PREPARED FOR
THE CITY OF
BOROONDARA

EAGA BIODIVERSITY MONITORING FRAMEWORK 2015

PART I – APPENDICES

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Appendices

Appendix A- Brisbane City Council Rapid Condition Assessment Scale

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Appendix A: Brisbane City Council Rapid Condition Assessment Scale

Healthy
As "Good' but no weed cover or recruitment.

Good
Expected # of canopy species, mid-stratum or groundcovers
Expected recruitment of canopy species.
Large # of large trees
Expected canopy height
Expected canopy, shrub and ground cover
Coarse woody debris present
Organic litter present
Weed cover and recruitment can vary….

Moderate
Reduced # of canopy species, mid-stratum or groundcovers
Reduced recruitment of canopy species.
Reduced # of large trees
Reduced canopy height
Reduced canopy, shrub and ground cover
Reduced Coarse woody debris
Reduced Organic litter
Weed cover is below 30% with moderate significant weeds.
Weed species recruitment is of moderate significant weeds.

Degraded
Minimal canopy, shrub or groundcover species richness
Minimal recruitment of canopy species.
Few large trees
Minimal canopy height (Eucalypt/melaleuca or 5m vineforest/riparian)
Minimal canopy, shrub and ground cover
Limited or no Coarse woody debris
Limited or no Organic litter
Weed cover is > 30% and predominantly high significance weeds.
Weed species recruitment is of high significance weeds.

Very Degraded
As 'Degraded', but
Weed cover is > 60% and predominantly very high significance weeds
Weed species recruitment is of very high significance weeds.

Appendix B: Review of All EAGA Council Policy Documents

Why do they do it/Objectives	Category (Regen/Reveg/Fauna/ Community/Weeds)	Where	Who (which staff)	What they collect	How they collect it	How often they collect it	Relevant policy doc	Affected asset
Boroondara								
Protect and restore remnant vegetation and existing ecologically significant sites for habitat and ecological values								
Maintenance of biodiversity assets	Regen	Biodiversity assets	P&G (but maybe in-house staff, contractors or external consultants- TBC)	baseline condition of zones within Biodiversity Assets	Baseline audit by consultant and staff.	Annually	Biodiversity Asset Management Plans (BAMPS); Biodiversity Strategy 2013-2023	Biodiversity assets
Maintenance of biodiversity assets	Weeds/Maintenance	36 ha of council land	P&G (Biosites Team)	Area of public land actively managed for biodiversity, condition rating, cost	Ongoing	Maintenance as needed, condition rating annually	Biodiversity strategy implementation plan 1.1 BAMP	Biodiversity assets
Maintenance of biodiversity assets	Regen	36 ha of council land	P&G (Biosites Team)	Area of regenerated land, condition rating, cost	Annual	?	Biodiversity strategy implementation plan 1.2 BAMP	Biodiversity assets
Maintenance of biodiversity assets	Biodiversity inventory	Biodiversity assets public and private land (58 sites)	Consultant (Lorimer)	Species present and locally extinct, communities and habitat sites, biological significance	Research, fieldwork and interviews. Compiled in mapping, database and reference photographs.	once off?	Biodiversity Strategy 2003; Inventory and assessment of indigenous flora and fauna 2005; BAMP	Biodiversity assets

Why do they do it/Objectives	Category (Regen/Reveg/Fauna/ Community/Weeds)	Where	Who (which staff)	What they collect	How they collect it	How often they collect it	Relevant policy doc	Affected asset
Maintenance of biodiversity assets	Biodiversity inventory, monitor change	Biodiversity assets public and private land (7 previously, planned 8 sites + 3 wetlands)	Consultant (Lorimer)	Species present and locally extinct, communities and habitat sites, biological significance	Research, fieldwork and interviews. Compiled in mapping, database and reference photographs	Every 5 years	Biodiversity Strategy 2003; Inventory and assessment of indigenous flora and fauna 2005; BAMP	Biodiversity assets
Extend revegetation to improve connectivity between biodiversity sites along corridors								
Increase biodiversity assets	Regen + Reveg	9 ha of council land	P&G (Biosites Team)	Area of regenerated land, condition rating, cost	Schedule according to BAMP	Annual	Biodiversity strategy implementation plan 1.4, BAMP	Biodiversity assets
Protect our waterways as natural landscapes for their ecological values								
Contribute to improved water quality		Various sites	Consultants	Data generated from modelling	N/A	Once off	Integrated water management strategy; Water Balance Report	Water quality
Protect significant habitat trees on public and private land								
To protect significant trees	Register of Significant Trees	Public and private land	Consultants	Listing of 309 significant trees including both native and exotic	2001 study by Lorimer	Ongoing	Biodiversity Strategy 2013-2023; Biodiversity Strategy Implementation Plan 1.6; BAMP	Plants
To protect significant and large canopy trees	Maintenance of trees	Public and private land	Statutory planning	No. of permit applications (to prune etc), % approved, prosecutions & infringements	Via permit applications and prosecution data	As it occurs	Tree protection local law; Biodiversity Strategy Implementation Plan 1.7	Plants
Use streetscapes to support indigenous flora and fauna, especially in street adjacent to and near biodiversity corridors								

Why do they do it/Objectives	Category (Regen/Reveg/Fauna/ Community/Weeds)	Where	Who (which staff)	What they collect	How they collect it	How often they collect it	Relevant policy doc	Affected asset
Increase indigenous flora and fauna, create connectivity	Reveg	Nature strips	P&G with E&SL	No. of permits for indigenous nature strips	No. of permits issued	annually	Nature strip guidelines 2010; biodiversity strategy implementation plan 1.8	Plants, animals, private land biodiversity
Promote and deliver community education projects and activities that encourage positive behaviours and values towards biodiversity conservation								
Encourage positive behaviour towards biodiversity conservation	Community	Various	P&G with E&SL	No. of indigenous plant vouchers provided to schools and residents, participation on Backyard Biodiversity project, attendance at Maranoa Gardens Festival and workshops.	Surveys	?	Biodiversity strategy implementation plan 3.1	Residents interest in biodiversity
Encourage indigenous vegetation restoration, revegetation and gardening across the municipality; Engage community groups and residents in biodiversity actions								
Encourage positive behaviour towards biodiversity conservation	Community	Various	P&G with E&SL	No. of friends groups (intend to collect no. of active members, volunteer hours)	Ongoing interaction with groups	Annually	Biodiversity strategy implementation plan 3.4	Community patch
Backyard biodiversity project- engage residents in biodiversity, create connectivity	Community		project officer	no. of households participating, tubestock planted	Surveys	Each project group surveyed	Biodiversity Corridors Plan 2003; Biodiversity Strategy 2013-2023; Biodiversity Strategy Implementation Plan 3.3	Private land, plant and animal community connectivity, residents involvement
Encourage private land owners with significant habitat (e.g. golf courses, schools) to protect, manage and enhance indigenous flora and fauna habitat								
Encourage private golf clubs to protect biodiversity	Protect existing	Golf courses (private)	E&SL with support from P&G	Proposed: area of habitat, condition rating of habitat, no. of tubestock provided	?	?	Biodiversity strategy implementation plan 3.8	Plants
Encourage private and public schools to protect biodiversity	Protect existing	Public and private schools	E&SL with support from P&G	No. of tubestock provided	Via requests for vouchers	Ongoing	Biodiversity strategy implementation plan 3.9	Plants
Complimentary activities								

Why do they do it/Objectives	Category (Regen/Reveg/Fauna/ Community/Weeds)	Where	Who (which staff)	What they collect	How they collect it	How often they collect it	Relevant policy doc	Affected asset
General recording	Water quality and pollution	waterways	P&G and E&SL	Algal blooms, azolla infestations, rubbish after flooding	?	as it occurs	"Business as usual" to support biodiversity strategy	Water quality
	Fauna and flora	Various	P&G and E&SL	Other routine activities: responding to inquires about possums, bees etc.; feral animal baiting/control; myrtle rust monitoring;	?	?	"Business as usual" to support biodiversity strategy	
Knox								
Protect and restore remnant vegetation and existing ecologically significant sites for habitat and ecological values								
	Biodiversity inventory	Koolunga Flora and Fauna Reserve	Consultant (Mark Allaway and ass.) on behalf of Friends Group	Botanical Survey	Quadrats, stored on disc at ARI and published on website	Once off (1994)		
Manage threatened plant species in Knox	Regen?	Council reserves, roadsides, Melb Water sites	Suggested to be done by councils, KES, VicRoads, CFA, Melb Water	Many suggestions in Threatened (flora) species management plan by Lorimer 2010: monitoring of burning, propagating, translocating	?	?	Threatened species management plan Lorimer 2010; Knox Planning Scheme; Knox Sustainable Environment Strategy 2008-2018	Plant TS
Land acquisition by council to protect biodiversity		?	?	Not sure they collect anything	?	?	?	?
Sites of biological significance	Biodiversity inventory	118 Public and private land sites	Consultant (Lorimer)	Flora and Fauna species list, significance level, EVC	Survey	2004, 2010 (every 6 years)	Incorporated into Knox Planning Scheme in 2013	Sites of biological significance
? Plant > 30000 plants a year	Reveg	?	volunteers & 'friends'	No. of plants planted	?	?	?	Plants

