**Supplementary Materials**

Supplementary Material 1.

List of variables extracted from each publication.

**Biophysical variables:**

 Longitude

 Latitude

 Continent

 Country

 Province/region/state

 City

 Elevation

 Precipitation (total annual)

 January average temperature

 July average temperature

 Biome

 Vegetation type

**Study data:**

 Type of study (observational/experimental)

 Year of data collection

 Native species

 Native species functional group

 Native community/species metric type (survival, growth, biomass, abundance, …)

 Native community/species metric units

 Invasive community/species metric type (survival, growth, biomass, abundance, …)

 Invasive community/species metric units

 Type of invasive management (if any)

**Analysis data:**

 Native community/species performance (low and high invasive) mean and SD (ES or variance)

 Native community/species sample size (low and high invasive

 Invasive community/species performance (low and high invasive) mean and SD (ES or variance)

 Invasive community/species sample size (low and high invasive)

 Driver of vulnerability/resistance

 If disturbance-type of disturbance and year of disturbance

Supplementary Material 2.

Flowchart of the publication selection process based on Preferred Reporting Items for Meta-analysis (PRISMA, <http://www.prisma-statement.org/>)



Supplementary Material 3.

Analyses code.

**ES estimation**

model{

for(i in 1:**N**){

taucon[i]<-invNlow[i]/(invsdlow[i]\*invsdlow[i])

tautreat[i]<-invNhigh[i]/(invsdhigh[i]\*invsdhigh[i])

C[i]~dnorm(invmeanlow[i],taucon[i])C(0,)#constrained to be positive for variables that can only be positive

T[i]~dnorm(invmeanhigh[i],tautreat[i])C(0,) #constrained to be positive for variables that can only be positive

ES[i]<-(T[i]-C[i])/((T[i]+C[i])/2)

} #observations with reported variance

}

**ES analysis**

model{

for(i in 1:506){ #invasive performance

Esinvsd[i]~dnorm(0.9176,1)C(0,) #missing variances

Esinvtau[i]<-1/(Esinvsd[i]\*Esinvsd[i])

Esinvtau.cut[i]<-cut(Esinvtau[i])

Esinv[i]~dnorm(Evul[i],Esinvtau.cut[i])

Esinv.h[i]~dnorm(Evul[i],Esinvtau[i])

Evul[i]<-Einv[Mech[i]]+SREi[StudyID[i]] #SRE randome effects

} #end invasive

for(i in 1:189){ #native performance

Esnatsd[i]~dnorm(0.5327,1)C(0,) #missing variances

Esnattau[i]<-1/(Esnatsd[i]\*Esnatsd[i])

Esnattau.cut[i]<-cut(Esnattau[i])

Esnat[i]~dnorm(EvulN[i],Esnattau.cut[i])

Esnat.h[i]~dnorm(EvulN[i],Esnattau.cut[i])

EvulN[i]<-Enat[Mech[i]]+SREn[StudyID[i]]

} #end native

#invasive priors

#disturbance

for(i in 1:6){

Einv[i]~dnorm(Ei[1],tau[1])

}

#decrease resources

for(i in 7:10){

Einv[i]~dnorm(Ei[2],tau[2])

}

#increase resources

for(i in 11:14){

Einv[i]~dnorm(Ei[3],tau[3])

}

#lack of biotic resistance

Einv[15]<-Ei[4]

#lack of natural enemies

for(i in 16:19){

Einv[i]~dnorm(Ei[5],tau[4])

}

#propagule pressure

Einv[20]<-Ei[6]

#native priors

#disturbance

for(i in 1:6){

Enat[i]~dnorm(En[1],tau[5])

}

#decrease resources

for(i in 7:9){

Enat[i]~dnorm(En[2],tau[6])

}

Enat[10]<-0 #no data

#increase resources

Enat[11]~dnorm(En[3],tau[7])

Enat[13]~dnorm(En[3],tau[7])

Enat[12]<-0#no data

Enat[14]<-0#no data

#lack of biotic resistance

Enat[15]<-En[4]

#lack of natural enemies

Enat[16]~dnorm(En[5],tau[8])

Enat[18]~dnorm(En[5],tau[8])

Enat[17]<-0 #no data

Enat[19]<-0 #no data

#propagule pressure

Enat[20]<-En[6]

for(i in 1:6){

Ei[i]~dnorm(0,1)

En[i]~dnorm(0,1)

}

for(i in 1:Npublications){

SREi[i]~dnorm(0,tau[9])

SREn[i]~dnorm(0,tau[10])

}

for(i in 1:10){

tau[i]<-1/var[i]

var[i]~dunif(0,10000)

}

}#end model

Disturbance and biome/vegetation types have code similar to the one shown above.

