

## Supplementary Material

### Appendix S1. Species lists for each site

These lists were compiled from a variety of sources. The publication year of the report or paper is given in the column header (Molloy 1970; Molloy & Ives 1972; Macmillan 1976; Meurk 1988; Meurk et al. 1995; Ross et al. 2002; Ecroyd & Brockerhoff 2005; Jenson & Shanks 2005 unpubl. data; Bowie et al. 2016). There is a clear pattern of native species lost and an increase in exotic species presence.

Table 1. Species list for Bankside. The columns refer to date of publication. The 1976 publication was limited to bryophytes only. 2005 refers to Jenson & Shanks 2005 unpubl. data. 2017 is the list of species found in plots in this study. \* Indicates exotic species, endemic species are in bold.

Form	Species	1970	1976	2005	2013	2017
Tree	<b><i>Carmichaelia australis</i></b>	x		x	x	x
	<b><i>Discaria toumatou</i></b>	x		x	x	x
	<i>Eyonymus europaeus</i> *					x
Fern	<i>Azolla rubra</i>	x		x	x	
	<i>Histiopteris incisa</i>	x		x	x	
	<i>Ophioglossum coriaceum</i>	x				
	<i>Pteridium esculentum</i>	x		x		
Shrub	<b><i>Carmichaelia monroi</i></b>	x		x	x	
	<b><i>Coprosma species</i></b>	x		x		
	<i>Cytisus scoparius</i> *	x		x	x	x
	<i>Euonymus europaeus</i> *	x		x		

Form	Species	1970	1976	2005	2013	2017
	<i>Kunzea ericoides</i>	X		X	X	X
	<i>Leucopogon fraseri</i>	X		X	X	X
	<i>Muehlenbeckia axillaris x ephedroides</i>					X
	<i>Muehlenbeckia ephedroides</i>	X				
	<i>Ulex europaeus*</i>	X		X	X	
SubShrub	<i>Gonocarpus aggregatus</i>	X				
	<i>Helichrysum filicaule</i>	X				
	<i>Hypericum gramineum</i>	X				
	<i>Leptostigma setulosum</i>	X				
	<i>Myriophyllum propinquum</i>	X				
	<i>Raoulia australis</i>	X				
	<i>Raoulia hookeri</i>	X				
	<i>Raoulia monroi</i>	X				
	<i>Raoulia subsericea</i>	X				
	<i>Solanum dulcamara*</i>	X		X		
	<i>Solanum nigrum*</i>					X
Vine	<i>Muehlenbeckia axillaris</i>	X		X	X	X
Forb	<i>Acaena agnipila*</i>	X		X		X
	<i>Acaena novae-zelandiae</i>	X				
	<i>Achillea millefolium*</i>	X		X		
	<i>Aphanes inexpectata*</i>	X				
	<i>Callitriche species</i>	X		X	X	
	<i>Capsella bursa-pastoris*</i>	X		X		

Form	Species	1970	1976	2005	2013	2017
	<i>Carduus nutans</i> *	X		X	X	
	<i>Celmisia gracilentia</i>	X				
	<i>Centella uniflora</i>	X				
	<i>Cerastium fontanum</i> *	X		X	X	X
	<i>Chaerophyllum novae-zelandiae</i>	X				
	<i>Cirsium arvense</i> *	X		X	X	X
	<i>Cirsium vulgare</i> *	X		X	X	X
	<i>Colobanthus brevisepalus</i>	X				
	<i>Conium maculatum</i> *					X
	<i>Cotula species</i>	X				
	<i>Craspedia uniflora</i>	X				
	<i>Crassula sieberiana</i>	X				
	<i>Crepis capillaris</i> *	X		X		X
	<i>Dichondra brevifolia</i>	X		X	X	
	<i>Dichondra repens</i>	X		X	X	X
	<i>Elodea canadensis</i> *	X				
	<i>Epilobium komarovianum</i>	X				
	<i>Erodium cicutarium</i> *	X				
	<i>Euchiton japonicus</i>	X				
	<i>Galium aparine</i> *	X		X	X	X
	<i>Geranium brevicaule</i>	X		X	X	
	<i>Glossostigma elatinoides</i>	X				
	<i>Hydrocotyle novae-zeelandiae</i>	X				

Form	Species	1970	1976	2005	2013	2017
	<i>Hypochaeris glabra</i> *	X				
	<i>Hypochaeris radicata</i> *	X		X	X	X
	<i>Iphigenia novae-zelandiae</i>	X				
	<i>Leontodon saxatilis</i> *	X				
	<i>Leptinella pusilla</i>	X				
	<i>Lilaeopsis species</i>	X				
	<i>Lobelia angulata</i>	X				
	<i>Lobelia ionantha</i>	X				
	<i>Mentha cunninghamii</i>	X				
	<i>Microseris scapigera</i>	X				
	<i>Microtis unifolia</i>	X		X	X	
	<i>Myosotis laxa subsp. caespitosa</i> *	X		X	X	
	<i>Oxalis corniculata</i> *	X				
	<i>Oxalis exilis</i>					X
	<i>Pilosella officinarum</i> *	X		X	X	X
	<i>Plantago lanceolata</i> *	X		X	X	X
	<i>Potamogeton cheesemanii</i>	X				
	<i>Prasophyllum colensoi</i>	X				
	<i>Prunella vulgaris</i> *	X		X		
	<i>Pterostylis tristis</i>	X				
	<i>Ranunculus acris</i> *	X		X		
	<i>Ranunculus multiscapus</i>	X				
	<i>Rumex acetosella</i> *	X		X	X	X

Form	Species	1970	1976	2005	2013	2017
	<i>Rumex obtusifolius</i> *	X		X		
	<i>Sagina procumbens</i> *	X		X	X	
	<i>Scleranthus brockiei</i>	X				
	<i>Scleranthus uniflorus</i>	X				
	<i>Senecio glomeratus</i>					X
	<i>Sonchus oleraceus</i> *	X		X		X
	<i>Stackhousia minima</i>	X				
	<i>Stellaria media</i> *	X		X		X
	<i>Taraxacum officinale</i> *	X		X		X
	<i>Thelymitra longifolia</i>	X		X	X	X
	<i>Trifolium arvense</i> *	X		X	X	X
	<i>Trifolium dubium</i> *	X				X
	<i>Trifolium glomeratum</i> *	X				
	<i>Trifolium repens</i> *	X		X	X	X
	<i>Trifolium subterraneum</i> *	X		X	X	
	<i>Urtica urens</i> *					X
	<i>Viola cunninghamii</i>	X				
	<i>Wahlenbergia gracilis</i>	X				
Graminoid	<i>Agrostis capillaris</i> *	X		X	X	X
	<i>Agrostis stolonifera</i> *	X		X		
	<i>Aira caryophyllea</i> *	X				X
	<i>Alopecurus geniculatus</i> *	X				
	<i>Anthosachne australasica</i>	X		X	X	