Why do they do it/Objectives	Category (Regen/Reveg/Fauna/ Community/Weeds)	Where	Who (which staff)	What they collect	How they collect it	How often they collect it	Relevant policy doc	Affected asset
Net gain of indigenous vegetation		?	Planning staff	Council will report on Net Gain assessments and activities. Success against this indicator will show an increase in successful actions that have resulted in an increase in indigenous vegetation in Knox.	?	?	Net Gain policy	
Increase habitat hectares across the municipality, including public and private land; Create a greener city with more trees and indigenous vegetation in public spaces, and thriving iconic species; Deliver focused programs for the control of pest animals and weeds on private and public land				Habitat hectares, no. of, area. Habitat hectares is a measure of both quantity and quality of remnant native vegetation. The quality assessment is conducted through comparison of a patch of indigenous vegetation to a 'benchmark' for the same vegetation type in a mature or long undisturbed state. Success will be measured as an increase in both quantity and quality of indigenous vegetation.			a	
Establish a network of habitat corridors to join sites of significance with other areas of indigenous vegetation; Create a greener city with more trees and indigenous vegetation in public spaces, and thriving iconic species				Ratio of sites linked to unlinked (connectivity): Connectivity of patches of habitat is considered essential to support biodiversity across the landscape. This ratio will consider the degree to which patches of indigenous habitat are linked to each other via corridors or other mechanisms that allow mobile species to travel between sites. Success against this measure will be seen through an increase in connectivity across the city.			b	

	Why do they do it/Objectives	Category (Regen/Reveg/Fauna/ Community/Weeds)	Where	Who (which staff)	What they collect	How they collect it	How often they collect it	Relevant policy doc	Affected asset
	Prevent further extinctions of flora, fauna or ecological vegetation classes in Knox; Deliver focused programs for the control of pest animals and weeds on private and public land				Number of threatened, endangered or extinct species: The number of fauna species listed as being threatened, endangered or extinct locally (e.g. within the Knox region) is seen to be an indicator of the overall health of biodiversity in an area. Success against this indicator will be seen through a reduction of the number of species listed in these categories as a result of improved population health of these species. NOTE: a reduction in the number of threatened or endangered species as a result of these species becoming extinct will not be seen as a successful outcome.			c	
	Prevent further extinctions of flora, fauna or ecological vegetation classes in Knox; Deliver focused programs for the control of pest animals and weeds on private and public land				Number of threatened, endangered or extinct EVCs (as for threatened species)			d	
	Knox Wildlife Atlas	Fauna	Everywhere	?	native animals that live or move through municipality (less common species)	database	ad hoc?	Knox sustainable environment strategy	fauna
	Create a greener city with more trees and indigenous vegetation in public spaces, and thriving iconic species				Tree cover (ratio): This indicator will measure the amount of tree cover present in the municipality, considering the ratio of land with trees to land without trees. Success against this indicator will be seen through an increase in tree cover. Where possible, Council will also report on the percentage of tree cover that is known to be indigenous.			e	
Extend revegetation to improve connectivity between biodiversity sites along corridors									
	Living Links			in partnership with other councils	? Ongoing revegetation and weed control				
Protect our waterways as natural landscapes for their ecological values									

Why do they do it/Objectives	Category (Regen/Reveg/Fauna/ Community/Weeds)	Where	Who (which staff)	What they collect	How they collect it	How often they collect it	Relevant policy doc	Affected asset
Platypus surveys	Fauna	Dobsons and Upper Dandenong Creek	Australian Platypus Conservancy	Population size, demographic info	?	?	Knox sustainable environment strategy	Waterways, iconic species
Increase water quality (including reducing levels of pollution) and the associated environmental values in local waterways	Water	Rivers	Melb Water and DEPI	Indicators of River Condition (IRC): The indicator assesses both water quality and the physical health of waterways. Success against this indicator will be measured as an improvement in river condition	?	?	Knox sustainable environment strategy	waterways
Increase water quality (including reducing levels of pollution) and the associated environmental values in local waterways	Water	?	?	Volume of litter in waterways: Council will report on activities that provide information about the volume of litter in local waterways. Activities that will be reported on will include amount of litter removed from waterways on Clean Up Australia day, the volume of litter collected in litter traps, and any other litter survey data collected from waterways. Litter volume will be reported in tonnes, and in the number of litter items found where appropriate. Success against this indicator will be seen in a reduction in the amount of litter found in waterways.	?	?	Knox sustainable environment strategy	waterways
Waterwatch sites		Old Joes Creek and Dandenong Creek						
Protect significant habitat trees on public and private land								
Protect trees, monitor outcomes of sustainable development, enhance neighbourhood character and liveability		Public and private land	Planning staff	No. of permit applications to remove or prune vegetation	Planning application triggered by overlays	As it occurs	Knox planning scheme	
		Public and private land		Significant trees, incl non-indigenous	Part of Lorimer study?			
Use streetscapes to support indigenous flora and fauna, especially in street adjacent to and near biodiversity corridors								
		Street trees	Sustainable planning and development?	Audit of street trees	GIS	ongoing		
Promote and deliver community education projects and activities that encourage positive behaviours and values towards biodiversity conservation								

Why do they do it/Objectives	Category (Regen/Reveg/Fauna/ Community/Weeds)	Where	Who (which staff)	What they collect	How they collect it	How often they collect it	Relevant policy doc	Affected asset
Create a greener city with more trees and indigenous vegetation in public spaces, and thriving iconic species; Improve community understanding of the importance of biodiversity and the role they can play in its conservation and protection				Community participation in biodiversity education programs: Community involvement will result in better community understanding of the value of biodiversity, and result in on-the ground action that will support biodiversity. This indicator will monitor the number of community members who choose to participate in biodiversity education programs such as Gardens for Wildlife, Greenleaf, Friends Groups, community planting activities and other educational programs. Success against this indicator will be seen through an increase in participation.			f	
Contribute to regional and global biodiversity, working with regional partners				Activity with regional partners: Providing successful support to local biodiversity will require Council to work effectively with other government departments and agencies that have a role to play in relation to biodiversity management. Council will report on the number of on-the-ground actions that have arisen as a result of partnerships with other agencies such as DSE, PPWPCMA and Melbourne Water. Success against this indicator will be seen as an increase in the number of activities undertaken with regional partners. Continuous or sustained action with partner organisations will demonstrate Council's success in maintaining relationships with regional partners.			g	
To identify changes in community understanding and perception of sustainability	Community	Online	?	Answers to 13 questions	Community survey about sustainability	2001 and repeated in 2008	Knox sustainable environment strategy (survey undertaken for the preparation of this document)	Community

	Why do they do it/Objectives	Category (Regen/Reveg/Fauna/ Community/Weeds)	Where	Who (which staff)	What they collect	How they collect it	How often they collect it	Relevant policy doc	Affected asset
	Advocate to other levels of Government and relevant agencies for higher standards in order to move towards a sustainable city				Number of sustainability issues on which Council has advocated to other levels of government or relevant agencies: the range of sustainability issues on which it has advocated, other agencies involved in the activity, and the outcomes for Knox.				
	Establish sustainability demonstration projects				Number of sustainability demonstration projects: the number of sustainability projects and how they have been promoted to the community.				
	Provide opportunities for community members to participate in meaningful ways; Provide effective resources to the community to facilitate behaviour change				Percentage of residents who believe they understand sustainability issues	Sustainability survey			
	Provide opportunities for community members to participate in meaningful ways;				Percent of residents that identify feeling connected to nature	Sustainability survey			
	EnviroCare lectures	?	?	?	Not sure if they collect anything	?	?	Knox sustainable environment strategy	Community
Encourage indigenous vegetation restoration, revegetation and gardening across the municipality; Engage community groups and residents in biodiversity actions									
	Urban Forest Planting Program: Carbon sequestration	Community, reveg	Open space, linear riparian corridors	?	No. of plants planted	?	?	Knox sustainable environment strategy	Plants
	Community and school planting program				Not sure if they collect anything	Same as urban forest planting program?	Done annually		
	National Tree Day/Arbour week				No. of trees planted				
	Schools for sustainability program				Not sure if they collect anything; but they distribute newsletters, give awards, run networking events, support tree planting				

