

This is an electronic appendix to the paper by Levine *et al.* 2003 Mechanisms underlying the impacts of exotic plant invasions. *Proc. R. Soc. Lond. B* 270, 775—781. (DOI 10.1098/rspb.2003.2327.)

Electronic appendices are refereed with the text. However, no attempt has been made to impose a uniform editorial style on the electronic appendices.

ELECTRONIC APPENDIX A. IMPACTS OF PLANT INVASIONS

| REFERENCE | EXOTIC SPECIES | CLIMATE | HABITAT | STUDY TYPE | TYPE OF IMPACT |
|---|--|---------------|------------------|------------------------|--------------------------------------|
| Impacts on plant community structure | | | | | |
| Abensperg-traun <i>et al.</i> 1988 | Numerous herbaceous species | Mediterranean | Woodland | Observational | Richness |
| Boyd 1992 | <i>Ammophila arenaria</i> | Mediterranean | Sand dunes | Observational | Composition |
| Braithwaite & Lonsdale 1987 | <i>Mimosa pigra</i> | Temperate | Floodplain | Observational | Richness |
| Daehler & Carino 1998 | <i>Cenchrus ciliaris</i> , <i>Pennisetum setaceum</i> , <i>Panicum maximum</i> | Subtropical | Grassland | Observational | Richness |
| Dunbar & Facelli 1999 | <i>Orbea variegata</i> | Temperate | Shrubland | Observational | Annual biomass |
| El-Ghaceb 1991 | <i>Mesembryanthemum crystallinum</i> | Mediterranean | desert | Observational (Time) | Composition |
| Fairfax & Fensham 2000 | Exotic grasses | Subtropical | Pasture | Observational | Richness |
| Farnsworth & Meyerson 1999 | <i>Phragmites australis</i> | Temperate | Freshwater marsh | Removal | Richness |
| Gould & Gorchov 2000 | <i>Lonicera maaekii</i> | Temperate | Forest | Experimental | Plant performance |
| Gremmen <i>et al.</i> 1998 | <i>Agrostis stolonifera</i> | Subantarctic | Riparian | Observational | Diversity and composition |
| Holmes & Cowling 1997a, b | <i>Acacia saligna</i> | Mediterranean | Fynbos | Observational | Composition, diversity and dominance |
| Hutchinson & Vankat 1997 | <i>Lonicera maaekii</i> | Temperate | Forest | Observational | Richness of tree seedlings |
| Keichiro & Shuichi 2000 | <i>Leucaena leucocephala</i> | Temperate | Forest | Observational | Native spp. richness and composition |
| Keller 2000 | <i>Lythrum salicaria</i> , <i>Phragmites australis</i> | Temperate | Freshwater marsh | Observational | Diversity and dominance |
| Kwiatkowski <i>et al.</i> 1997 | <i>Carpinus betulus</i> | Temperate | Forest | Observational (Time) | Richness |
| Lavergne <i>et al.</i> 1999 | <i>Ligustrum robustum ssp. Walkeri</i> | Tropical | Forest | Observational | Composition |
| Lesica 1997 | <i>Phalaris arundinacea</i> | Temperate | Freshwater marsh | Observational | Composition |
| Lonsdale & Braithwaite 1988 | <i>Mimosa pigra</i> | Temperate | Floodplain | Observational | Richness |
| Martin 1999 | <i>Acer platanoides</i> | Temperate | Forest | Observational | Seedling and sapling Richness |
| McPherson <i>et al.</i> 1988 | <i>Prosopis glandulosa</i> | Semi-arid | Grassland | Observational | Shrub composition |
| Morgan 1998 | Various | Mediterranean | Grassland | Observational | Native spp. richness |
| Pysek & Pysek 1995 | <i>Heracleum mantegazzium</i> | Temperate | Various habitats | Observational | Diversity |
| Richardson <i>et al.</i> 1989 | Various trees | Mediterranean | Fynbos | Observational/ Removal | Diversity |
| Richburg <i>et al.</i> 2001 | <i>Phragmites australis</i> | Temperate | Fen | Observational | Abundance |