Form	Species	1970	1976	2005	2013	2017
	<i>Anthosachne scabra</i> *	X				
	<i>Anthosachne solandri</i>					X
	<i>Anthoxanthum odoratum</i> *	X		X	X	X
	<i>Bromus catharticus</i> *					X
	<i>Bromus diandrus</i> *	X		X		X
	<i>Bromus hordeaceus</i> *	X		X	X	X
	<i>Bromus lithobius</i> *					X
	<i>Bromus sterilis</i> *	X		X		
	<i>Carex breviculmis</i>	X				X
	<i>Carex colensoi</i>	X				X
	<b><i>Carex virgata</i></b>	X		X	X	
	<i>Critesion murinum</i> *	X		X		
	<i>Cynosurus echinatus</i> *	X		X		
	<i>Dactylis glomerata</i> *	X		X		X
	<i>Deyeuxia avenoides</i>	X				
	<i>Dichelachne crinita</i>	X		X	X	
	<i>Eleocharis acuta</i>	X		X	X	
	<b><i>Festuca novae-zelandiae</i></b>	X		X	X	
	<i>Festuca rubra subsp. commutata</i> *	X		X	X	
	<i>Festuca rubra</i> *					X
	<i>Glyceria fluitans</i> *	X		X		
	<i>Holcus lanatus</i> *	X		X	X	
	<i>Juncus articulatus</i> *	X				

Form	Species	1970	1976	2005	2013	2017
	<i>Juncus bufonius*</i>	X				
	<i>Juncus edgariae</i>	X		X		
	<i>Juncus filicaulis*</i>	X				
	<i>Juncus tenuis*</i>	X				
	<i>Lolium perenne*</i>	X		X	X	X
	<i>Luzula rufa var. albicomans</i>	X				
	<i>Poa annua*</i>	X		X		
	<i>Poa pratensis*</i>	X		X	X	
	<i>Rytidosperma clavatum</i>	X		X	X	X
	<i>Rytidosperma exiguum</i>	X				
	<i>Rytidosperma racemosum*</i>					X
	<i>Rytidosperma species</i>					X
	<i>Triglochin striata</i>	X				
	<i>Vulpia bromoides*</i>	X				X
NonVascular	<i>Brachythecium plumosum</i>		X			
	<i>Breutelia affinis</i>		X			X
	<i>Breutelia pendula</i>	X			X	
	<i>Bryum truncorum</i>	X	X			
	<i>Campylopus clavatus</i>		X			
	<i>Campylopus introflexus</i>	X	X			X
	<i>Ceratodon purpureus</i>	X	X			
	<i>Cladia aggregata</i>					X
	<i>Cladonia darwinii</i>					X

Form	Species	1970	1976	2005	2013	2017
	<i>Cladonia mitis</i>					X
	<i>Cladonia uncialis</i>					X
	<i>Fossombronia pusilla</i>		X			
	<i>Hedwigia ciliata</i>		X			
	<i>Hypnum cupressiforme</i>	X	X		X	
	<i>Hypnum cupressiforme</i> var. <i>cupressiforme</i>					X
	<i>Hypnum cupressiforme</i> var. <i>filiforme</i>					X
	<i>Marchantia foliacea</i>		X			
	<i>Philonotis tenuis</i>		X			
	<i>Physcia adscendens</i>					X
	<i>Physcia adscendens</i>					X
	<i>Pleurozium nervosum</i>		X			
	<i>Polytrichum juniperinum</i>	X	X			X
	<i>Racomitrium lanuginosum</i>		X			
	<i>Racomitrium pruinosum</i>	X			X	X
	<i>Racomitrium pychophyllum</i>	X			X	
	<i>Syntrichia princeps</i>		X			
	<i>Teleoschistes chrysophthalmus</i>					X
	<i>Tortula muralis</i>	X				
	<i>Triquetrella papillata</i>	X	X			X



Table 2. List of species found at Culverden in the plots, no other species lists were available.

\* indicates exotic species, endemic species are in bold.

Form	Species	2017
Tree	<i>Discaria toumatou</i>	x
Fern	<i>Trichomanes strictum</i>	x
Shrub	<i>Coprosma intertexta</i>	x
	<i>Cytisus scoparius</i> *	x
	<i>Kunzea ericoides</i>	x
	<i>Leucopogon fraseri</i>	x
	<i>Melicytus alpinus</i>	x
SubShrub	<i>Muehlenbeckia axillaris</i> x	x
	<i>ephedroides</i>	
Forb	<i>Acaena agnipila</i> *	x
	<i>Aphanes inexpectata</i> *	x
	<i>Arenaria serpyllifolia</i> *	x
	<i>Celmisia gracilentia</i>	x
	<i>Cerastium fontanum</i> *	x
	<i>Cerastium glomeratum</i> *	x
	<i>Crepis capillaris</i> *	x
	<i>Echium vulgare</i> *	x
	<i>Galium aparine</i> *	x
	<i>Hypochaeris radicata</i> *	x
	<i>Microtis unifolia</i>	x
<i>Myosotis discolor</i> *	x	

Form	Species	2017
	<i>Myosotis stricta</i> *	X
	<i>Pilosella officinarum</i> *	X
	<b><i>Prasophyllum colensoi</i></b>	X
	<i>Rumex acetosella</i> *	X
	<i>Taraxacum officinale</i> *	X
	<i>Thelymitra longifolia</i>	X
	<i>Thelymitra species</i>	X
	<i>Trifolium arvense</i> *	X
	<i>Trifolium dubium</i> *	X
	<i>Trifolium repens</i> *	X
	<i>Trifolium striatum</i> *	X
Graminoid	<i>Agrostis capillaris</i> *	X
	<i>Aira caryophylla</i> *	X
	<i>Anthosachne scabra</i> *	X
	<b><i>Anthosachne solandri</i></b>	X
	<i>Anthoxanthum odoratum</i> *	X
	<i>Bromus diandrus</i> *	X
	<i>Bromus hordeaceus</i> *	X
	<i>Carex breviculmis</i>	X
	<i>Festuca rubra</i> *	X
	<i>Poa pratensis</i> *	X
	<b><i>Rytidosperma clavatum</i></b>	X
	<i>Vulpia bromoides</i> *	X

<b>Form</b>	<b>Species</b>	<b>2017</b>
NonVascular	<i>Barbula calycina</i>	x
	<i>Buellia</i>	x
	<i>Cladia aggregata</i>	x
	<i>Cladonia</i>	x
	<i>Cladonia chlorophaea</i>	x
	<i>Cladonia crispata</i>	x
	<i>Cladonia crispata var crispata</i>	x
	<i>Cladonia darwinii</i>	x
	<i>Cladonia darwinii or imbricata</i>	x
	<i>Cladonia gracilis ssp turbinata</i>	x
	<i>Cladonia imbricata</i>	x
	<i>Cladonia macilenta</i>	x
	<i>Cladonia mitis</i>	x
	<i>Cladonia pertriosa</i>	x
	<i>Cladonia polycarpoides</i>	x
	<i>Cladonia tenerrima</i>	x
	<i>Cladonia uncialis</i>	x
	<i>Crustose</i>	x
	<i>Hypnum chrysogaster</i>	x
	<i>Parmelia cunninghamii</i>	x
<i>Physcia adscendens</i>	x	
<i>Physcia adscendens</i>	x	
<i>Physcia caesia</i>	x	

Form	Species	2017
	<i>Physcia stellaris</i>	x
	<i>Polytrichum juniperinum</i>	x
	<i>Racomitrium pruinosum</i>	x
	<i>Ramalina glaucescens</i>	x
	<i>Teleoschistes velifer</i>	x
	<i>Triquetrella papillata</i>	x
	<i>Xanthoparmelia</i>	x
	<i>Xanthoparmelia loxodella</i>	x
	<i>Xanthoparmelia molliuscula</i>	x
	<i>Xanthoparmelia substrigosa</i>	x
	<i>Xanthoria parietina</i>	x

Table 3. Species lists for Eyrewell. The years refer to survey dates. 2005 refers to Ecroyd and Brockerhoff (2005). \* indicates exotic species, endemic species are in bold.