Why do they do it/Objectives	Category (Regen/Reveg/Fauna/ Community/Weeds)	Where	Who (which staff)	What they collect	How they collect it	How often they collect it	Relevant policy doc	Affected asset
Provide opportunities for community members to participate in meaningful ways; Provide effective resources to the community to facilitate behaviour change	community	?	?	participation in Friend's groups/volunteers hours in environmental activity: Council will report on the number of friends groups and other community groups that are involved in activities related to improving sustainability in the city. Reports will focus on the number of groups, the total number of members in groups, the range of activities undertaken and estimated volunteer hours spent in environmental activities. Success against this indicator will be seen in an increase in: Number of environmental groups in Knox Number of people participating in groups • Number of activities undertaken • Estimated hours or work delivered	? Friends group kit, publication of newsletter, coordination of FG activities	?	Knox sustainable environment strategy	community
Encourage private land owners with significant habitat (e.g. golf courses, schools) to protect, manage and enhance indigenous flora and fauna habitat								
Gardens for Wildlife	Community	Private gardens	?	Biodiversity buddy grants, facebook 'likes', garden description information collected during sign-up	Not sure if they collect anything	?	Knox sustainable environment strategy	
Complimentary activities								
Plan for adaptation to climate change (not really aimed at biodiversity though)				No. of actions to adapt to climate change: Actions that have been taken, Outcomes that are expected from these actions. Success against this indicator will be seen through an increase in actions that are taken to adapt to climate change.				

Maroondah

Protect and restore remnant vegetation and existing ecologically significant sites for habitat and ecological values

Why do they do it/Objectives	Category (Regen/Reveg/Fauna/ Community/Weeds)	Where	Who (which staff)	What they collect	How they collect it	How often they collect it	Relevant policy doc	Affected asset
Sites of biological significance	Biodiversity inventory	132 Public and private land sites	Consultant (Lorimer)	Flora and Fauna species list, significance level, EVC	Survey: veg assessment, quadrats, 20 min bird census, spotlighting, hair surveys and incidental records		Maroondah Planning Scheme Overlay	
				Weed monitoring and rare plant monitoring				
Living documents that records site history and management for many sites (each a separate .doc)			Bushland crew	RECOMMENDED MONITORING, Site history, recommended actions, species extinct, species recorded	Staff update action plans doc for each site	?	Multiple site ACTION plans	Plants
Extend revegetation to improve connectivity between biodiversity sites along corridors								
Living links		?	in partnership with other councils	?	?	?	Workshop questionnaire	?
Habitat corridors strategy		Mixed land use?	Consultant (Context)	Field inspection of 150 corridor sections to collect data on vegetation type and quality, other habitat quality, significant species, connectivity for arboreal, ground-dwelling and aquatic fauna, threatening processes, and opportunities for enhancement of links. Compilation of sighting records for a number of 'indicator species' that would benefit from habitat links	Data entry and mapping into GIS		Maroondah Habitat Corridors Strategy (many others relevant)	Flora, fauna, connectivity
Protect our waterways as natural landscapes for their ecological values								
Protect significant habitat trees on public and private land								
Use streetscapes to support indigenous flora and fauna, especially in street adjacent to and near biodiversity corridors								
Promote and deliver community education projects and activities that encourage positive behaviours and values towards biodiversity conservation								
Encourage indigenous vegetation restoration, revegetation and gardening across the municipality; Engage community groups and residents in biodiversity actions								
Encourage private land owners with significant habitat (e.g. golf courses, schools) to protect, manage and enhance indigenous flora and fauna habitat								
Complimentary activities								

Why do they do it/Objectives	Category (Regen/Reveg/Fauna/ Community/Weeds)	Where	Who (which staff)	What they collect	How they collect it	How often they collect it	Relevant policy doc	Affected asset
Monash								
Protect and restore remnant vegetation and existing ecologically significant sites for habitat and ecological values								
Inventory	Plants	Reserves	Plan prepared by consultant (Biosis, Practical Ecology, Michael G?)	Inventory of flora, management effort (eg days/month), EVC condition, site management history (eg. Burning)	species list in management plan; Flora and Fauna monitoring sheets filled out on a day to day basis	every 5-10 years	Individual reserve management plans	Plants
Sustainability target: Plant 100000 plants a year	Reveg	?	?	? Presumably no. of plants planted	**?**	a year	Environmental sustainability roadmap	Plants
Increased tree canopy and flora	Reveg	Parks and reserves	?	Tree canopy within parks and reserves?	**?**	?	Environmental sustainability roadmap	Plants
			PPWPCA	Measurement of progress of conservation and enhancement of biodiversity.				
Extend revegetation to improve connectivity between biodiversity sites along corridors								
Need to audit the current status of species in Monash bushland reserves and put into an online database.								
Enhance connectivity, habitat restoration	Reveg	Scotchmans, Dandenong and Gardiners creek	?	Assessment and enhancement of areas linking natural communities (EVC condition, connectivity, plant and animal species lists, significance)	?	?	Environmental sustainability roadmap; Indigenous Reserve Corridors Conservation Management plan	Connectivity

Why do they do it/Objectives	Category (Regen/Reveg/Fauna/ Community/Weeds)	Where	Who (which staff)	What they collect	How they collect it	How often they collect it	Relevant policy doc	Affected asset
Living links		Napier park and Mulgrave Reserve Wetlands - Dandenong Creek catchment	in partnership with other councils	? Ongoing revegetation and weed control	?	?	Workshop questionnaire	?
Protect our waterways as natural landscapes for their ecological values								
Water watch	Water	? Water watch sites	Melb water, EPA, Friends groups	?				
Improved creek environs	Reveg	Creeks	?	?	?	?	Environmental sustainability roadmap	
Protect significant habitat trees on public and private land								
Gateway plantation: Enhance the appearance of major thoroughfares and increase vegetation	Reveg	Major arterial roads	?	?	**?**	**?**	Environmental sustainability roadmap	Aesthetic, trees
National Tree Planting Day								
Integrated water management plan- – increase the city tree canopy and increase diversity	trees/water	?	?	**?**	Criteria for species selection to provide habitat	**?**	**?**	
Use streetscapes to support indigenous flora and fauna, especially in street adjacent to and near biodiversity corridors								
Target: Increase vegetation canopy within streetscapes		Streets and parkland		Street tree planting program: Street trees planted adjacent to bushland are consistent with bushland species to extend habitat	?	?	Environmental sustainability roadmap	
Maintain street trees		Street trees	Consultant (Enspec)	Condition and age of tree, maintenance/removal/replacement plans	GIS database			
Promote and deliver community education projects and activities that encourage positive behaviours and values towards biodiversity conservation								

Why do they do it/Objectives	Category (Regen/Reveg/Fauna/ Community/Weeds)	Where	Who (which staff)	What they collect	How they collect it	How often they collect it	Relevant policy doc	Affected asset
Increased community knowledge of suitable plant species for the area	Community			Nothing? Provide information on local indigenous species	?	?	Environmental sustainability roadmap	
Increased community knowledge of weeds	Weeds	Private land	?	Nothing? Provide information on weeds				
Encourage indigenous vegetation restoration, revegetation and gardening across the municipality; Engage community groups and residents in biodiversity actions								
Support Friend's groups	Reveg	?	?	No. of volunteers?				
Encourage private land owners with significant habitat (e.g. golf courses, schools) to protect, manage and enhance indigenous flora and fauna habitat								
Complimentary activities								
? Nest box monitoring	Fauna	Reserves		Nest box data (location, type, condition, occupying species, tree condition)	spreadsheet	?	?	Fauna
Stonnington								
Protect and restore remnant vegetation and existing ecologically significant sites for habitat and ecological values								
Biodiversity Review		Mostly public purposes reserves	Consultant (Practical Ecology)	Native vegetation assessed at 54 sites, many along Gardiners Creek valley. Assessment included desktop research, field investigation of EVCs, threats and significance. Flora list in appendix and site data description data sheets for all sites.				
Biodiversity Monitoring			Sustainable Environment Coordinator/Parks Coordinator	Establish a mechanism to objectively measure, and track over time, changes in biodiversity values at Council's priority biodiversity sites to enable a cost-benefit assessment of investments in key biodiversity sites. Establish a routine monitoring program to measure biodiversity at agree locations over time to track changes and assess the impact of Council's Biodiversity and Habitat Management program.	Existing Resources + additional budget for consultant to undertake biodiversity monitoring.			