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|---|---|---------------|-----------------------|------------------------------|---|
| Rose & Fairweather 1997 | <i>Pitiosporum undulatum</i> | Mediterranean | Shrubland | Observational | Native spp. richness and diversity |
| Seabloom & Weidemann 1994 | <i>Ammophila arenaria</i> and another | Temperate | Sand dunes | Observational | Diversity |
| Treberg & Husband 1999 | <i>Lythrum salicaria</i> | Temperate | Wetland | Observational | Native and introduced spp. richness |
| Tyser 1992 | <i>Phleum pratense</i> , <i>Centaurea maculosa</i> | Temperate | Grassland | Observational | Composition and diversity |
| Vivrette & Muller 1977 | <i>Mesembryanthemum crystallinum</i> | Mediterranean | Grassland | Observational/Removal | Composition |
| Wardle <i>et al.</i> 1995 | <i>Senecio jacobaea</i> | Temperate | Pasture | Observational | Composition and performance of spp. |
| Weiss 1984 | <i>Chrysanthemoides monilifera</i> | Temperate | Sand dunes | Observational | Composition |
| Woods 1993 | <i>Lonicera tartarica</i> | Temperate | Forest | Observational | Herb richness, cover and composition |
| Wyckoff & Webb 1996 | <i>Acer platanoides</i> | Temperate | Forest | Observational | Understorey composition |
| Competitive effects of exotic on native plants | | | | | |
| Ashton <i>et al.</i> 1998 | <i>Pinus caribaea</i> | Tropical | Oldfield | Removal | Plant biomass |
| Baker & Wilson 2001 | <i>Agropyron cristatum</i> | Temperate | Prairie | Observational/Removal | Plant survival and growth rate |
| Brooks 2000 | <i>Bromus rubens</i> , <i>Schismus arabicus</i> , <i>S. barbatus</i> | Desert | Grassland | Removal | Density and biomass of native spp. |
| Buman <i>et al.</i> 1988 | <i>Bromus tectorum</i> | Temperate | Grassland | Replacement series | Plant biomass |
| Burdon & Chilvers 1994 | <i>Pinus radiata</i> | Temperate | Sclerophyllous forest | Neighbourhood analysis | Plant growth |
| Busch & Smith 1995 | <i>Tamarix ramosissima</i> | Semi-arid | Riparian Zone | Removal | Water Use |
| D'Antonio & Mahall 1991 | <i>Carpobrotus edulis</i> | Mediterranean | Coastal scrub | Removal | Plant size and soil water availability |
| D'Antonio <i>et al.</i> 1998 | <i>Schizachyrium condensatum</i> | Subtropical | Woodland | Removal | Plant biomass |
| Dillenburg <i>et al.</i> 1993 | <i>Lonicera japonica</i> | Temperate | Coastal plain | Removal | Plant performance |
| Gentle & Duggin 1997 | <i>Lantana camara</i> | Temperate | Forest | Removal/ Addition | Seedling growth |
| Gentle & Duggin 1998 | <i>Lantana camara</i> | Temperate | Forest | Addition/ Replacement series | Seedling growth |
| Gillispie <i>et al.</i> 1994 | <i>Trifolium repens</i> | Temperate | Fallow | Removal | Plant growth |
| Hester & Hobbs 1992 | Various annuals | Mediterranean | Shrubland | Removal | Cover of natives |
| Hobbs & Atkins 1991 | <i>Ursinia anthemoides</i> | Mediterranean | Heathland | Addition | Plant growth |
| Huenneke & Thomson 1994 | <i>Dipsacus sylvestris</i> | Temperate | Grassland | Replacement series | Plant growth |
| Melgoza <i>et al.</i> 1990 | <i>Bromus tectorum</i> | Temperate | Grassland | Removal | Plant biomass and soil water content |
| Mesléard <i>et al.</i> 1993 | <i>Paspalum paspaloides</i> | Temperate | Marsh | Replacement series | Plant growth |
| Nadkarni <i>et al.</i> 1986 | <i>Lolium multiflorum</i> | Mediterranean | Chaparral | Addition | Biomass, density and richness |
| Nelson & Allen 1993 | <i>Avena barbata</i> | Mediterranean | Grassland | Addition | Plant performance |
| Randall & Rejmanek 1993 | <i>Cirsium vulgare</i> | Mediterranean | Forest | Neighbourhood analysis | Seedling growth |
| Romo & Eddlemem 1987 | <i>Bromus japonicus</i> | Temperate | Prairie | Removal | Plant performance |
| Impacts on animal populations and communities | | | | | |
| Auerbach & Simberloff 1988 | <i>Quercus acutissima</i> , <i>Castanea crenata</i> | Sub-tropical | Forest | Observational | Density, and performance of leaf miners |