Form	Species	1972	1995	2005	2017
Tree	<i>Acer pseudoplatanus</i> *			x	
	<b><i>Carmichaelia australis</i></b>	x	x	x	x
	<b><i>Coprosma propinqua</i></b>	x	x	x	x
	<b><i>Coprosma robusta</i></b>				
	<b><i>Discaria toumatou</i></b>	x	x	x	
	<i>Leptospermum scoparium</i>	x	x		
	<i>Pinus radiata</i> *			x	
	<i>Pinus species</i> *				

Form	Species	1972	1995	2005	2017
	<i>Prunus species*</i>			X	
Fern	<i>Asplenium flabellifolium</i>			X	
	<i>Dryopteris filix-mas*</i>			X	
	<i>Hypolepis ambigua</i>			X	
	<i>Microsorium pustulatum</i>			X	X
	<i>Ophioglossum coriaceum</i>	X			
Shrub	<i>Buddleja davidii*</i>			X	
	<i>Coprosma crassifolia</i>			X	
	<i>Coprosma intertexta</i>			X	
	<i>Coprosma rhamnoides</i>	X	X		
	<i>Cotoneaster simonsii*</i>			X	
	<i>Cytisus scoparius*</i>	X	X	X	X
	<i>Helichrysum lanceolatum</i>				
	<i>Kunzea ericoides</i>	X	X	X	X
	<i>Leptecophylla juniperina</i>	X	X	X	X
	<i>Leucopogon fraseri</i>	X	X	X	X
	<i>Melicytus alpinus</i>			X	
	<i>Pomaderris amoena</i>				X
	<i>Pomaderris edgerleyi</i>	X		X	
	<i>Ribes sanguineum*</i>			X	
	<i>Rosa rubiginosa*</i>			X	
<i>Sambucus nigra*</i>			X		
<i>Solanum laciniatum</i>			X		

Form	Species	1972	1995	2005	2017
	<i>Ulex europaeus*</i>	X	X	X	
SubShrub	<b><i>Gonocarpus incanus</i></b>	X			
	<i>Gonocarpus micranthus</i>	X			
	<b><i>Helichrysum filicaule</i></b>	X			
	<i>Hypericum gramineum</i>	X	X	X	
	<b><i>Leptostigma setulosum</i></b>	X	X	X	
	<i>Pimelea species</i>	X			
	<b><i>Raoulia monroi</i></b>	X			
	<i>Rubus fruticosus*</i>			X	
	<i>Rubus idaeus*</i>			X	
	<i>Rubus species</i>			X	
	<i>Solanum dulcamara*</i>			X	
<i>Solanum nigrum*</i>				X	
Vine	<b><i>Clematis marata</i></b>				X
	<b><i>Clematis quadribracteolata</i></b>			X	
	<i>Muehlenbeckia axillaris</i>	X	X		
Forb	<i>Acaena novae-zelandiae</i>	X	X		
	<i>Achillea millefolium*</i>			X	
	<b><i>Aciphylla subflabellata</i></b>	X			
	<i>Anthriscus caucalis*</i>			X	
	<i>Aphanes inexpectata*</i>			X	
	<b><i>Brachyglottis bellidioides</i></b>	X	X	X	
	<i>Caladenia lyallii</i>	X			

Form	Species	1972	1995	2005	2017
	<i>Cardamine debilis</i>				X
	<i>Cardamine flexuosa</i> *				X
	<i>Cardamine hirsuta</i> *			X	X
	<i>Cardamine species</i>				X
	<i>Celmisia gracilentia</i>	X	X	X	X
	<i>Cerastium fontanum</i> *	X	X	X	X
	<i>Cerastium glomeratum</i> *			X	
	<i>Chenopodium album</i> *			X	
	<i>Cirsium arvense</i> *			X	
	<i>Cirsium vulgare</i> *	X	X	X	X
	<i>Conium maculatum</i> *				X
	<i>Conyza sumatrensis</i> *			X	
	<i>Crepis capillaris</i> *	X	X	X	X
	<i>Crepis vesicaria</i> subsp. <i>taraxacifolia</i> *			X	X
	<i>Crepis vesicaria</i> *				X
	<i>Dichondra brevifolia</i>	X			
	<i>Dichondra repens</i>	X	X	X	X
	<i>Digitalis purpurea</i> *			X	
	<i>Epilobium alsinoides</i> subsp. <i>atriplicifolium</i>			X	
	<i>Epilobium billardioreanum</i> subsp. <i>cinereum</i>			X	

<b>Form</b>	<b>Species</b>	<b>1972</b>	<b>1995</b>	<b>2005</b>	<b>2017</b>
	<i>Epilobium ciliatum</i> *			X	
	<i>Euchiton audax</i>	X			
	<i>Fallopia convolvulus</i> *			X	
	<i>Fragaria vesca</i> *			X	
	<i>Galium aparine</i> *			X	X
	<i>Galium perpusillum</i>	X			
	<i>Galium propinquum</i>	X	X	X	X
	<i>Geranium microphyllum</i>	X		X	
	<i>Geranium molle</i> *				X
	<i>Geranium sessiliflorum</i>	X			
	<i>Hieracium lepidulum</i> *	X		X	X
	<i>Hydrocotyle moschata</i>	X	X	X	X
	<i>Hydrocotyle novae-zeelandiae</i>	X			
	<i>Hypochaeris radicata</i> *	X	X	X	X
	<i>Jacobaea vulgaris</i> *			X	
	<i>Lagenophora strangulata</i>	X	X	X	
	<i>Leontodon saxatilis</i> *	X		X	
	<i>Leptinella perpusilla</i>	X			
	<i>Leptinella pusilla</i>	X	X	X	X
	<i>Leptinella serrulata</i>	X			
	<i>Linum catharticum</i> *	X			
	<i>Mentha cunninghamii</i>	X			
	<i>Microtis unifolia</i>			X	X



<b>Form</b>	<b>Species</b>	<b>1972</b>	<b>1995</b>	<b>2005</b>	<b>2017</b>
	<i>Mycelis muralis</i> *			X	
	<i>Oxalis exilis</i>	X	X	X	
	<i>Pelargonium inodorum</i>	X		X	
	<i>Pilosella officinarum</i> *	X	X	X	X
	<i>Plantago lanceolata</i> *			X	X
	<i>Potentilla indica</i> *			X	
	<i>Prasophyllum colensoi</i>	X			
	<i>Pterostylis tristis</i>	X			
	<i>Ranunculus multiscapus</i>	X			
	<i>Rumex acetosella</i> *	X	X	X	X
	<i>Sagina apetala</i> *	X			
	<i>Scleranthus uniflorus</i>	X			
	<i>Senecio glomeratus</i>			X	X
	<i>Senecio minimus</i>			X	
	<i>Sonchus asper</i> *			X	
	<i>Sonchus oleraceus</i> *			X	X
	<i>Spergularia rubra</i> *	X			
	<i>Stackhousia minima</i>	X	X	X	
	<i>Stellaria media</i> *			X	X
	<i>Tanacetum parthenium</i> *			X	
	<i>Taraxacum officinale</i> *			X	X
	<i>Thelymitra longifolia</i>	X		X	
	<i>Thelymitra pauciflora</i>	X	X	X	

