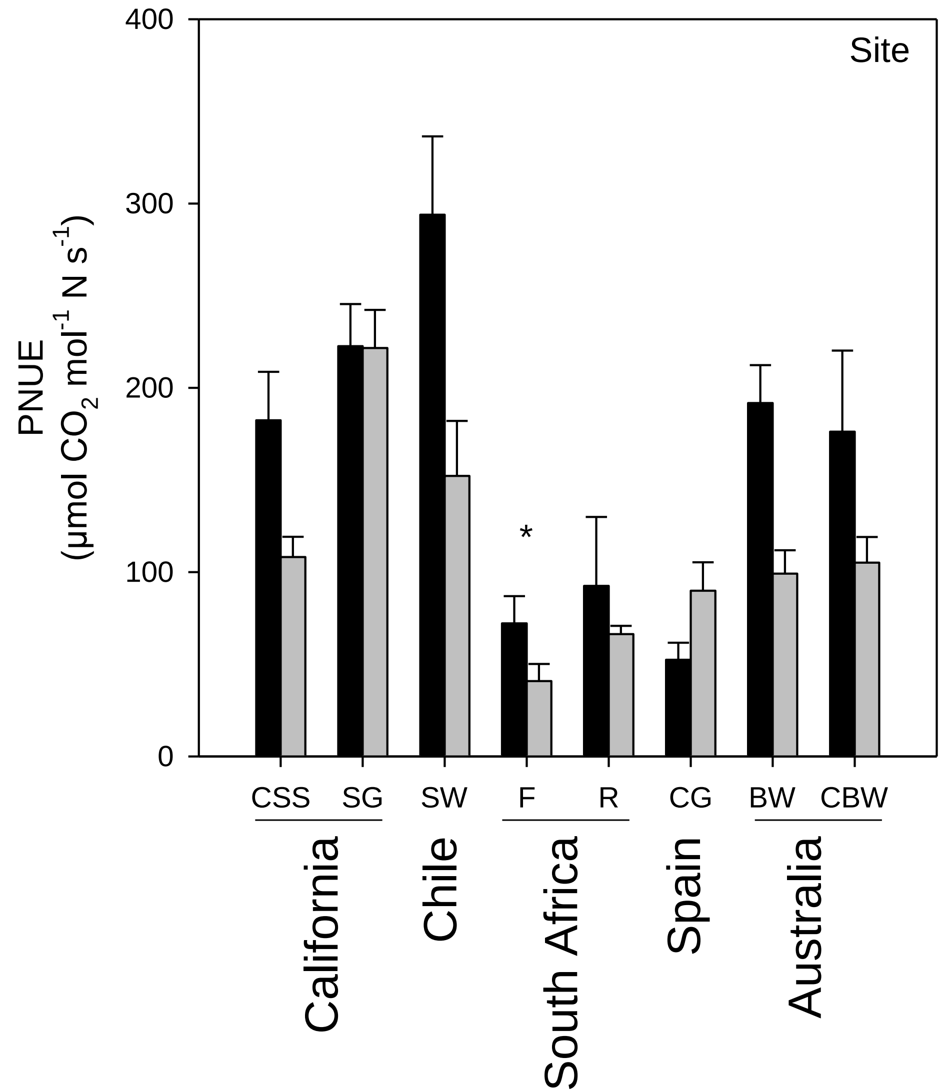
LMA differed between native and invasive species, but C assimilation did not





Leaf nutrient traits varied across sites, but not between native and invasive species