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|----------------------------|--|---------------|-------------------------|---------------------------------|--|
| Bell <i>et al.</i> 1987 | Various forbs | Mediterranean | Shrub scrub and forest | Observational | Diet expansion of tamar |
| Bock <i>et al.</i> 1986 | <i>Eragrostis</i> spp. | Semi-arid | Grassland | Observational | Diversity and abundance of various animals |
| Belnap & Phillips 2001 | <i>Bromus tectorum</i> | Semi-arid | Grassland | Observational | Soil food web |
| Bowers <i>et al.</i> 1992 | <i>Plantago lanceolata</i> | Temperate | Meadow | Host preference trials | Diet expansion of checkerspot |
| Brown & Mitchell 2001 | <i>Lythrum salicaria</i> | Temperate | Wetland | Manipulation of pollen | Pollen transfer |
| Bruzzese 1980 | <i>Rubus fruticosus</i> , <i>R. procerus</i> | Various | Various habitats | Observational | Phytophagous diversity |
| Carrol <i>et al.</i> 1997 | <i>Koeleria elegans</i> | Subtropical | Forest | Host preference trials | Insect performance |
| Carrol <i>et al.</i> 1998 | <i>Koeleria elegans</i> | Subtropical | Forest | Host preference trials | Host shift of soapberry bug |
| Chittka & Schürkens 2001 | <i>Impatiens glandulifera</i> | Temperate | River bank | Addition | Pollinator visit |
| Chown & Block 1997 | <i>Poa annua</i> | Antarctic | Tussock grassland | Host preference trials | Insect size |
| Crisp <i>et al.</i> 1998 | Various shrubs | Temperate | Shrubland and grassland | Observational | Beetle diversity |
| Feare <i>et al.</i> 1997 | <i>Portulaca oleracea</i> | Tropical | Woodlands | Observational | Bird nest density |
| Fraser & Grove 1990 | Acacias and pines | Mediterranean | Fynbos | Observational | Bird guilds and insect diversity |
| Goergen & Daehler 2001 | <i>Pennisetum setaceum</i> | Tropical | Grassland | Observational | Seed predation |
| Goss-Custard & Moser 1988 | <i>Spartina anglica</i> | Temperate | Mudflat | Observational | Dunlin density |
| Guix 2000 a | <i>Carpobrotus edulis</i> , <i>Solanum nigrum</i> | Temperate | Forest and open dunes | Survey of seeds in faeces | Diet expansion of foxes |
| Guix 2000 b | Various shrubs | Temperate | Forest | Survey of seeds in faeces | Diet expansion of birds |
| Kourtev <i>et al.</i> 1999 | <i>Berberis thunbergii</i> , <i>Microstegium vimineum</i> | Temperate | Hardwood forests | Observational | Earthworm density |
| Lagerlöf & Wallin 1993 | <i>Elytrigia repens</i> | Temperate | Agroecosystem | Observational | Diversity of arthropod guilds |
| Lambrinos 2000 | <i>Cortaderia jubata</i> | Mediterranean | Maritime chaparral | Observational | Arthropod and rodent diversity |
| Ramos 1996 | Various shrubs | Temperate | Forest | Observational | Density of bullfinch |
| Schellborn & Sork 1997 | Various shrubs | Temperate | Agroecosystem | Addition | Predation on crop pests |
| Slobodchikoff & Doyen 1977 | <i>Ammophila arenaria</i> | Mediterranean | Coastal dunes | Observational | Diversity and abundance of arthropods |
| Schmidt & Whelan 1999 | <i>Rhamnus cathartica</i> , <i>Lonicera maackii</i> | Temperate | Deciduous forest | Observational | Predation of robin nests |
| Sheldon & Creed 1995 | <i>Myriophyllum spicatum</i> | Temperate | Lake | Host preference trials | Diet shift of a weevil |
| Thomas <i>et al.</i> 1987 | <i>Plantago lanceolata</i> | Temperate | Meadow | Host preference trials | Oviposition choice of a butterfly |
| Toft <i>et al.</i> 2001 | <i>Tradescantia fluminensis</i> | Temperate | Forest | Observational | Insect richness |
| Trammell & Butler 1995 | <i>Euphorbia esula</i> , <i>Bromus inermis</i> , <i>B. japonica</i> , <i>B. tectorum</i> | Mediterranean | Prairie and forest | Observation of pellet densities | Ungulate use of habitat |
| Vilà & D'Antonio 1998 | <i>Carpobrotus edulis</i> | Mediterranean | Coastal scrub | Fruit trials | Diet expansion of mammals |
| Vilà <i>et al.</i> 1998 | <i>Carpobrotus edulis</i> | Mediterranean | Coastal scrub | Observational | Diet expansion of pollinators |
| Whelan & Willson 1994 | <i>Lonicera maackii</i> | Temperate | Deciduous forest | Fruit trials | Fruit preference |
| Williams & Karl 1996 | Various shrubs | Temperate | Forest | Survey of seeds in faeces | Diet expansion of birds |