Form	Species	1972	1995	2005	2017
	<i>Thelymitra species</i>	X			
	<i>Trifolium arvense</i> *	X			
	<i>Trifolium dubium</i> *	X	X	X	X
	<i>Trifolium glomeratum</i> *	X			
	<i>Trifolium repens</i> *	X	X	X	X
	<i>Trifolium striatum</i> *	X	X	X	
	<i>Trifolium subterraneum</i> *	X	X		
	<i>Urtica urens</i> *			X	
	<i>Verbascum thapsus</i> *	X	X	X	
	<i>Veronica arvensis</i> *			X	
	<i>Vicia sativa</i> *	X		X	X
	<i>Vicia tetrasperma</i> *			X	
	<i>Viola cunninghamii</i>	X			
	<i>Viola odorata</i> *			X	
	<b><i>Wahlenbergia albomarginata</i></b>	X	X		
	<i>Wahlenbergia gracilis</i>	X			
	<i>Wahlenbergia violacea</i> *	X	X	X	
Graminoid	<i>Agrostis capillaris</i> *	X	X	X	X
	<i>Aira caryophylla</i> *	X	X	X	
	<i>Anthosachne australasica</i>	X	X	X	
	<b><i>Anthosachne solandri</i></b>	X			
	<i>Anthoxanthum odoratum</i> *	X	X	X	X
	<i>Bromus diandrus</i> *				X

<b>Form</b>	<b>Species</b>	<b>1972</b>	<b>1995</b>	<b>2005</b>	<b>2017</b>
	<i>Bromus lithobius</i> *				X
	<i>Bromus stamineus</i> *			X	
	<i>Carex breviculmis</i>	X	X	X	X
	<i>Carex colensoi</i>	X			
	<i>Carex goyenii</i>			X	
	<i>Cynosurus echinatus</i> *			X	
	<i>Dactylis glomerata</i> *			X	X
	<i>Deyeuxia avenoides</i>	X	X	X	
	<i>Dichelachne crinita</i>	X	X	X	
	<i>Festuca novae-zelandiae</i>	X		X	
	<i>Festuca rubra subsp. commutata</i> *				X
	<i>Festuca rubra</i> *			X	X
	<i>Holcus lanatus</i> *	X		X	X
	<i>Lolium perenne</i> *			X	X
	<i>Luzula flaccida</i> *			X	
	<i>Luzula rufa var. rufa</i>	X		X	
	<i>Microlaena stipoides</i>	X	X	X	
	<i>Poa cita</i>	X	X	X	X
	<i>Poa pratensis</i> *			X	
	<i>Poa pusilla</i>			X	
	<i>Rytidosperma clavatum</i>	X			
	<i>Rytidosperma exiguum</i>	X			
	<i>Rytidosperma gracile</i>	X		X	

Form	Species	1972	1995	2005	2017
	<i>Rytidosperma species</i>				X
	<i>Rytidosperma unarede</i>	X	X	X	
	<i>Vulpia bromoides*</i>	X		X	X
NonVascular	<i>Barbula calycina</i>				X
	<i>Breutelia pendula</i>				X
	<i>Bryum argenteum</i>	X			
	<i>Campylopus clavatus</i>	X			
	<i>Campylopus introflexus</i>	X			
	<i>Cladia aggregata</i>				X
	<i>Hedwigia ciliata</i>				X
	<i>Heteroscyphus coalitus</i>				X
	<i>Hypnum chrysogaster</i>				X
	<i>Hypnum cupressiforme</i>	X			
	<i>Hypnum cupressiforme</i> var. <i>cupressiforme</i>				X
	<i>Lecanora dispersa</i>				X
	<i>Parmotrema chinense</i>				X
	<i>Polytrichum juniperinum</i>	X			
	<i>Racomitrium lanuginosum</i>	X			
	<i>Racomitrium pruinosum</i>				X
	<i>Thuidiopsis furfurosa</i>				X
	<i>Triquetrella papillata</i>	X			X

Table 4. Species list for Medbury. The years refer to survey date. \* indicates exotic species, endemic species are in bold.

Form	Species	1988	2017
Tree	<i>Carmichaelia australis</i>	X	
	<b><i>Coprosma propinqua</i></b>	X	X
	<b><i>Discaria toumatou</i></b>	X	X
	<i>Pinus radiata</i> *		X
	<i>Pinus species</i> *	X	
Fern	<i>Pteridium esculentum</i>	X	
Shrub	<b><i>Coprosma intertexta</i></b>	X	
	<i>Cytisus scoparius</i> *	X	X
	<b><i>Kunzea ericoides</i></b>	X	X
	<i>Leucopogon fraseri</i>	X	X
	<b><i>Melicytus alpinus</i></b>	X	
	<b><i>Muehlenbeckia ephedroides</i></b>		X
	<b><i>Ozothamnus leptophyllus</i></b>	X	
	<i>Rosa rubiginosa</i> *	X	
SubShrub	<i>Muehlenbeckia axillaris x ephedroides</i>	X	X
	<b><i>Raoulia australis</i></b>	X	
	<i>Rubus fruticosus</i> *		X
Vine	<i>Muehlenbeckia axillaris</i>	X	X
Forb	<i>Acaena agnipila</i> *	X	X
	<i>Arenaria serpyllifolia</i> *	X	

Form	Species	1988	2017
	<i>Cerastium fontanum</i> *		X
	<i>Cerastium glomeratum</i> *		X
	<i>Cirsium vulgare</i> *		X
	<i>Conium maculatum</i> *		X
	<i>Crepis capillaris</i> *		X
	<i>Crepis vesicaria</i> subsp. <i>taraxacifolia</i> *		X
	<i>Dichondra repens</i>		X
	<i>Dichondra</i> species	X	
	<i>Echium vulgare</i> *	X	X
	<b><i>Euchiton audax</i></b>	X	
	<i>Galium aparine</i> *		X
	<i>Hypericum</i> species	X	
	<i>Hypochaeris radicata</i> *		X
	<b><i>Leptinella pusilla</i></b>		X
	<i>Microtis unifolia</i>	X	X
	<i>Myosotis stricta</i> *		X
	<i>Pilosella officinarum</i> *	X	X
	<b><i>Prasophyllum colensoi</i></b>		X
	<i>Rumex acetosella</i> *	X	X
	<i>Senecio quadridentatus</i>		X
	<i>Sonchus oleraceus</i> *		X
	<b><i>Stackhousia minima</i></b>	X	X

<b>Form</b>	<b>Species</b>	<b>1988</b>	<b>2017</b>
	<i>Thelymitra longifolia</i>		X
	<i>Trifolium arvense</i> *	X	
	<i>Trifolium dubium</i> *	X	
	<i>Verbascum thapsus</i> *	X	X
	<i>Vicia sativa</i> *		X
Graminoid	<i>Agrostis capillaris</i> *	X	X
	<i>Aira caryophylla</i> *	X	X
	<i>Anthosachne australasica</i>	X	
	<i>Anthosachne scabra</i> *		X
	<b><i>Anthosachne solandri</i></b>		X
	<i>Anthoxanthum odoratum</i> *	X	X
	<i>Bromus diandrus</i> *		X
	<i>Bromus hordeaceus</i> *		X
	<i>Carex breviculmis</i>	X	X
	<i>Dactylis glomerata</i> *		X
	<b><i>Deyeuxia avenoides</i></b>	X	
	<i>Dichelachne crinita</i>	X	
	<b><i>Festuca novae-zelandiae</i></b>	X	X
	<i>Festuca rubra</i> *		X
	<i>Poa pratensis</i> *		X
	<b><i>Rytidosperma clavatum</i></b>	X	X
	<b><i>Rytidosperma unarede</i></b>		X
<i>Vulpia bromoides</i> *	X	X	