Why do they do it/Objectives	Category (Regen/Reveg/Fauna/ Community/Weeds)	Where	Who (which staff)	What they collect	How they collect it	How often they collect it	Relevant policy doc	Affected asset
To establish a mechanism to objectively measure, and track over time, changes in biodiversity values to enable a cost benefit assessment of investments in key biodiversity sites.							Sustainable Environment Strategy 2013-2017	
Target: Enhanced biodiversity of open space							Sustainable Environment Strategy 2013-2017	
Environmental enhancement through ecological concept plans to improve habitat for indig plants and animals		Council's priority biodiversity sites include: • Glenburn Bend Park • Muswell Bend Park • Glen Iris Wetlands • Darling Park • Malvern Valley Golf Course • Urban Forest Reserve • Yarra River Corridor	Manager Parks Environment and Buildings Sustainable Environment Coordinator	Extent and quality of site indigenous vegetation and habitat for fauna. Achieved through indig reveg, weed control, erosion control and habitat structure improvements				
Vegetation enhancement and maintenance	Reveg and weeds		Gardeners	Herbicide records: application date, product name, crop or situation applied, extent of use, location where product was used, wind speed, wind direction, name of applicator. Gardeners record fauna in their diaries opportunistically. Planting records taken since 2009 (provenance, parks locations an schools or community who did the planting. Self recruiting species not planted.				

	Why do they do it/Objectives	Category (Regen/Reveg/Fauna/ Community/Weeds)	Where	Who (which staff)	What they collect	How they collect it	How often they collect it	Relevant policy doc	Affected asset
	Program to increase number of nest boxes in key locations for targeted species			Manager Parks Environment and Buildings Sustainable Environment Coordinator	Planned for 2013-2015 within existing resources			Sustainable Environment Strategy 2013-2017	
Extend revegetation to improve connectivity between biodiversity sites along corridors									
	Yarra River Biodiversity Linkages Project: aims to increase habitat connectivity, improve water quality and provide recreational and educational opportunities for the community	Reveg	The entire length of the Yarra River bank in public ownership between Punt and Grange rd		No. of plants and species planted, area planted,	?	?	Sustainable Environment Strategy 2013-2017	
	Habitat corridors			Manager Parks Environment and Buildings Parks Coordinator Sustainable Environment Coordinator	Identify feasible opportunities to create habitat corridors throughout the City of Stonnington, particularly corridors that link larger parks, gardens and reserves containing habitat values. Priority should be given to developing corridors using site indigenous plant species, while respecting the area's character, amenity and European heritage. Investigate a partnership with railway authorities and Vic Roads to identify opportunities to enhance biodiversity along railway corridors and freeway corridors within the City of Stonnington. Incorporate linking habitat corridors into biodiversity planning for individual priority biodiversity sites.			Sustainable Environment Strategy 2013-2017	
Protect our waterways as natural landscapes for their ecological values									

Why do they do it/Objectives	Category (Regen/Reveg/Fauna/ Community/Weeds)	Where	Who (which staff)	What they collect	How they collect it	How often they collect it	Relevant policy doc	Affected asset
Stormwater and rainwater-fed wildlife zones	Fauna		Sustainable Environment Coordinator / Team Leader Design	Identify opportunities and priorities to create enhanced wildlife zones in public parks and reserves through the capture and storage of rainwater and stormwater. Identify costs associated with construction, monitoring and ongoing management. Incorporate enhanced wildlife zones into biodiversity planning for individual priority biodiversity sites.	?	?	Sustainable Environment Strategy 2013-2017	
Protect significant habitat trees on public and private land								
Use streetscapes to support indigenous flora and fauna, especially in street adjacent to and near biodiversity corridors								
Increase the amount of open space and improve and balance the use of existing spaces through greening of streets and implementation of other initiatives including green roofs and walls.							Public Realm Strategy (2010); Street Tree Policy (currently in review)	
Urban trees			Arborist Coordinator, Sustainable Environment Coordinator, Arborist Officer	In recognition of the biodiversity value of urban street trees, ensure that through Council's asset management programs involving street trees and parks and gardens, tree health and attributes that support fauna, such as hollows, are preserved and enhanced. Develop and implement a program to complement existing street tree stock with interspersed indigenous tree species, while respecting the area's predominant character, amenity and European heritage. Development of a significant tree register.				
Promote and deliver community education projects and activities that encourage positive behaviours and values towards biodiversity conservation								
Objective is to: develop standard evaluation process for monitoring and evaluating participation in and impact of education initiatives								
Environmental branding			Environmental Education Officer & Urban Environment Officer	Develop new branding for the Sustainable Environment Unit to use to unify events, education and initiatives. The branding should appeal to a broad demographic and reflect local sustainability issues				

Why do they do it/Objectives	Category (Regen/Reveg/Fauna/ Community/Weeds)	Where	Who (which staff)	What they collect	How they collect it	How often they collect it	Relevant policy doc	Affected asset
Community education programs			Environment Education Officer / Sustainable Environment Coordinator / Parks Coordinator	Identify opportunities to align Council investments in biodiversity enhancement with recreation facilities and open spaces to maximise the number of visitors to biodiversity enhancement areas. Develop and implement an environmental education program for school-aged children focussed on the importance of biodiversity. Identify and promote opportunities for the community to 'get in touch' with biodiversity through tree planting programs, biodiversity tours and passive experiences in parklands. Develop online and printed educational resources for residents including waste and recycling guides, events information, local biodiversity information, gardening in Stonnington, local sustainability opportunities.	Additional budget for signage			
Calendar of Environmental Events			Environmental Education Officer	Develop and hold an annual calendar of environmental information sessions that cater to residents specified interests in relation to energy efficiency, waste management, green purchasing, sustainable living, and biodiversity.				
TH King Environmental Education Centre			Environmental Education Officer / Education contractors	Deliver components of existing residential and school environmental education programs from the centre. Develop new programs highlighting the biodiversity of the local area and ESD features of the centre.				
Monitor and evaluate environmental education			Environmental Education Officer	Develop and employ standard education participant evaluation processes, which includes the opportunity for participants to provide feedback to Council on the quality of the education initiative delivered and the extent to which added to their knowledge and influenced their behaviours.				

Why do they do it/Objectives	Category (Regen/Reveg/Fauna/ Community/Weeds)	Where	Who (which staff)	What they collect	How they collect it	How often they collect it	Relevant policy doc	Affected asset
Stonnington Green Schools network program			Environmental Education Officer	Develop and deliver the Stonnington Green Schools Network program which helps connect and support schools and kindergartens, providing opportunities to staff and students to deliver environmental initiatives. Key initiatives include facilitating the network meetings for school staff, in school sessions and excursions on a range of environmental topics (including waste and recycling, biodiversity and water), teacher resources.				
"Sustainability Snapshot"	Community			Report to be released each financial year will be the primary method of reporting council's sustainability outcomes			Sustainable Environment Strategy 2013-2017	
Survey community expectations	Community			Data about environmental attitudes and behaviours: surveyed 500 residents with 200 responses.	Resident survey	Nov-12	Sustainable Environment Strategy 2013-2017	
Target: Increased community engagement through participation in Councils environmental education programs for resident and schools.							Sustainable Environment Strategy 2013-2017	
Target: Reporting annually to the community on Council's and the community's environmental impact.							Sustainable Environment Strategy 2013-2017	
Encourage indigenous vegetation restoration, revegetation and gardening across the municipality; Engage community groups and residents in biodiversity actions								
Support for friends groups and community planting days	Community		Parks Coordinator Sustainable Environment Coordinator	Continue to support friends groups in the planning and implementation of their projects involving urban plantings. Plan and conduct multiple community planting days in key biodiversity enhancement sites within the city, which connect the community with the biodiversity enhancement effort.				
Encourage private land owners with significant habitat (e.g. golf courses, schools) to protect, manage and enhance indigenous flora and fauna habitat								
Complimentary activities								

Why do they do it/Objectives	Category (Regen/Reveg/Fauna/ Community/Weeds)	Where	Who (which staff)	What they collect	How they collect it	How often they collect it	Relevant policy doc	Affected asset
Environmental education for staff				Internal meetings and seminars to educate staff about sustainability topics				
Planning requirements for landscaping			Strategic Planning Manager Coordinator Statutory Planning Sustainable Environment Coordinator	Review and update, where possible, the City of Stonnington Planning Scheme to require residential housing developments to use a minimum of 50% native plants in landscaping. Proactively work with the development industry and individual developers to encourage them to embrace the use of indigenous plants for both biodiversity and water conservation benefits.	additional budget for internal ESD officer			
Environmental performance reporting			Software consultant via Sustainable Environment Coordinator / Urban Environment Officer	Refine Council's data management systems to enable efficient monitoring and reporting of Council's environmental performance including corporate energy and water consumption				
Whitehorse								
Protect and restore remnant vegetation and existing ecologically significant sites for habitat and ecological values								
Bushland monitoring		7 bushland sites done so far, plus bird surveys at 5 sites	Consultant (Practical Ecology)	"Bushland quality indicators": Habitat hectares, veg quality mapping, flora species list, area, EVC, significance, quadrats, bird census, veg action plan. Previous "vegetation quality maps 1987, 1996, 2004" also available and used for comparison	Quadrats, field work	Annual	Whitehorse Urban Biodiversity Strategy	