Impacts on hydrology

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|------------------------------------|---|-----------------------|-------------------|-----------------------------|---|
| Borman <i>et al.</i> 1992 | <i>Cynosurus echinatus</i> | Temperate | Grassland | Observational | Soil moisture |
| Cline <i>et al.</i> 1977 | <i>Bromus tectorum</i> | Temperate | Shrub-steppe | Observational | Soil moisture |
| Dukes 2001 | <i>Centaurea solstitialis</i> | Mediterranean | Grassland | Microcosm | Water balance |
| Dyer & Rice 1999 | European annual grasses | Mediterranean | Grassland | Observational | Soil moisture |
| Gerlach 2000 | <i>Centaurea solstitialis</i> | Mediterranean | Grassland | Observational | Soil moisture |
| Holmes & Rice 1996 | <i>Bromus diandrus</i> | Mediterranean | Grassland | Microcosm | Soil moisture |
| Kremer & Running 1996 | <i>Bromus tectorum</i> | Temperate | Shrub-steppe | Observ. & Modelling | Soil moisture |
| Lacey <i>et al.</i> 1989 | <i>Centaurea maculosa</i> | Temperate | Grassland | Observational | Runoff |
| Le Maitre <i>et al.</i> 2000 | Several woody species | Mediterranean | Various | Modelling | Water use |
| Mueller-Dombois 1973 | <i>Andropogon virginicus</i> | Hawaii | Forest | Observational | Evapotranspiration |
| Sala <i>et al.</i> 1996 | <i>Tamarix ramosissima</i> | Semi-arid | Riparian | Observational | Sap flow |
| Sharma 1984 | <i>Pistia stratiotes</i> | Tropical/ Subtropical | Aquatic | Microcosm | Water use |
| Shukla <i>et al.</i> 1990 | <i>African pasture grasses</i> | Amazonia | Forest | Modelling | Climate |
| Specht 2000 | European annuals | Australia | Savannah woodland | Modelling | Ecophysiology |
| Van Lill <i>et al.</i> 1980 | <i>Eucalyptus grandis</i> | South Africa | Grassland | Observational | Catchment streamflow |
| Impacts on nutrient cycling | | | | | |
| Amiotti <i>et al.</i> 2000 | <i>Pinus radiata</i> | Temperate | Grassland | Observational | Various soil nutrients and pH |
| Asner & Beatty 1996 | <i>Melinis minutiflora</i> | Tropical | Shrubland | Observational | Soil nitrogen processes |
| Cameron & Spencer 1989 | <i>Sapium sebiferum</i> | Subtropical | Grassland | Observational | Various soil nutrients |
| Cannon <i>et al.</i> 1995 | <i>Salsola tragus (kali)</i> | Mediterranean | Grassland | Experimental | Soil P |
| Christian & Wilson 1999 | <i>Agropyron cristatum</i> | Temperate | Grassland | Observational | Soil N and C |
| D'Antonio <i>et al.</i> 1998 | <i>Schizachyrium condensatum</i> & other grasses | Tropical | Dry Forest | Removal | Available N |
| Dascanio <i>et al.</i> 1994 | <i>Ligustrum lucidum</i> | Subtropical | Forest | Observational | Biomass and litter decomposition |
| Dormaar <i>et al.</i> 1995 | <i>Agropyron cristatum</i> | Temperate | Grassland | Observational | Soil N, P and OM |
| Egunjobi 1969 | <i>Ulex europaeus</i> | Temperate | Temperate forest | Observational | Soil and litter N |
| Egunjobi 1971 | <i>Ulex europaeus</i> | Temperate | Temperate forest | Observational | Annual dry matter production |
| El-Ghareeb 1991 | <i>Mesembryanthemum crystallinum</i> | Mediterranean | Desert | Observational | Soil OM, soil salinity |
| Ehrenfeld <i>et al.</i> 2001 | <i>Berberis thunbergii, Microstegium vimineum</i> | Temperate | Deciduous forest | Experimental, observational | Various soil nutrients and N min. |
| Evans <i>et al.</i> 2001 | <i>Bromus tectorum</i> | Arid | Grassland | Observational | Various soil nutrients |
| Johnson & Wedin 1997 | <i>Hyparrhenia rufa</i> | Tropical | Dry Forest | Observational | Various soil nutrients and C |
| Ley & D'Antonio 1998 | <i>Schizachyrium condensatum, Melinis minutiflora</i> | Subtropical | Montane woodland | Observational | N fixation rate |
| Mack <i>et al.</i> 2001 | <i>Schizachyrium condensatum, M. minutiflora</i> | Subtropical | Montane woodland | Experimental, observational | Various aspects of ecosystem N+production |
| Milton & Siegfried 1981 | <i>Acacia saligna, A. cyclops</i> | Mediterranean | Shrubland | Observational | Aboveground biomass |