<b>Form</b>	<b>Species</b>	<b>1988</b>	<b>2017</b>
NonVascular	<i>Breutelia affinis</i>	x	
	<i>Bryum campylothecium</i>		x
	<i>Buellia</i>		x
	<i>Calopaca</i>		x
	<i>Campylopus clavatus</i>		x
	<i>Campylopus introflexus</i>		x
	<i>Candelariella xanthostigma</i>		x
	<i>Candellariella xanthostigma</i>		x
	<i>Cladia aggregata</i>		x
	<i>Cladonia</i>		x
	<i>Cladonia aspera</i>		x
	<i>Cladonia crispata var crispata</i>		x
	<i>Cladonia darwinii</i>		x
	<i>Cladonia macilenta</i>		x
	<i>Cladonia merchlorophaea</i>		x
	<i>Cladonia polycarpoides</i>		x
	<i>Cladonia subulata</i>		x
	<i>Cladonia uncialis</i>		x
	<i>Crustose</i>		x
	<i>Hedwigia ciliata</i>	x	x
<i>Hypnum chrysogaster</i>		x	
<i>Hypnum cupressiforme</i>	x		



<b>Form</b>	<b>Species</b>	<b>1988</b>	<b>2017</b>
	<i>Hypnum cupressiforme</i> var. <i>cupressiforme</i>		X
	<i>Megalospora</i>		X
	<i>Neofuscelia adpicta</i>		X
	<i>Physcia caesia</i>		X
	<i>Placopsis</i>		X
	<i>Polytrichum juniperinum</i>	X	X
	<i>Racomitrium lanuginosum</i>	X	
	<i>Racomitrium pruinosum</i>		X
	<i>Ramalina glaucescens</i>		X
	<i>Teleoschistes fasciculatus</i>		X
	<i>Teleoschistes velifer</i>		X
	<i>Triquetrella papillata</i>	X	X
	<i>Usnea</i>		X
	<i>Usnea arida</i>		X
	<i>Xanthoparmelia</i>		X
	<i>Xanthoparmelia molliuscula</i>		X
	<i>Xanthoparmelia scabrosa</i>		X

Table 5. Species list for Motu Kānuka. No other published lists could be located for this site.

\* indicates exotic species, endemic species are in bold.

Form	Species	2017
Tree	<i>Carmichaelia australis</i>	x
	<i>Coprosma propinqua</i>	x
	<i>Discaria toumatou</i>	x
	<i>Olearia avicenniifolia</i>	x
Shrub	<i>Coprosma rhamnoides</i>	x
	<i>Coprosma species</i>	x
	<i>Cytisus scoparius</i> *	x
	<i>Kunzea ericoides</i>	x
	<i>Leptecophylla juniperina</i>	x
	<i>Leucopogon fraseri</i>	x
	<i>Pittosporum crassicaule</i>	x
	<i>Pittosporum species</i>	x
	<i>Ulex europaeus</i> *	x
SubShrub	<i>Hypericum gramineum</i>	x
	<i>Leptostigma setulosum</i>	x
	<i>Solanum nigrum</i> *	x
Vine	<i>Clematis species</i>	x
	<i>Muehlenbeckia complexa</i>	x
Forb	<i>Anthriscus caucalis</i> *	x
	<i>Aphanes inexpectata</i> *	x
	<i>Brachyglottis bellidioides</i>	x

<b>Form</b>	<b>Species</b>	<b>2017</b>
	<i>Brachyglottis lagopus</i>	X
	<i>Capsella bursa-pastoris</i> *	X
	<i>Cardamine species</i>	X
	<i>Celmisia gracilentia</i>	X
	<i>Cerastium fontanum</i> *	X
	<i>Cirsium vulgare</i> *	X
	<i>Conium maculatum</i> *	X
	<i>Craspedia species</i>	X
	<i>Crepis capillaris</i> *	X
	<i>Crepis vesicaria</i> subsp. <i>taraxacifolia</i> *	X
	<i>Dichondra repens</i>	X
	<i>Euchiton species</i>	X
	<i>Galium propinquum</i>	X
	<i>Geranium molle</i> *	X
	<i>Hieracium lepidulum</i> *	X
	<i>Hypochaeris radicata</i> *	X
	<i>Leontodon saxatilis</i> *	X
	<i>Leptinella pusilla</i>	X
	<i>Microtis unifolia</i>	X
	<i>Oxalis exilis</i>	X
	<i>Pilosella officinarum</i> *	X
	<i>Pilosella piloselloides</i> *	X

<b>Form</b>	<b>Species</b>	<b>2017</b>
	<i>Plantago lanceolata</i> *	X
	<i>Plantago major</i> *	X
	<i>Plantago tagname masonae</i>	X
	<i>Rumex acetosella</i> *	X
	<i>Senecio glomeratus</i>	X
	<i>Senecio quadridentatus</i>	X
	<i>Sonchus oleraceus</i> *	X
	<i>Stellaria media</i> *	X
	<i>Taraxacum officinale</i> *	X
	<i>Thelymitra longifolia</i>	X
	<i>Trifolium dubium</i> *	X
	<i>Trifolium pratense</i> *	X
	<i>Trifolium repens</i> *	X
	<i>Trifolium striatum</i> *	X
	<i>Veronica arvensis</i> *	X
	<i>Viola cunninghamii</i>	X
Graminoid	<i>Agrostis capillaris</i> *	X
	<i>Aira caryophyllea</i> *	X
	<b><i>Anthosachne solandri</i></b>	X
	<i>Anthosachne species</i>	X
	<i>Anthoxanthum odoratum</i> *	X
	<i>Bromus diandrus</i> *	X
	<i>Bromus hordeaceus</i> *	X

<b>Form</b>	<b>Species</b>	<b>2017</b>
	<i>Carex breviculmis</i>	X
	<i>Critesion glaucum</i> *	X
	<i>Cynosurus echinatus</i> *	X
	<i>Dactylis glomerata</i> *	X
	<b><i>Deyeuxia avenoides</i></b>	X
	<i>Festuca rubra subsp. commutata</i> *	X
	<i>Festuca rubra</i> *	X
	<i>Holcus lanatus</i> *	X
	<i>Lolium perenne</i> *	X
	<i>Microlaena stipoides</i>	X
	<i>Poa annua</i> *	X
	<i>Poa pratensis</i> *	X
	<i>Rytidosperma gracile</i>	X
	<i>Rytidosperma racemosum</i> *	X
	<i>Rytidosperma species</i>	X
	<i>Vulpia bromoides</i> *	X
NonVascular	<i>Breutelia pendula</i>	X
	<i>Candelariella xanthostigma</i>	X
	<i>Chiloscyphus semiteres</i>	X
	<i>Cladia aggregata</i>	X
	<i>Cladonia darwinii</i>	X
	<i>Cladonia imbricata</i>	X
	<i>Cladonia mitis</i>	X