Why do they do it/Objectives	Category (Regen/Reveg/Fauna/ Community/Weeds)	Where	Who (which staff)	What they collect	How they collect it	How often they collect it	Relevant policy doc	Affected asset
Inventory of Whitehorse Biodiversity Assets and Urban Habitat: to recognise biodiversity assets and form a baseline for monitoring tool			ParksWide?	Intended action to inventory all biodiversity assets. Will include: bushland reserves, habitat of threatened species, areas to extend bushland regeneration, threatened flora and fauna list, woody weeds with habitat values, biodiversity site inductions, coarse woody debris, cost estimates to maintain and improve, management threats and improvement opportunities, list of biodiversity hotspots, no mow areas	Intent is to put it in a central database (probably GIS). Current flora list from previous field surveys is submitted to the Viridans database; the Flora Information System and is in appendix of biodiversity strategy	Monitoring to evaluate success of strategy to be determined	Whitehorse Urban Biodiversity Strategy	
To measure improvements in bushland 'quality' over time				Bushland Management Monitoring Framework:				
				Indigenous Plant database			Whitehouse Sustainability Report in Bushland Monitoring Framework	

Why do they do it/Objectives	Category (Regen/Reveg/Fauna/ Community/Weeds)	Where	Who (which staff)	What they collect	How they collect it	How often they collect it	Relevant policy doc	Affected asset
		14 Reserves	BA volunteers	Bird census, incidental recordings of other fauna	20 min survey, results in Birds Aust Bird Atlas; incidental fauna records not in BA database, some recorded in Advisory committee websites	Once a season, data collected since 1998		
				Quadrat data	FIS recording sheets, system			
to direct elements of annual bushland management programs		16 reserves?	bushland crew	Veg quality mapping	GIS maps	annual	Bushland monitoring framework	
		11 Reserves		Habitat Hectare assessments			Bushland monitoring framework	
		16 reserves?		Flora species lists	Vegetation Action plans for 17 reserves; FIS system	Every 8-11 years	Vegetation Action Plans in Bushland Monitoring Framework	
Extend revegetation to improve connectivity between biodiversity sites along corridors								
Biodiversity Corridors Plan: to map out corridors to facilitate infill, protection (e.g. via planning) and funding for enhancing				To be prepared after Inventory of Biodiversity. Will be a map of biodiversity nodes and linkages/corridors			Whitehorse Urban Biodiversity Strategy	
Living Links			in partnership with other councils	? Ongoing revegetation and weed control				
Protect our waterways as natural landscapes for their ecological values								
Protect significant habitat trees on public and private land								
Use streetscapes to support indigenous flora and fauna, especially in street adjacent to and near biodiversity corridors								

Why do they do it/Objectives	Category (Regen/Reveg/Fauna/ Community/Weeds)	Where	Who (which staff)	What they collect	How they collect it	How often they collect it	Relevant policy doc	Affected asset
Link bushland, maximise indigenous veg, aesthetic	Reveg?	street trees	Consultants: Murphy design group	Map data, street tree database (species, condition, scale, street character, no. of trees), $ spent per annum, no. new street trees per year	drive around streets, entered into database	Street tree inventory in 1997, this field work done in 2002	Streetscape policy and strategy 2002 (to become the "Urban Forest Strategy" in future)	street trees
To control what is planted on nature strips for insurance and access reasons				Nature strip planting permits	Permit application			
Promote and deliver community education projects and activities that encourage positive behaviours and values towards biodiversity conservation								
To educate schools and community groups			Education Program Officer; done by council officers and volunteers	Workshops and tours of local bushland; Tree Education program	?	?	Website	
To educate public about biodiversity				Logos, signage, publications/web-based material for biodiversity assets interpretation. To be prepared after inventory			Whitehorse Urban Biodiversity Strategy	
To educate anyone				Website for multiple reserves, each run separately				
Volunteer Management Framework			Volunteers?	Desired: Citizen science data eg. Bird watching data (pre-existing and future)	Centralised system for recording citizen science data	They don't yet	Whitehorse Urban Biodiversity Strategy	
Gauge community interest/values of street trees	Community		Consultants: Murphy design group	Street tree character survey of residents- values about tree origin, habitat value, aesthetic	Telephone survey (351 people) and workshops(29 people)	Once off	Streetscape policy and strategy	
Encourage indigenous vegetation restoration, revegetation and gardening across the municipality; Engage community groups and residents in biodiversity actions								
Support care of parks			Volunteers	Parkland Advisory Committees: organise forums, working bees, publish contact details	Council website and individual park websites			
Encourage private land owners with significant habitat (e.g. golf courses, schools) to protect, manage and enhance indigenous flora and fauna habitat								

Why do they do it/Objectives	Category (Regen/Reveg/Fauna/ Community/Weeds)	Where	Who (which staff)	What they collect	How they collect it	How often they collect it	Relevant policy doc	Affected asset
to assist with landscaping or planting using indigenous plants				Landscape design tool: Provides indig plant list, calculates area and growing conditions, and gives how many plants of each type of required	Website, not sure it really collects any data			
Complimentary activities								
Biodiversity Reporting				"Stepping Stones to Improving Public Whitehorse Biodiversity report"	Biodiversity Action Evaluation Template in Appendix 9	Annually	Whitehorse Urban Biodiversity Strategy	
Hollow management			Volunteers with council coordination	Desired: ID and mapping of hollows, species usage, breeding success, pest removal, nest box installation and maintenance			Whitehorse Urban Biodiversity Strategy	
Biodiversity Research Liaison Committee			Committee to be formed	Desired: Committee to collate research ideas from council, and provide them to tertiary research students	?	?	Whitehorse Urban Biodiversity Strategy	
Yarra Ranges								
Protect and restore remnant vegetation and existing ecologically significant sites for habitat and ecological values								
strategic weed mapping and monitoring program			Bushlands team	Vegetation assessment scores for sites: Tree canopy cover, understorey cover, patch size, vegetation link, weed cover, regeneration cover, EVC, conservation ratings are scored and mapped	Trimble GPS unit	Annually		
Trust for Nature Stewardship Program; Biodiversity Offsets Scheme		Offset sites	Site visits conducted by TFN	Permanent photo points. Annual report outlines issues and actions.	Annual report, photos	Annual		
Urban Fringe Weed Management Initiative		30 selected KPI bushland reserves in 2012/13	Project officer	Paid for Dandenong Ranges National Park weed assessment monitoring for Parks Victoria. ? Caring for country grant, $ spent?	**?**	Builds on 3 prior repeats		
Threatened species action plan				Threatened species locations. Plan "continuing to develop"				
Extend revegetation to improve connectivity between biodiversity sites along corridors								

Why do they do it/Objectives	Category (Regen/Reveg/Fauna/ Community/Weeds)	Where	Who (which staff)	What they collect	How they collect it	How often they collect it	Relevant policy doc	Affected asset
Living Links			in partnership with other councils	? Ongoing revegetation and weed control				
Melbourne Water Corridors of Green Program		30 Project sites						
Protect our waterways as natural landscapes for their ecological values								
Protect significant habitat trees on public and private land								
Use streetscapes to support indigenous flora and fauna, especially in street adjacent to and near biodiversity corridors								
Promote and deliver community education projects and activities that encourage positive behaviours and values towards biodiversity conservation								
Green schools program: to assist and support schools to incorporate sustainable initiatives both within the school grounds and the broader community		Website for schools		Schools "document their learning". Contains a biodiversity module. One part has schools identify their forest type, then fill out a worksheet				
Encourage indigenous vegetation restoration, revegetation and gardening across the municipality; Engage community groups and residents in biodiversity actions								
Ribbons of green program			P&G	Council visits neighbourhood or school site, then provides min 300 plants if site is suitable				
Volunteer exchange website			Service established by Yarra Ranges	Connects volunteers with projects seeking volunteers	?	?	Website	
Weed control	Community, weeds		Over 60 environmental and community groups	Mostly weed control works. Council provides Environmental volunteers resource kits and things like tools, tea and coffee kits, insurance. These could be monitored.	?			
Encourage private land owners with significant habitat (e.g. golf courses, schools) to protect, manage and enhance indigenous flora and fauna habitat								
Complimentary activities								

Appendix C: Questionnaire used in Workshop 1:12 May 2014

Questions for Workshop participants - Please complete questions 1-5 and bring with you to Monday's meeting.

Council Name

Do you have any additional documents or resources other than what is on the list over the page?

If yes, what? Please bring additional information with you on Monday 12th May (on USB, or email it).