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|---|---|---------------|--------------------|-----------------------------|--|
| Musil 1993 | <i>Acacia saligna</i> | Mediterranean | Shrubland | Observational | Various soil nutrients and pH |
| Musil & Midgley 1990 | <i>Acacia saligna</i> | Mediterranean | Shrubland | Observational | Various soil nutrients and pH |
| Pickart <i>et al.</i> 1998 | <i>Lupinus arboreus</i> | Mediterranean | Coastal dunes | Observational | Soil nutrients and OM |
| Ogle <i>et al.</i> 2001 | <i>Bromus japonicus, B. tectorum</i> | Temperate | Grassland | Experimental | Above- and below-ground biomass |
| Scott <i>et al.</i> 2001 | <i>Hieracium pilosella</i> | Temperate | Grassland | Observational | Soil C and N cycling |
| Smoliak & Dormaar 1985 | <i>Agropyron cristatum</i> | Temperate | Grassland | Observational | Dry matter production, soil C, N and pH |
| Sparling <i>et al.</i> 1994 | <i>Ulex europaeus</i> | Temperate | Temperate forest | Observational | Soil and microbial C, N, and P |
| Stock <i>et al.</i> 1995 | <i>Acacia saligna</i> | Mediterranean | Shrubland | Observational | Soil nutrients, OM and aboveground biomass |
| Svejar & Sheeley 2001 | <i>Bromus tectorum</i> | Arid | Shrubland | Observational | Soil N dynamics |
| van Wilgen & Richardson 1985 | <i>Hakea sericea, Acacia saligna</i> | Mediterranean | Shrubland | Observational | Aboveground biomass |
| Vitousek & Walker 1989 | <i>Myrica faya</i> | Tropical | Woodland | Observational | N fixation rate |
| Vivrette & Muller 1977 | <i>Mesembryanthemum crystallinum</i> | Mediterranean | Grassland | Observational | Soil osmotic level |
| Witkowski 1991 | <i>Acacia saligna</i> | Mediterranean | Shrubland | Observational | Various soil nutrients, OM and pH |
| Witkowski & Mitchell 1987 | <i>Acacia cyclops</i> | Mediterranean | Shrubland | Observational | Soil total N and P |
| Impacts on fire regime | | | | | |
| Anable <i>et al.</i> 1992 | <i>Eragrostis lehmanniana</i> | Arid | Desert grassland | observational | Fire frequency |
| Baird 1977 | <i>Ehrhardia calycina</i> | Temperate | Woodland | observational | Fire frequency |
| Bell 1997 | <i>Arundo donax</i> | Mediterranean | Chaparral | observational | Fire frequency and intensity |
| Bilbao 1995 | <i>Hyparrhenia rufa</i> | Tropical | Savanna | observational, experimental | Fire intensity |
| Blydenstein 1967, Medina 1987 | Several grasses | Tropical | Savanna | observational | Fire intensity |