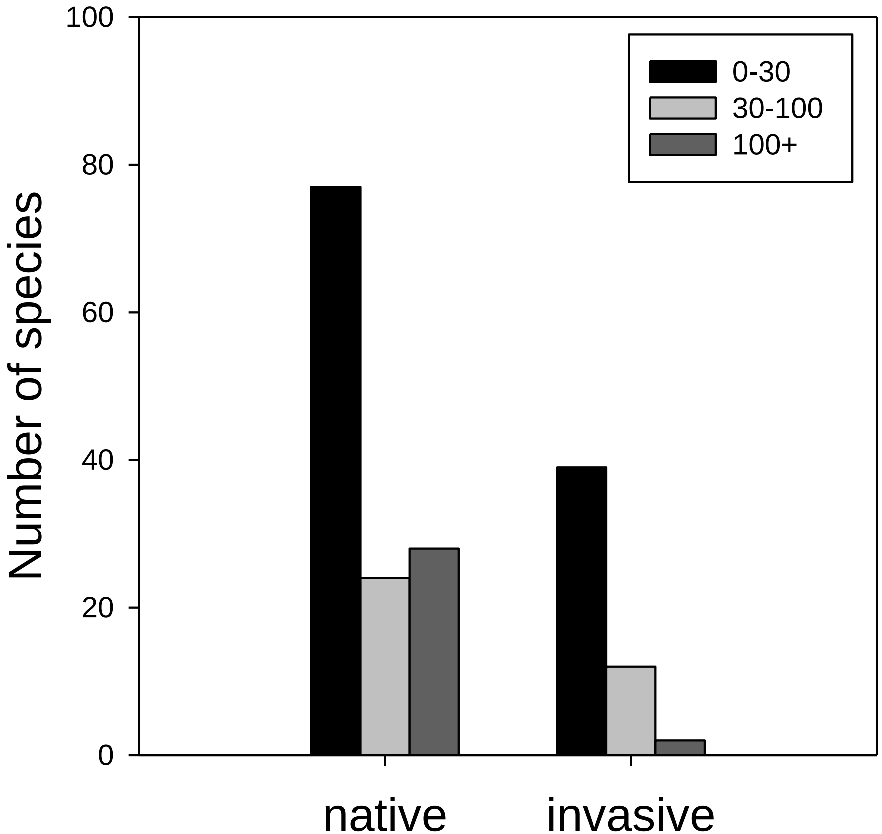




Invaders had shallower roots and an annual life form

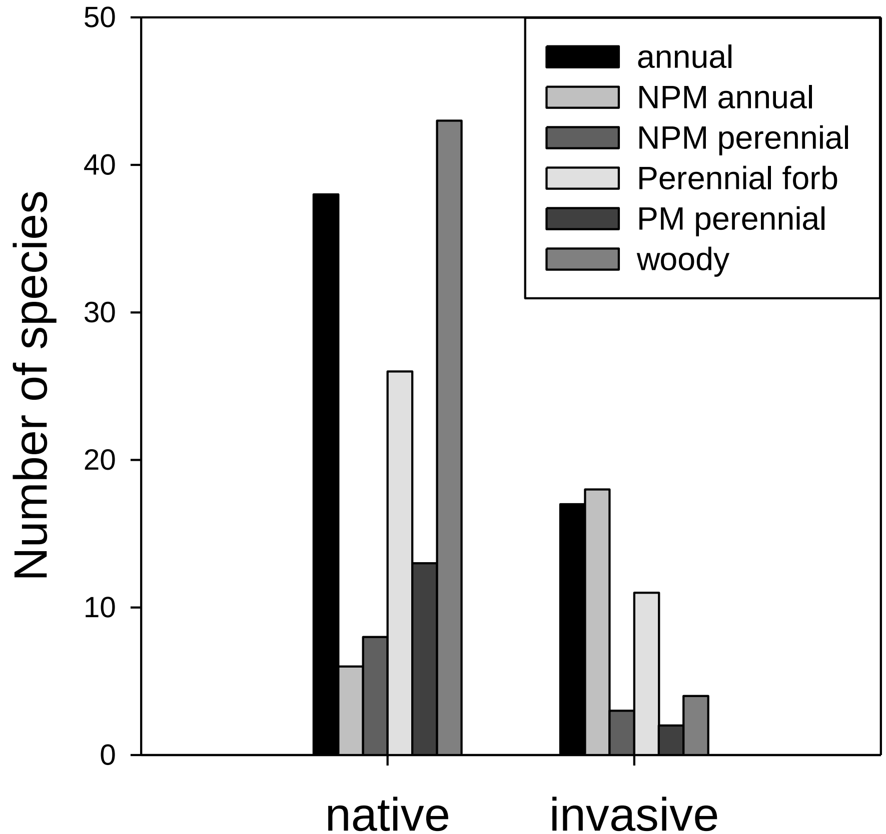
Root depth (cm)

$X^2 = 54.34$, $P < 0.0001$



Life form

$X^2 = 116.63$, $P < 0.0001$



Conclusions

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Rates of carbon assimilation and resource use were not linked to LMA.

Implications for restoration

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Our study ignored key aspects of resource use such as phenology and dormancy which may suggest alternative restoration manipulations.

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