1. We want to gauge your Council's capacity to:
   a) Run monitoring programs: Could you provide comments on what monitoring programs are currently run by your Council (e.g. pollution monitoring, weed monitoring etc), and how extensive or comprehensive these are.

   b) Undertake the biodiversity monitoring: How many staff in your Council are responsible for biodiversity management (on-ground management, policy, 'Friends of' Groups and community engagement)? WHO would be expected to undertake this monitoring program (e.g. Biodiversity officers, bushland crews, 'Friends of' groups)?

   c) Take on additional monitoring: If you have no personnel to take on the monitoring, could you source extra money to do this monitoring? Is there capacity to undertake this monitoring?

2. What is the current level of interest/understanding in your council of the impact of climate change on biodiversity in your LGA?

3. Are you currently co-operating with other LGA's on biodiversity projects, if so, what ones?

4. What does your LGA want out of this project?

Questions on notice: Please think about the following issues prior to the workshop.

- Are there any citizen science projects in your LGA? What indicators do you want to monitor? Eg. species, processes (eg. pollination), vegetation communities, others such as community values –

Known Existing Information/Documents

Note: please correct/update this list if it is incorrect.

Boroondara

- Urban Biodiversity Strategy 2013-2023
- Urban Biodiversity Strategy Implementation plan 2013-2017
- Biodiversity Inventory 2005 (G. Lorimer)

Knox

- Bushland condition report every 5 years (one due this year) by G. Lorimer
- Sites of Biological Significance by G. Lorimer (same as item 1?)- Incl. inventory of lots of sites
- Management Plan for Locally Threatened Species in Knox – 2010 by G. Lorimer
- Native Vegetation Genetic Integrity Policy
- Sustainable environment strategy 2008-2018 (incl. action plan and $$)

Maroondah

- Sites of Biological Significance (big inventory)
- Habitat Corridors Strategy (ID of corridors, protect via planning and directing on-ground activities)

Monash

- Environmental Sustainability Roadmap (says doing revegetation, anything else?)
- Street tree database
- "Measurement of progress of conservation and enhancement of biodiversity. Port Phillip and Westernport Catchment Authority involvement." ?
- "Integrated Water Management Plan – increase the city tree canopy and increase diversity." Suggests they know the diversity of the tree canopy…?

Stonnington

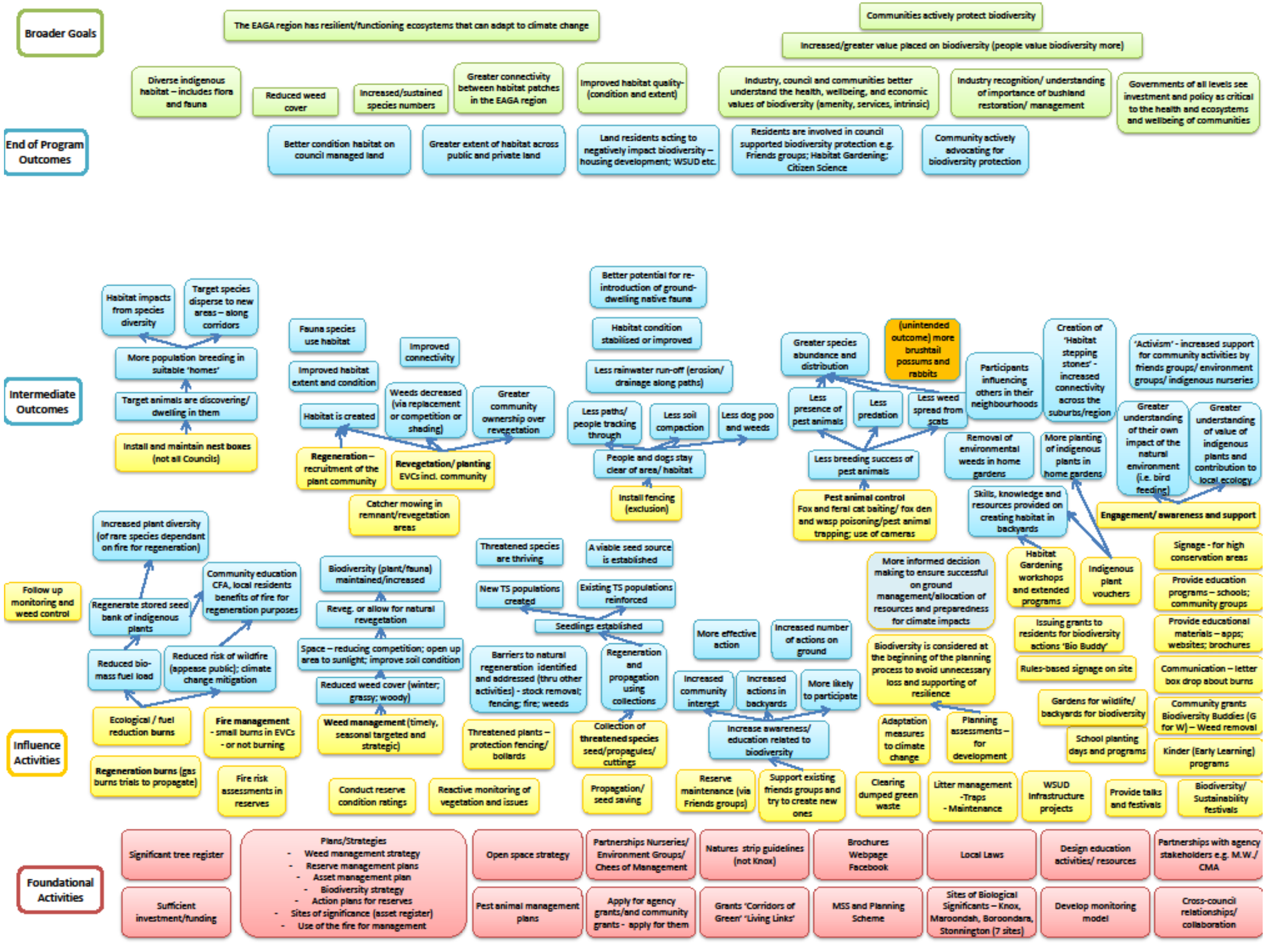
- Sustainable Environment Strategy 2013-2017. Monitoring & reporting via "Sustainability Snapshot" done annually 2013/2014. "Budget for consultant to undertake biodiversity monitoring."
- Survey of community expectations (incl. biodiversity) Nov 2012
- "Seven sites have been chosen for …the development of ecological concept plans aimed at addressing the threats listed for the respective sites and improving habitat for indigenous plants and wildlife."… "An assessment was undertaken for each of the key sites, including the extent and quality of site indigenous vegetation and habitat and fauna species likely to occur at the site."
- "Council recently commissioned Practical Ecology Pty Ltd to complete a review of the biodiversity in Stonnington to establish a biodiversity value for the area and highlight specific locations that would be worthwhile preserving and enhancing. As an extension of this review, Council is developing a Biodiversity Strategy…"

Whitehorse

Yarra Ranges

- Strategic weed mapping and monitoring
- "Yarra Ranges Biodiversity Offsets Program, monitored through Trust for Nature's stewardship program. This involves the submission of an annual report outlining and issues and actions undertaken at each offset site and site visits conducted by Trust for Nature. Permanent photo points have been established at each offset site to track changes over time."

Appendix D: Program Logic Developed and Key Assumptions: Workshop 2



Key Assumptions from program logic (focus on linkages – word in the positive) We assume that…..	What evidence do we have to support this (e.g. scholarly literature, evaluations, observations)	What confidence do you have in the assumption?			How serious a risk to achievement of the end-of program outcome?			Investigate this assumption further?
		Low	Medium	High	Low	Medium	High	Yes
1. We can implement 'enough' to make a difference	Past experience of land managed for habitat in Boorondara – have seen significant improvement; Council has adopted and is investing in Biodiversity Strategy	☐	☐	✓	☐	☐	✓	☐
2. Habitats that are connected and in good condition contribute to ecosystem functioning and resilience	Contribution is well-known through scientific literature	☐	☐	✓	☐	☐	✓	☐
3. Fauna will respond to revegetation activities	More evidence for this in a more-connected natural setting but not for urban environments	✓	☐	☐	☐	✓	☐	✓
4. Plants survive in revegetation activities and sufficiently recruited	Anecdotal evidence from historical practice (approx. 70% survival) but less sure given changing climate; also variable across sites. Knox has info on this	✓	✓	☐	☐	✓	☐	✓ Access Knox info
5. Planting according to EVCs/local provenance is appropriate	Growing evidence in the literature that this is less appropriate (City of Melbourne using 'high genetic diversity' stock)	✓	☐	☐	☐	✓	☐	Change activity?