Supplemental Material 4.

List of publications included in the analyses.

|  |
| --- |
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Supplemental Material 5.

Funnel plots of estimated effect sizes (ES) for invasive and native species.



Supplemental Material 6.

Parameters from analyses.

**Analysis by driver (and sub-driver) of vulnerability**:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Community** | **Driver** | **sub-driver** | **mean** | **sd** | **2.50%** | **97.50%** |
| invasive | disturbance | Overall | 0.8977 | 0.3875 | 0.02088 | 1.62 |
| invasive | disturbance | altered hydrology | 1.206 | 0.8229 | -0.4296 | 2.859 |
| invasive | disturbance | fire | 1.022 | 0.3316 | 0.3737 | 1.752 |
| invasive | disturbance | herbivory | 0.8391 | 0.2091 | 0.5204 | 1.339 |
| invasive | disturbance | human activities | 1.067 | 0.2579 | 0.6025 | 1.687 |
| invasive | disturbance | removal of vegetation | 1.265 | 0.2808 | 0.7689 | 1.894 |
| invasive | disturbance | soil disturbance | 0.629 | 0.3707 | -0.18 | 1.371 |
| invasive | decrease resources | Overall | 0.5533 | 0.6768 | -1.005 | 1.727 |
| invasive | decrease resources | light | 0.8239 | 0.2916 | 0.2548 | 1.387 |
| invasive | decrease resources | water | 1.354 | 0.2261 | 1.01 | 1.889 |
| invasive | decrease resources | nutrients | 1.422 | 0.2399 | 1.031 | 1.966 |
| invasive | decrease resources | space | -0.0146 | 0.4016 | -0.7931 | 0.7831 |
| invasive | increase resources | Overall | 1.086 | 0.631 | -0.5605 | 2.074 |
| invasive | increase resources | light | 1.686 | 0.4016 | 0.9223 | 2.538 |
| invasive | increase resources | water | 1.131 | 0.316 | 0.6076 | 1.819 |
| invasive | increase resources | nutrients | 1.478 | 0.2865 | 0.9882 | 2.104 |
| invasive | increase resources | space | 1.339 | 0.3126 | 0.8041 | 2.02 |
| invasive | lack of biotic resistance | Overall | 1.22 | 0.2126 | 0.8858 | 1.724 |
| invasive | natural enemies | Overall | 0.8498 | 0.5494 | -0.5708 | 1.734 |
| invasive |  | herbivores | 1.281 | 0.2294 | 0.9153 | 1.81 |
| invasive |  | allelopathy | 1.066 | 0.2491 | 0.6553 | 1.637 |
| invasive |  | seed predators | 0.8556 | 0.2512 | 0.434 | 1.416 |
| invasive |  | parasites | 1.107 | 0.5291 | 0.07438 | 2.223 |
| invasive | propagule pressure | Overall | 0.8646 | 0.1957 | 0.4948 | 1.238 |
| native | disturbance | Overall | 0.2516 | 0.2731 | -0.31 | 0.7769 |
| native | disturbance | altered hydrology | 0.06994 | 0.1656 | -0.2567 | 0.3729 |
| native | disturbance | fire | 0.2972 | 0.1638 | -0.0285 | 0.5971 |
| native | disturbance | herbivory | 0.4592 | 0.1656 | 0.1227 | 0.7653 |
| native | disturbance | human activities | -0.0706 | 0.1839 | -0.4409 | 0.2762 |
| native | disturbance | removal of vegetation | 0.3236 | 0.4487 | -0.552 | 1.266 |
| native | disturbance | soil disturbance | 0.5161 | 0.2589 | 0.03605 | 1.192 |
| native | decrease resources | Overall | 0.2899 | 0.6891 | -1.303 | 1.568 |
| native | decrease resources | light | 0.6241 | 0.4187 | -0.2069 | 1.463 |
| native | decrease resources | water | 0.3166 | 0.3399 | -0.3852 | 0.9788 |
| native | decrease resources | nutrients | 0.5871 | 0.1862 | 0.2135 | 0.936 |
| native | increase resources | Overall | -0.0584 | 0.9384 | -1.893 | 1.833 |
| native | increase resources | light | -0.8901 | 0.5629 | -2.015 | 0.2017 |
| native | increase resources | nutrients | -0.0721 | 0.228 | -0.4125 | 0.4785 |
| native | lack of biotic resistance | Overall | -0.3843 | 0.1348 | -0.5987 | -0.0836 |
| native | natural enemies | Overall | 0.04674 | 0.9114 | -1.817 | 1.832 |
| native |  | herbivores | 0.2243 | 0.3535 | -0.4231 | 0.9725 |
| native |  | seed predators | 0.3372 | 0.3667 | -0.3404 | 1.101 |
| native | propagule pressure | Overall | -0.9538 | 0.2345 | -1.465 | -0.5275 |
| invasive | variance disturbance  |  | 1.657 | 52.74 | 0.03638 | 5.774 |
| invasive | variance decrease resources | 15.43 | 145.3 | 0.1692 | 74.71 |
| invasive | variance increase resources | 9.382 | 141.3 | 0.02695 | 38.8 |
| invasive | variance natural enemies | 6.946 | 115.8 | 0.02362 | 31.25 |
| native | variance disturbance  |  | 1.538 | 75.51 | 0.02746 | 2.269 |
| native | variance decrease resources | 79.38 | 501.6 | 0.02135 | 607.5 |
| native | variance increase resources | 1113 | 2075 | 0.3631 | 7977 |
| native | variance natural enemies | 983.6 | 1980 | 0.07877 | 7762 |
| invasive | Variance random effects | 0.4669 | 0.181 | 0.2714 | 0.9616 |
| native | Variance random effects | 0.6308 | 0.1063 | 0.4555 | 0.8684 |