<b>Form</b>	<b>Species</b>	<b>2017</b>
	<i>Hedwigia ciliata</i>	x
	<i>Heteroscyphus coalitus</i>	x
	<i>Hypnum cupressiforme</i> var. <i>filiforme</i>	x
	<i>Lepraria incana</i>	x
	<i>Parmelia cunninghamii</i>	x
	<i>Parmotrema chinense</i>	x
	<i>Peltigera didactyla</i>	x
	<i>Physcia adscendens</i>	x
	<i>Physcia caesia</i>	x
	<i>Polytrichum juniperinum</i>	x
	<i>Racomitrium elongatum</i>	x
	<i>Racomitrium pruinosum</i>	x
	<i>Ramalina glaucescens</i>	x
	<i>Syntrichia ruralis</i>	x
	<i>Teleoschistes velifer</i>	x
	<i>Thuidiopsis furfurosa</i>	x
	<i>Triquetrella papillata</i>	x
	<i>Xanthoparmelia</i>	x

## Appendix S2. Model parameter estimates

This appendix contains the proportion of exotic cover (Table 6), total exotic grass cover (Table 7), and the proportion of non-vascular plant cover (Table 8) parameter estimates. A detailed description of the Gompertz mixture models that were fitted to the proportion of exotic cover, the total exotic grass cover, and the proportion of non-vascular plant cover are included in the main paper.

Proportion of exotic cover

Table 6. Parameter estimates (means  $\pm$ 95% credible intervals) for the proportion of exotic species cover mixture model. Asterisks indicate 95% CIs that exclude zero.  $\hat{R}$  is the Gelman-Rubin convergence diagnostic statistic.

Parameter	Description	Estimate	Effective sample size	$\hat{R}$
$\beta_1$	Lag intercept	3.522 [2.58 – 4.56]*	1472.067	0.999
$\beta_2$	Maximum slope with distance from fence line (distance main effect)	2.952 [2.095 – 3.839]*	1487.788	0.999
$\beta_3$	Effect of irrigation on lag (main effect of irrigated edge)	1.299 [0.127 – 2.439]*	1644.974	1.000
$\beta_4$	Effect of irrigation on maximum slope (distance x irrigation interaction)	1.376 [0.367 – 2.356]*	1736.853	1.000
$\delta$	Weight relationship slope	0.178 [–0.162 – 0.577]	2225.93	0.999
$\gamma_1$	Lower asymptote intercept	0.351 [–0.096 – 0.831]	848.268	1.003
$\gamma_2$	Lower asymptote kānuka cover slope	0.196 [0.059 – 0.329]*	2416.433	1.000
$\gamma_3$	Lower asymptote topography (high point)	–0.362 [–0.63 – –0.093]*	2721.796	0.998
a	Upper asymptote	5.682 [5.025 – 5.979]*	2505.092	0.999



$\sigma$	Error standard deviation of the mixture components	1.418 [1.339 – 1.503]*	2461.561	0.999
$\sigma_{\text{site}}$	Standard deviation of the site random effects	0.407 [0.01 – 1.045]*	600.496	1.004
$\sigma_{\text{transect}}$	Standard deviation of the transect random effects	0.457 [0.276 – 0.666]*	796.69	1.003

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Exotic grass cover

Table 7. Parameter estimates (means  $\pm$ 95% credible intervals) for the exotic grass cover mixture model. Asterisks indicate 95% CIs that exclude zero.  $\hat{R}$  is the Gelman-Rubin convergence diagnostic statistic.

Parameter	Description	Estimate	Effective sample size	$\hat{R}$
$\beta_1$	Lag intercept	2.428 [1.324 – 3.653]*	1165.475	1.004
$\beta_2$	Maximum slope with distance from fence line (distance main effect)	2.151 [1.171 – 3.275]*	1084.843	1.003
$\beta_3$	Effect of irrigation on lag (main effect of irrigated edge)	0.503 [–0.778 – 1.814]	965.251	1.003
$\beta_4$	Effect of irrigation on maximum slope (distance x irrigation interaction)	0.517 [–0.585 – 1.657]	936.918	1.004
$\delta$	Weight relationship slope	0.884 [0.224 – 2.011]*	1081.367	1.003
$\gamma_1$	Lower asymptote intercept	0.956 [0.86 – 0.999]*	1930.822	0.999
$\gamma_2$	Lower asymptote kānuka cover slope	0.464 [0.205 – 0.74]*	356.478	1.004
$\gamma_3$	Lower asymptote topography (high point)	–0.032 [–0.077 – 0.015]	2401.898	0.999
a	Upper asymptote	0.016 [–0.011 – 0.043]	2014.492	1.000
$\sigma$	Error standard deviation of the mixture components	0.246 [0.233 – 0.26]*	1513.338	1.000
$\sigma_{\text{site}}$	Standard deviation of the site random effects	0.271 [0.116 – 0.668]*	526.54	1.003
$\sigma_{\text{transect}}$	Standard deviation of the transect random effects	0.089 [0.061 – 0.126]*	641.553	1.003



Non-vascular species cover

Table 8. Parameter estimates (means  $\pm$  95% credible intervals) for the non-vascular species cover mixture model. Asterisks indicate 95% CIs that exclude zero.  $\hat{R}$  is the Gelman-Rubin convergence diagnostic statistic.

Parameter	Description	Estimate	Effective sample size	$\hat{R}$
$\beta_1$	Lag intercept	-4.156 [-5.384 – -2.939]*	1108.94	1.003
$\beta_2$	Maximum slope with distance from fence line (distance main effect)	-3.267 [-4.385 – -2.076]*	971.192	1.003
$\beta_3$	Effect of irrigation on lag (main effect of irrigated edge)	-1.302 [-2.692 – -0.003]*	1329.066	1.000
$\beta_4$	Effect of irrigation on maximum slope (distance x irrigation interaction)	-1.307 [-2.472 – -0.159]*	1235.346	1.001
$\delta$	Weight relationship slope	0.527 [0.092 – 1.197]*	1454.849	1.003
$\gamma_1$	Upper asymptote intercept	-1.208 [-1.568 – -0.833]*	1007.225	1.000

$\gamma_2$	Upper asymptote kānuka cover slope	-0.662 [-0.86 – -0.472]*	1970.276	1.001
$\gamma_3$	Upper asymptote topography (high point)	0.34 [-0.024 – 0.724]	2313.556	1.001
a	Lower asymptote	-5.703 [-5.98 – -5.126]*	2877.547	1.000
$\sigma$	Error standard deviation of the mixture components	1.966 [1.841 – 2.099]*	1744.031	1.003
$\sigma_{\text{site}}$	Standard deviation of the site random effects	0.14 [0 – 0.578]	615.327	1.009
$\sigma_{\text{transect}}$	Standard deviation of the transect random effects	0.695 [0.459 – 1.005]*	1203.373	1.002

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Appendix S3. Observed data and fitted models of individual species cover as a function of distance to edge.

Here we plot the model fits of the best fitting model to each of the 33 species for which we have enough data to model trends in cover with distance from edge. The fitted relationships for irrigated and non-irrigated edges are shown on the logit scale. The raw data are summarised as the means of 40 bins along the distance gradient ( $\pm$  standard error).