| Brooks 1998, Brown & Minnich 1986, Beatley 1966 | <i>Bromus rubens, B. tectorum, Schismus spp.</i> | Arid | Desert shrubland | observational | Fire frequency |
| Búrquez & Quintana 1994 | <i>Pennisetum ciliare</i> | Arid | Desert woodland | observational | Fire frequency |
| Busch 1995 | <i>Tamarix ramossisima</i> | Arid | Desert floodplains | observational | Fire frequency |
| Cable 1971 | <i>Eragrostis lehmanniana</i> | Arid | Desert grassland | anecdotal | Fire frequency |
| Freifelder <i>et al.</i> 1998 | <i>Schizachyrium condensatum, Melinis minutiflora</i> | Subtropical | Woodland | Modelling | Fire spread rate |
| Gill <i>et al.</i> 1990 | <i>Pennisetum polystachum, Melinis minutiflora</i> | Temperate | Forest | anecdotal | Fire frequency |
| Gordon 1998 | <i>Melaleuca quinquinervia</i> | Subtropical | Prairie | anecdotal | Fire intensity |
| Haidinger & Keeley 1993 | Various annual grasses and forbs | Mediterranean | Chaparral | observational | Fire frequency |
| Janzen 1988 | <i>Hyparrhenia rufa</i> | Tropical | Dry forest | anecdotal | Fire frequency |
| Latz 1991 | <i>Cenchrus ciliare</i> | Subtropical | Riparian woodland | anecdotal | Fire frequency and size |
| Lippincott 2000 | <i>Imperata cylindrica</i> | Subtropical | Savanna | experimental | Fire intensity |
| Menke 1989 | <i>Taeniatherum caput-medusae</i> | Arid | Desert shrubland | anecdotal | Fire frequency |

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|--|---|---------------------|----------------------|---------------|------------------------------------|
| Smith & Tunison 1992 | Various grasses | Subtropical, alpine | Woodland | observational | Fire intensity |
| Steward & Hull 1949 | <i>Bromus tectorum</i> | Arid | Desert shrubland | anecdotal | Fire frequency, timing |
| Tunison <i>et al.</i> 1994, 1995, 2001 | Various grasses | Subtropical | Woodland & shrubland | observational | Fire frequency, size and intensity |
| van Wilgen & Richardson 1985 | <i>Acacia saligna</i> , <i>Hakea sericea</i> | Mediterranean | Fynbos | Modelling | Fire frequency and intensity |
| van Wilgen & van Hensbergen 1992 | <i>Pinus</i> spp., <i>Acacia saligna</i> , <i>Hakea sericea</i> | Mediterranean | Fynbos | Modelling | Fire intensity |
| Whisenant 1990 | <i>Bromus tectorum</i> | Arid | Desert shrubland | observational | Fire frequency, timing |
| Zedler <i>et al.</i> 1983 | <i>Lotium perenne</i> | Mediterranean | Coastal shrubland | observational | Fire frequency |

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