**Analysis by metric of plant performance**:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Community | Metric | mean | sd | 2.50% | 97.50% |
| invasive | abundance | 0.903 | 0.03776 | 0.8262 | 0.9766 |
| invasive | biomass | 1.014 | 0.03852 | 0.94 | 1.088 |
| invasive | growth | 0.6168 | 0.1631 | 0.304 | 0.9418 |
| invasive | reruitment | 1.193 | 0.04254 | 1.11 | 1.274 |
| invasive | survival | 0.8387 | 0.05068 | 0.7393 | 0.9365 |
| invasive | richness | 0.8454 | 0.03912 | 0.766 | 0.9218 |
| native | abundance | -0.6653 | 0.1115 | -0.8689 | -0.4321 |
| native | biomass | 0.8509 | 0.1285 | 0.6298 | 1.131 |
| native | growth | -0.2322 | 0.5821 | -1.337 | 0.9121 |
| native | reruitment | 0.6013 | 0.6751 | -0.7327 | 1.925 |
| native | survival | 0.648 | 0.6763 | -0.6832 | 1.975 |
| native | richness | -0.4743 | 0.1125 | -0.6827 | -0.238 |
| invasive | Variance random effects | 0.2682 | 0.028 | 0.2185 | 0.328 |
| native | Variance random effects | 1.203 | 0.2034 | 0.8622 | 1.658 |
|  |  |  |  |  |  |