Key to models:

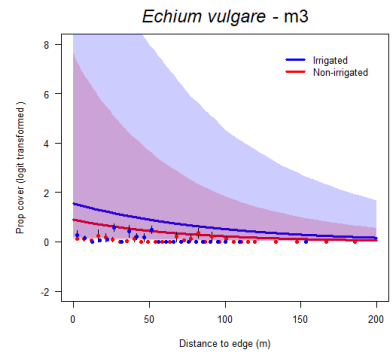
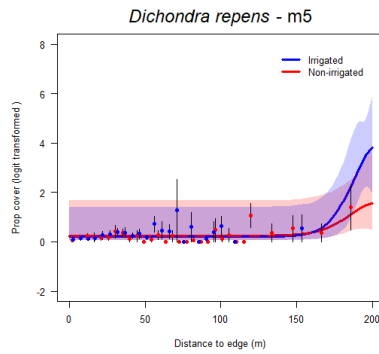
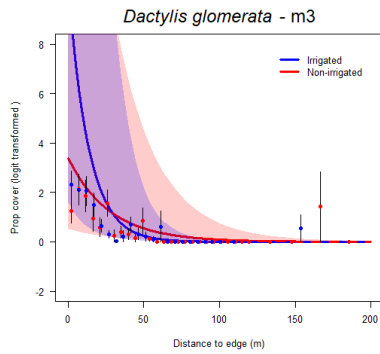
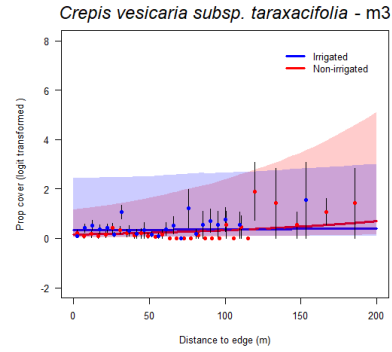
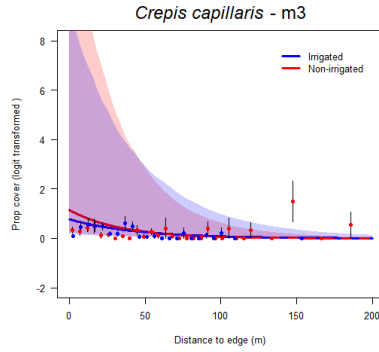
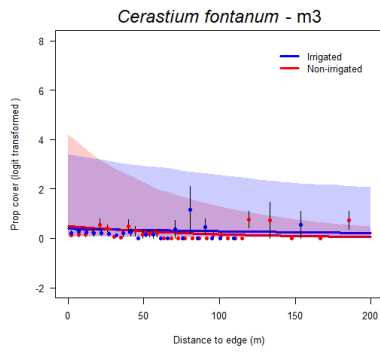
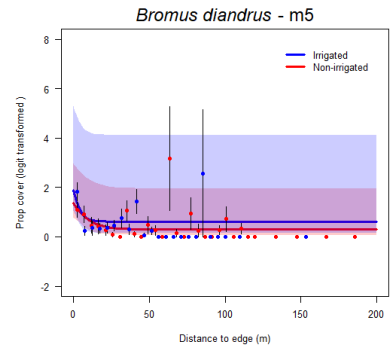
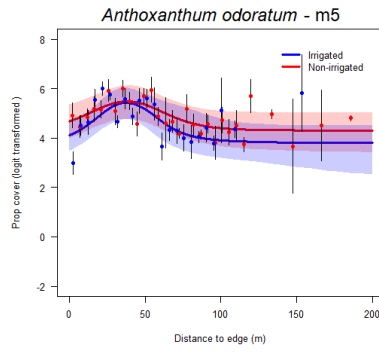
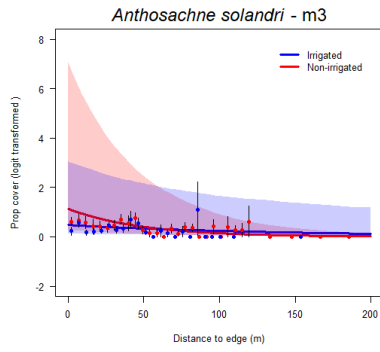
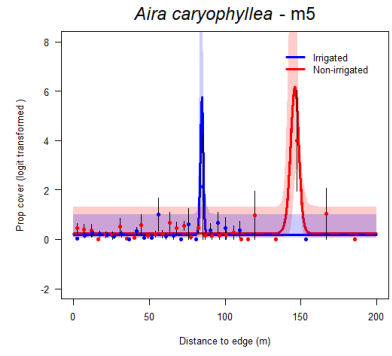
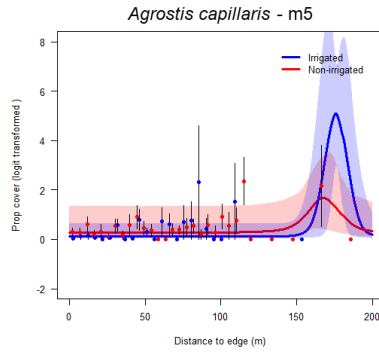
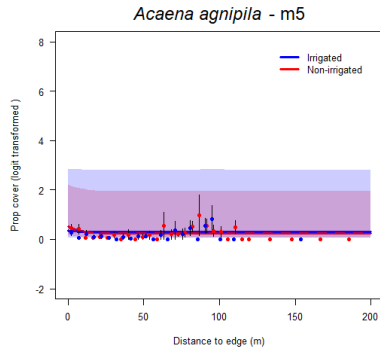
Intercept only (m1)