Key Assumptions from program logic (focus on linkages – word in the positive) We assume that…..	What evidence do we have to support this (e.g. scholarly literature, evaluations, observations)	What confidence do you have in the assumption?			How serious a risk to achievement of the end-of program outcome?			Investigate this assumption further?
6. Fauna will respond to nest boxes (there will be breeding populations)	Mixed evidence, depends on specific conditions in terms of design and maintenance. But Councils generally can manage design and maintenance	☐	✓	☐	☐	✓	☐	☐
7. Sites subject to ecological burns regenerate native species	Native species are more adapted to fire than weed species	☐	☐	✓	☐	✓	☐	☐
8. There is community and political support for ecological burns	Evidence suggests otherwise	✓	☐	☐	☐	✓	☐	☐
9. Follow-up weed control is sufficient to achieve the expected outcomes of ecological burns	Presume (?)	☐	☐	☐	☐	☐	☐	☐
10. Weed management is timely, seasonal, targeted, responsive and strategic	In theory, have resources to do this	☐	✓	☐	☐	✓	☐	☐
11. Reduced weed cover enables natural regeneration	Scientific literature - but isn't only factor	☐	☐	✓	☐	☐	✓	✓
12. Fencing is designed to effectively dissuade ingress	Mixed – observations; design protocols in place (?)	☐	✓	☐	☐	✓	☐	☐
13. Baiting/trapping/gassing effort is sufficient to reduce weed spread and predation on small native species	Knox has stopped based on anecdotal evidence that it wasn't making much difference.	✓	☐	☐	☐	✓	☐	✓

Key Assumptions from program logic (focus on linkages – word in the positive) We assume that…..	What evidence do we have to support this (e.g. scholarly literature, evaluations, observations)	What confidence do you have in the assumption?			How serious a risk to achievement of the end-of program outcome?			Investigate this assumption further?
	Other councils?							
14. Baiting/trapping/gassing effort is sufficient to enable greater species abundance and diversity	Probably no evidence, especially given (13) above	✓	☐	☐	☐	✓	☐	☐
15. Seed collection from threatened plants is possible	Anecdotal evidence that it is not always possible	☐	✓	☐	☐	✓	☐	☐
16. Propagation is successful	Anecdotal – mixed, depending on species (Knox has done work on this)	☐	✓	☐	☐	✓	☐	Access Knox info
17. Barriers to recruitment of threatened species are able to be determined	Anecdotal	☐	✓	☐	☐	✓	☐	☐
18. People want to participate in 'Friends' group	Less evidence for this – need to re-think model for how we are going connect with community	✓	☐	☐	☐	☐	✓	☐
19. Awareness leads to changes in interest, attitudes, behaviours and practices	Very mixed	✓	☐	☐	☐	☐	✓	☐
20. Councils have the capacity for habitat gardening programs		☐	☐	☐	☐	☐	☐	☐
21. Participation in habitat gardening programs leads to practice change	Evidence that it works – Backyard Biodiversity examples	☐	✓	☐	☐	✓	☐	☐

Appendix E: Comparison of Existing Vegetation Condition Data

Contents

Executive Summary

The purpose of this sub-project is to provide a background for the development of the Eastern Alliance for Greenhouse Action (EAGA) Biodiversity Monitoring Framework, vegetation condition indicator. Vegetation condition data collected by all councils was collated and reviewed to assess compatibility between councils and suitability for use under a changing climate.

This process allowed us to evaluate which assessment tools deliver the most useful information and then produce a field sheet (Appendix A) that combines the methods and is applicable across councils and under future climates, for trial in the 2014-15 trial period.

The assessment process also allowed us to make some general recommendations about data selection and collection to improve current methods and prepare for future needs. These recommendations are summarised as follows:

- Make new data backwardly and forwardly compatible.
- Minimise the use of abstract descriptions, scores and measures and instead use raw measurements with minimal conversion.
- Use continuous, rather than categorical scales where ever possible. Focus on useful data that can be collected rigorously.
- Match the accuracy of observation with the scale of measurement.

The vegetation condition parameters most commonly shared by councils are:

- Large Old Trees
- Large Old Tree Canopy Health
- Tree canopy cover %
- Tree Canopy Health
- Understorey Cover %
- Understory Species Richness (no. species)
- Understorey Life Forms
- Composition (species list)
- Weeds cover %
- Recruitment
- Disturbance
- Organic Litter Cover % (<10 cm dia.)
- Logs (>10 cm dia.)
- Patch size
- Vegetation Link/Neighbourhood
- Distance to Core area

The two methods used by councils that pick up the most desired components of vegetation condition are Yarra Ranges' Weed Mapping Program 2013 and Lorimer's Modified HHa 2010. This is because they record a lot of raw data in the field, rather than recording or scoring sites relative to a benchmark condition. If a site is scored in relation to a benchmark in the field, then the actual value for each parameter is lost, and only the benchmark comparison score is recorded. Instead, it is recommended that all actual data for each vegetation component be recorded in the field, and compared to a benchmark afterwards if desired.

A new data sheet has been written that includes the best aspects of each method, but removes categories and benchmarks where ever possible (Appendix A). Data recorded in this way are still comparable with older methods, because raw data can be converted to relevant benchmarks or categories once collected. Data on this new data sheet is compatible with most current methods. Councils can still collect data using their current approaches if desired, however should consider the general principles outlined in section 1.1 if they chose not to use this new recommended method during the trial period.

1. Comparison of Existing Vegetation Condition Data

1.1 Context

The purpose of this sub-project is to provide a background for the development of the Eastern Alliance for Greenhouse Action (EAGA) Biodiversity Monitoring Framework, vegetation condition indicator. Vegetation condition data was collated to investigate what parameters are collected by all EAGA councils and to compare overlap in scales that each council uses. Furthermore, an assessment of whether condition ratings based on expected cover/EVC benchmarks can be converted to a "climate ready" condition metric was conducted.

A database was compiled listing the full range of parameters each council uses to rank vegetation condition. From this process the level of overlap between each council was assessed, and for which parameter. The amount of historic data available for each parameter in the region was also assessed, and which parts of the assessments are used in current policy documents.

This synthesis of this is listed below, in Section 2. Section 2 recommends which currently used assessment tool delivers the most useful information, and which parts of these tools are being measured already by different councils. The resulting recommendation is a combined field sheet (Appendix A) that details the method that is most applicable across councils and under future climates.

1.2 General Recommendations

From the assessment of all data being collected currently, the following recommendations have been made to assist councils in moving forward, to improve current data collection methods.

Make new data backwardly and forwardly compatible. This means that the format should allow for maximum use of existing data, whilst preparing for future data needs. For example, collect and store raw data so that it can be converted to benchmarks used now, and in the future.

Minimise the use of abstract descriptions, scores and measures and instead use raw measurements with minimal conversion. This allows measures to be easily compared between different management agencies without complicated conversions or back-tracking through raw data sheets, assuming raw data sheets are even still available. The further an assessment component is from a raw observation (eg. an abstract score or a category with a separate definition), the more scope for variation between observers if definitions are overlooked or complex. Converting raw data to benchmarks or scores can be done with simple software without compromising the future applications of the data. A good example of this is Modified HHa (2010).

Use continuous, rather than categorical scales where ever possible. Continuous scales are much more statistically powerful. If categorical scales are chosen, do not choose categories that overlap. For example, a percentage scale should be 0-10, 11-25, 26-50, 51-75, 76-100, and not 0-10, 10-25, 25-50, 50-75, 75-100. This is poor practice because if the true value is say, 10%, it belongs in two categories. Also, data collected on a continuous percentage scale can be more easily compared, because 10, 25, and 75% can be assigned in the analysis to one category, if so desired. When choosing a categorical scale, follow existing widely-used scales (like habitat hectares) where

possible. This will maximise the chance that data will be compatible with other agency data should a future comparison be attempted.

Focus on useful data that can be collected rigorously. Data that is not useful for management should not be prioritised highly; nor should methods or measures that are unrepeatable, subjective, biased or ambiguous (therefore inaccurate across many observers). Data and methods can be maintained for many years; therefore they should be easily described and transferred between generations of staff and consultants.

Match the accuracy of observation with the scale of measurement. For example, if an observer can only accurately identify presence or absence, then asking the observer to record fine scale continuous data is a waste of time and likely to frustrate the observer.

1.3 Detailed Comparison of Vegetation Condition Components

Table 1. List of vegetation condition components from the Habitat Hectares Methodology (HHa 2004) commonly shared by different council assessment methods. Other commonly reported metrics are also listed (not under HHa 2004).