**Analysis by biome and driver of vulnerability**:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Community** | **biome** | **driver** | **mean** | **sd** | **2.50%** | **97.50%** |
| invasive | boreal | disturbance | 0.4782 | 0.035 | 0.4104 | 0.5456 |
| invasive | boreal | increase resources | 1.598 | 0.224 | 1.159 | 2.037 |
| invasive | boreal | lack of biotic resistance | 1.466 | 0.072 | 1.325 | 1.606 |
| invasive | desert | disturbance | 1.46 | 0.017 | 1.425 | 1.494 |
| invasive | desert | decrease resources | 1.142 | 0.017 | 1.108 | 1.176 |
| invasive | desert | lack of biotic resistance | 1.344 | 0.012 | 1.321 | 1.367 |
| invasive | desert | natural enemies | 0.6093 | 0.049 | 0.5134 | 0.7049 |
| invasive | desert | propagule pressure | 1.085 | 0.161 | 0.7834 | 1.404 |
| invasive | Mediterranean | disturbance | 0.6429 | 0.022 | 0.6328 | 0.6516 |
| invasive | Mediterranean | decrease resources | 1.322 | 0.01 | 1.303 | 1.341 |
| invasive | Mediterranean | increase resources | 0.9557 | 0.004 | 0.9472 | 0.9643 |
| invasive | Mediterranean | lack of biotic resistance | 1.392 | 0.006 | 1.379 | 1.405 |
| invasive | Mediterranean | natural enemies | 0.5681 | 0.013 | 0.5428 | 0.5934 |
| invasive | Mediterranean | propagule pressure | 1.643 | 0.009 | 1.626 | 1.66 |
| invasive | temperate | disturbance | 0.8512 | 0.041 | 0.8413 | 0.8659 |
| invasive | temperate | decrease resources | 0.8007 | 0.017 | 0.7676 | 0.8334 |
| invasive | temperate | increase resources | 0.9268 | 0.037 | 0.9204 | 0.9313 |
| invasive | temperate | lack of biotic resistance | 1.095 | 0.029 | 1.076 | 1.114 |
| invasive | temperate | natural enemies | 0.599 | 0.017 | 0.5651 | 0.6329 |
| invasive | temperate | propagule pressure | 0.1413 | 0.008 | 0.1282 | 0.1547 |
| invasive | tropical | disturbance | 1.499 | 0.155 | 1.024 | 1.557 |
| invasive | tropical | decrease resources | 0.9568 | 0.031 | 0.8952 | 1.018 |
| invasive | tropical | increase resources | 1.684 | 0.015 | 1.678 | 1.691 |
| invasive | tropical | lack of biotic resistance | 1.102 | 0.054 | 1.012 | 1.176 |
| native | boreal | disturbance | 0.2796 | 0.036 | 0.2088 | 0.3505 |
| native | boreal | lack of biotic resistance | 1.37 | 0.022 | 1.327 | 1.413 |
| native | desert | disturbance | 0.2348 | 0.033 | 0.1699 | 0.2998 |
| native | desert | decrease resources | 0.7141 | 0.041 | 0.6338 | 0.7947 |
| native | desert | lack of biotic resistance | -1.02 | 0.023 | -1.04 | -1.001 |
| native | desert | natural enemies | 0.4329 | 0.059 | 0.3186 | 0.5477 |
| native | desert | propagule pressure | -1.598 | 0.055 | -1.707 | -1.489 |
| native | Mediterranean | disturbance | -0.1823 | 0.009 | -0.1996 | -0.165 |
| native | Mediterranean | decrease resources | 0.4794 | 0.077 | 0.3282 | 0.6304 |
| native | Mediterranean | lack of biotic resistance | -0.5596 | 0.074 | -0.6599 | -0.5333 |
| native | Mediterranean | natural enemies | -0.4649 | 0.017 | -0.4978 | -0.4319 |
| native | Mediterranean | propagule pressure | -1.593 | 0.011 | -1.614 | -1.571 |
| native | temperate | disturbance | 1.073 | 0.055 | 1.057 | 1.085 |
| native | temperate | decrease resources | 0.4481 | 0.046 | 0.3582 | 0.5386 |
| native | temperate | increase resources | 0.8123 | 0.003 | 0.8067 | 0.8178 |
| native | temperate | lack of biotic resistance | 0.3486 | 0.111 | 0.2827 | 0.3919 |
| native | temperate | natural enemies | 0.4669 | 0.033 | 0.4035 | 0.531 |
| native | temperate | propagule pressure | -1.864 | 0.005 | -1.874 | -1.854 |
| native | tropical | disturbance | -0.2283 | 0.01 | -0.2484 | -0.2083 |
| native | tropical | decrease resources | 0.1788 | 0.089 | 0.00537 | 0.3527 |
| native | tropical | increase resources | -0.4028 | 0.009 | -0.4195 | -0.3862 |
| native | tropical | lack of biotic resistance | -1.087 | 0.309 | -1.255 | 0.03763 |