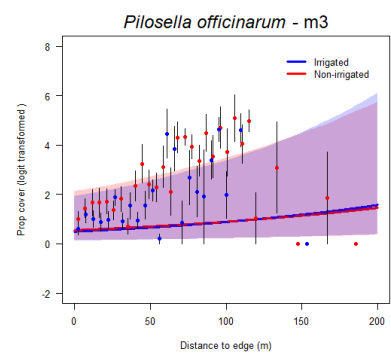
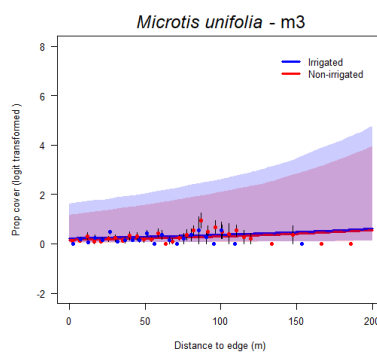
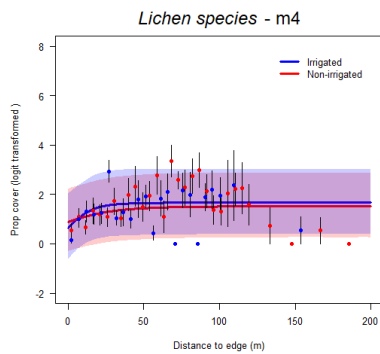
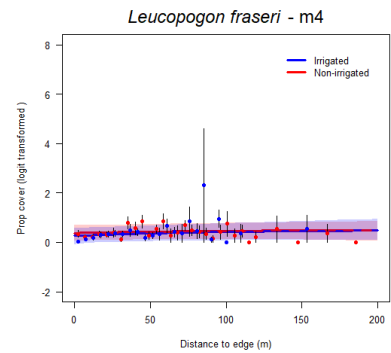
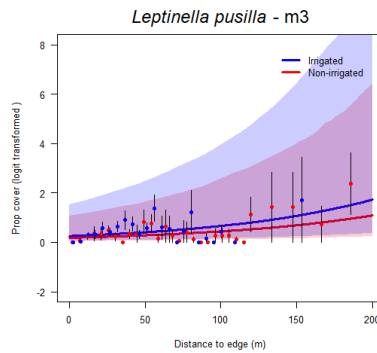
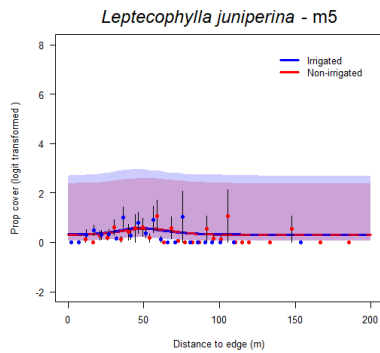
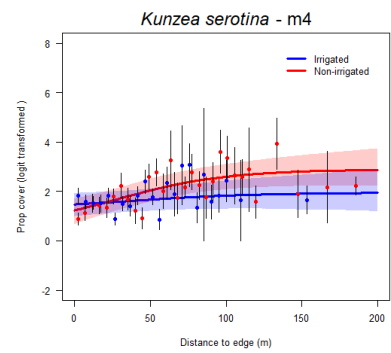
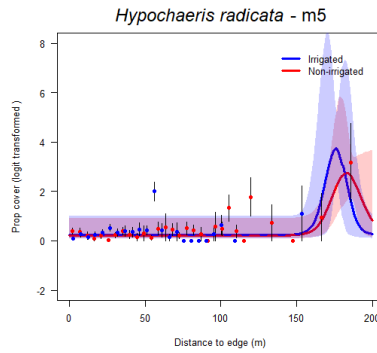
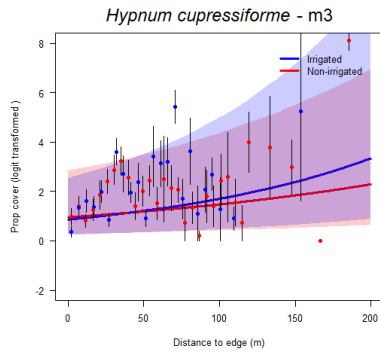
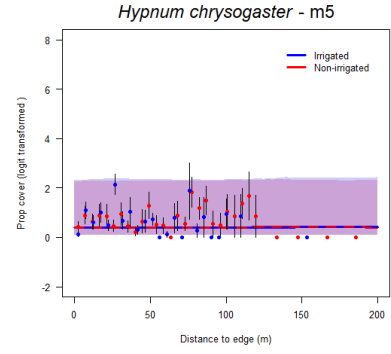
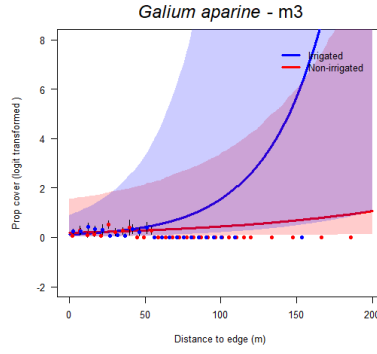
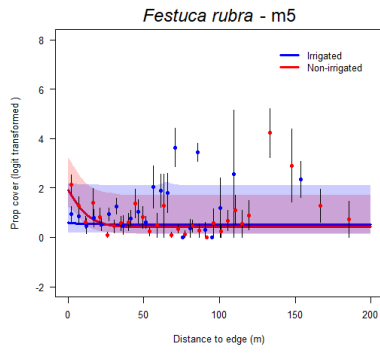
Linear trend with distance from edge (m2)

Exponential trend with distance from edge (m3)

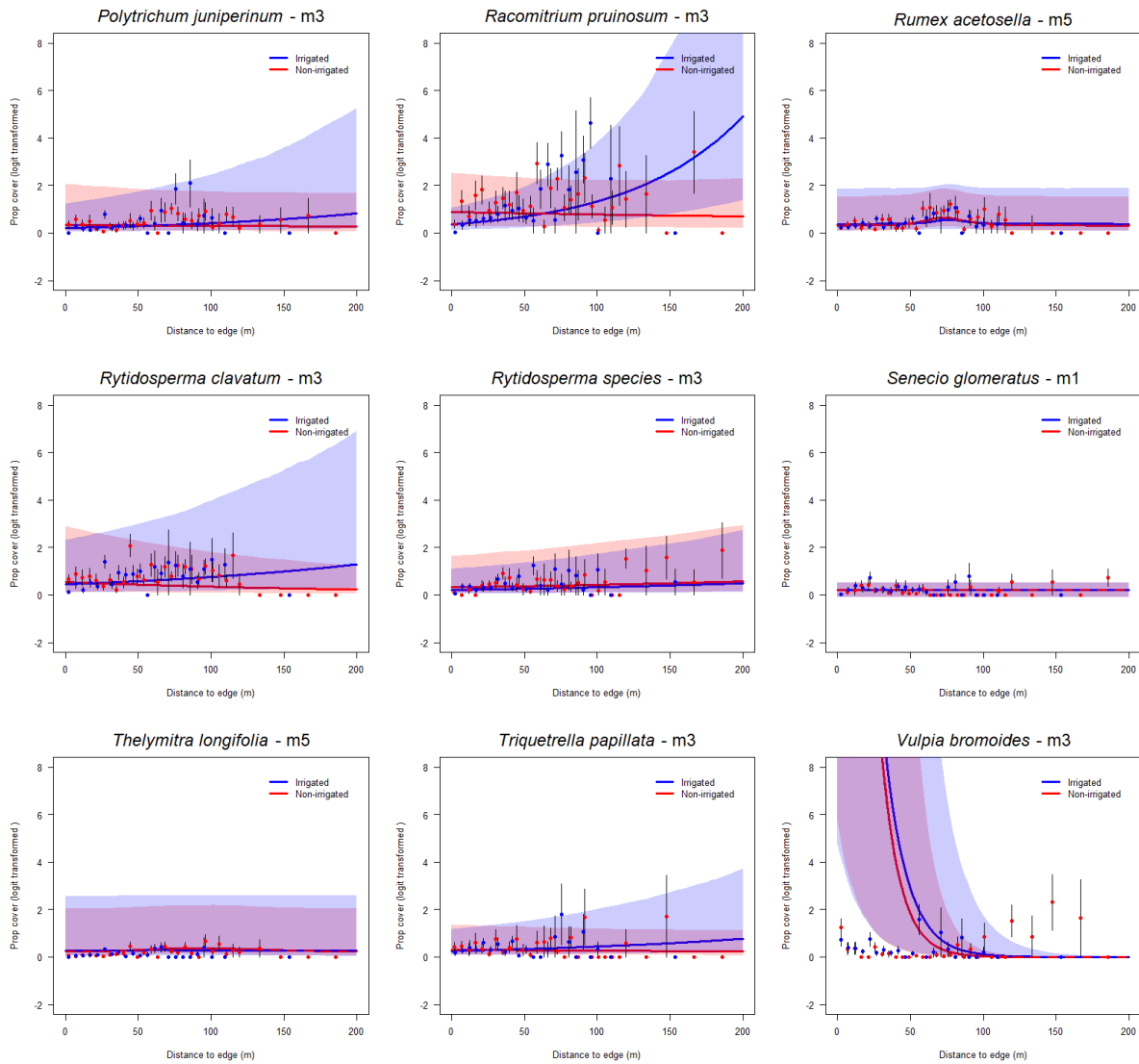
Logistic trend with distance from edge (m4)

Unimodal trend with distance from edge (m5)









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