**Analysis by vegetation type and driver of vulnerability**:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Community** | Veg. type | **driver** | **mean** | **sd** | **2.50%** | **97.50%** |
| invasive | dune | disturbance | 1.306 | 0.00499 | 1.296 | 1.316 |
| invasive | forest | disturbance | 0.8918 | 0.06417 | 0.7947 | 0.9372 |
| invasive | forest | decrease resources | 1.234 | 0.0084 | 1.217 | 1.25 |
| invasive | forest | increase resources | 1.002 | 0.08565 | 0.8886 | 1.061 |
| invasive | forest | lack of biotic resistance | 0.9975 | 0.03058 | 0.9773 | 1.016 |
| invasive | forest | natural enemies | 0.6014 | 0.01051 | 0.5808 | 0.622 |
| invasive | forest | propagule pressure | 0.7001 | 0.00782 | 0.6894 | 0.7109 |
| invasive | grassland | disturbance | 0.697 | 0.05207 | 0.6835 | 0.7069 |
| invasive | grassland | decrease resources | 0.8175 | 0.01645 | 0.7852 | 0.8498 |
| invasive | grassland | increase resources | 0.9019 | 0.00164 | 0.8987 | 0.9051 |
| invasive | grassland | lack of biotic resistance | 1.513 | 0.03284 | 1.5 | 1.529 |
| invasive | grassland | natural enemies | 0.2706 | 0.03822 | 0.1962 | 0.3455 |
| invasive | grassland | propagule pressure | 0.5139 | 0.02738 | 0.4601 | 0.5678 |
| invasive | shrubland | disturbance | 0.3546 | 0.0099 | 0.3351 | 0.374 |
| invasive | shrubland | increase resources | 1.475 | 0.00261 | 1.47 | 1.48 |
| invasive | shrubland | lack of biotic resistance | 1.712 | 0.02025 | 1.673 | 1.751 |
| invasive | shrubland | natural enemies | 1.047 | 0.1509 | 0.7509 | 1.342 |
| invasive | shrubland | propagule pressure | 0.2442 | 1.4 | -2.873 | 3.309 |
| invasive | wetland | disturbance | 0.7413 | 0.00786 | 0.726 | 0.7567 |
| invasive | wetland | decrease resources | 1.851 | 0.03995 | 1.773 | 1.929 |
| invasive | wetland | increase resources | 1.463 | 0.0413 | 1.446 | 1.48 |
| invasive | wetland | lack of biotic resistance | 1.048 | 0.02212 | 1.026 | 1.069 |
| invasive | dune | disturbance | 0.1152 | 0.05552 | 0.00589 | 0.2239 |
| native | forest | disturbance | 0.1645 | 0.05889 | 0.1368 | 0.204 |
| native | forest | decrease resources | 0.5863 | 0.03047 | 0.5267 | 0.6457 |
| native | forest | increase resources | 0.296 | 0.02225 | 0.2527 | 0.3396 |
| native | forest | lack of biotic resistance | -0.424 | 0.1718 | -0.6498 | -0.1834 |
| native | forest | natural enemies | -0.226 | 0.01454 | -0.2541 | -0.1971 |
| native | forest | propagule pressure | -1.272 | 0.00933 | -1.29 | -1.253 |
| native | grassland | disturbance | 1.081 | 0.00329 | 1.074 | 1.087 |
| native | grassland | decrease resources | 0.3175 | 0.06408 | 0.1933 | 0.4434 |
| native | grassland | increase resources | 0.6995 | 0.00267 | 0.6943 | 0.7047 |
| native | grassland | lack of biotic resistance | -1.276 | 0.2034 | -1.353 | -0.8577 |
| native | grassland | propagule pressure | -1.985 | 0.00526 | -1.995 | -1.974 |
| native | shrubland | increase resources | -0.699 | 0.07467 | -0.8453 | -0.553 |
| native | shrubland | lack of biotic resistance | -0.677 | 0.1096 | -0.891 | -0.463 |
| native | wetland | disturbance | -0.407 | 0.0087 | -0.4236 | -0.3895 |
| native | wetland | decrease resources | 0.7255 | 0.1411 | 0.4495 | 1.002 |
| native | wetland | lack of biotic resistance | 0.3835 | 0.0097 | 0.3771 | 0.3895 |