Vegetation Condition Component	Definition under the Habitat Hectares Methodology 2004
1. Large Old Trees	Count of large old indigenous canopy species trees in a given area. Minimum DBH* and whether a 'canopy species' determined by benchmark. Trees may be dead or alive (HHa 2004).
2. Large Old Tree Canopy Health	For Large Old Trees as defined above. Comparative rating of foliage density at branch ends compared with full health, as a percentage (ie not missing due to tree death, decline, insect attack or mistletoe infestation). Compare to reference photos that illustrate benchmark (HHa 2004).
3. Tree canopy cover %	Percentage of projected foliage cover of mature (at least 80% adult height according to benchmark), indigenous, canopy tree species compared to benchmark. Diagrams provided to illustrate different levels of cover. Canopy layer only, not sub-branches.
4. Tree Canopy Health	Mature canopy tree species as defined above. Comparative rating of foliage cover at branch ends compared with full health, as a percentage (ie. not missing due to tree death, decline, insect attack or mistletoe infestation). Compare to reference photos as a guide.
5. Understorey Cover %	Projected cover of indigenous understorey as a percentage.
6. Understory Species Richness [no. species]	Number of species comprising indigenous understorey.
7. Understorey Life Forms	Presence/absence of indigenous life forms (eg vines, immature trees etc . see HHa 2004 list and definitions).
8. Composition [Species list]^	List of all flora species in a given area (quadrat, site)
9. Weeds cover %	Projected cover of weeds as a percentage. EVC benchmarks provide some guidance for what weed species may be present.
10. Recruitment	Recruitment is the establishment of individual indigenous plants beyond the initial seedling stage to maintain or improve site condition. Recruitment only includes woody species taller than prostrate shrubs to reduce impact of seasonality.
11. Disturbance ^	"Disturbance is defined as the disruption of normal processes or conditions. It may be visible as soil upheaval, fire, erosion by wind or water, major weed control or heavy mulch application. Disturbance is expressed as an observed presence or absence." (BAMP 2011)
12. Organic Litter Cover % (<10 cm dia.)	Projected cover of organic matter detached from the parent plant (ie. leaves and branches) at ground level. Includes branches up to 10 cm in diameter, with thicker wood included under logs.
13. Logs (>10 cm dia.)	The cumulative length of fallen wood ≥10 cm thick, plus 50 cm for each cut stump >10 cm diameter and <1.3 m high.
14. Patch size	Total size of patch of native vegetation containing assessed area. Corridors should be ≥50 m wide to be considered contiguous.
15. Vegetation Link/Neighbourhood	Amount of vegetation in surrounding landscape. Include freshwater as vegetation.
16. Distance to Core area	Distance to edge of nearest patch of native vegetation>50 ha (or whether contiguous with one).

*DBH = Diameter at Breast Height (i.e. measured over bark at 1.3 m above ground level)

^ Not fromf Habitat Hectares Vegetation Assessment (HHa 2004).

1.3.1 Large Old Trees

Table 2. List of councils and documents that measure large old trees, using what definition, how this is done and whether the assessment is compared to a benchmark or reference value.

Councils	Document	Difference in definition to Table 1	Area measured	Scale or Categories	Benchmark?
Boroondara Whitehorse Knox	HHa 2004	None	At least 1000 m^2	Count per ha as a % of benchmark: None, >0-20%, 20-40, 40-70,70-100, ≥benchmark	Yes- to determine size of 'large' tree and relative %
Maroondah	Habitat Corridors Strategy 2005	Score only (combination of no. trees x canopy health)	Varies, commonly < 1000 m^2	Score out of 10 as for habitat hectares scores. Only score recorded.	Yes- to determine size of 'large' tree and relative %
Knox	Modified HHa 2010	Girth instead of DBH	At least 100 m^2	Count. If none in assessment area, count for a larger area and calculate a fraction for assessed area.	Yes- to determine size of 'large' tree
Boroondara	Inventory Boroondara 2005	Girth instead of DBH	All large trees at a site	Count and girth/diameter (converted) of each tree	Yes- to determine size of 'large' tree

Documents that do not record this component: BAMP 2011, SBS Knox 2010, SBS Maroondah 1997, Weed Mapping Program 2013.

1.3.2 Large Old Tree Canopy Health

Table 3. List of councils and documents that measure Large Old Tree Canopy Health, using what definition, how this is done and whether the assessment is compared to a benchmark or reference value.

Council	Document	Difference in definition to Table 1	Area measured	Scale or Categories	Benchmark?
Boroondara Whitehorse Knox	HHa 2004	None	At least 1000 m^2	Average % healthy cover for Large Old Trees >70, 30-70, <30	Yes- to determine size of 'large' tree
Knox	Modified HHa 2010	None	At least 100 m^2	Minimum and maximum estimated % values	Yes- to determine size of 'large' tree
Boroondara	Inventory Boroondara 2005	Girth instead of DBH	All large trees at a site	Categorical: very good, good, fair, poor. Many photographed during assessment to assist future monitoring.	Yes- to determine size of 'large' tree

Documents that do not record this component: BAMP 2011, Weed Mapping Program 2013, SBS Knox 2010, SBS Maroondah 1997. The Habitat Corridors Strategy 2005 does not record this component directly, but it is inextricably linked to Large Old Tree component through use of habitat hectares score.

1.3.3 Tree canopy cover %

Table 4. List of councils and documents that measure Tree canopy cover %, using what definition, how this is done and whether the assessment is compared to a benchmark or reference value.

Councils	Document	Difference in definition to Table 1	Area measured	Scale or Categories	Benchmark?
Boroondara Whitehorse Knox	HHa 2004	None	At least 1000 m^2	Of benchmark <10%, <50 or >150% (under or over abundance), ≥50 or ≤150%	Yes, recorded relative to benchmark
Maroondah	Habitat Corridors Strategy 2005	Score only (combination of trees cover % x canopy health)	Varies, commonly < 1000 m^2	Score out of 5 as for habitat hectares scores. Only score recorded.	Yes, recorded relative to benchmark
Knox	Modified HHa 2010	None.	At least 100 m^2	Min and max % values recorded.	No, raw cover recorded and Excel compares to benchmark
Boroondara	BAMP 2011	Definition does not mention only using benchmark defined canopy species.	Any (sites range from 0.005-143 ha)	Score between 0-4 corresponding to a word, corresponding to the following scale (of benchmark): <5-10%, 10-25, 25-50, 50-75, ~100%. 76-99 % category not accounted for.	Yes, recorded relative to benchmark
Yarra Ranges	Weed Mapping Program 2013	Includes non-indigenous species, but derived score is marked down.	Any	< 10%,10-25, 25-50, 50-75 (no category above 75)	No. Cover estimation guide used.

Documents that do not record this component: Inventory Boroondara 2005, SBS Maroondah 1997, SBS Knox 2010.

1.3.4 Tree Canopy Health

Table 5. List of councils and documents that measure Tree Canopy Health, using what definition, how this is done and whether the assessment is compared to a benchmark or reference value.

Councils	Document	Difference in definition to Table 1	Area measured	Scale or Categories	Benchmark?
Boroondara Whitehorse Knox	HHa 2004	None	At least 1000 m^2	Average proportion healthy cover for trees at least 80% of mature size >70%, 30-70, <30	No.
Knox	Modified HHa 2010	None	At least 100 m^2	Min and max % values recorded.	No.

Documents that do not record this component: BAMP 2011, Weed Mapping Program 2013, Inventory Boroondara 2005, SBS Knox 2010, SBS Maroondah 1997. The Habitat Corridors Strategy 2005 does not record this component directly, but it is inextricably linked Tree Canopy cover % component through use of habitat hectares score.

1.3.5 Understorey Cover %

Table 6. List of councils and documents that measure Understorey cover %, using what definition, how this is done and whether the assessment is compared to a benchmark or reference value.

Councils	Document	Difference in definition to Table 1	Area measured	Scale or Categories	Benchmark?
Boroondara Whitehorse Knox	HHa 2004	None.	At least 1000 m^2	Observed % cover for each life form in the EVC benchmark	No, but life forms determined by EVC benchmark
Knox	Modified HHa 2010		At least 100 m^2	Min and max % values recorded.	No, raw cover recorded and Excel compares to benchmark
Boroondara Knox	Inventory Boroondara 2005; SBS Knox 2010	Field asks for % coverage of all ground flora species	Any	Report gives qualitative description of ground flora density eg. "moderately to very sparse"	No.
Yarra Ranges	Weed Mapping Program 2013	None.	Any	0-1%, 1-10, 10-25, 25-50, 50-75,75-100	No.

Documents that do not record this component: Habitat Corridors Strategy 2005, BAMP 2011, SBS Maroondah 1997.

1.3.6 Understory Species Richness [no. species]

Table 7. List of councils and documents that measure Understorey Species Richness, using what definition, how this is done and whether the assessment is compared to a benchmark or reference value.

Councils	Document	Difference in definition to Table 1	Area measured	Scale or Categories	Benchmark?
Boroondara Whitehorse Knox	HHa 2004	None.	At least 1000 m^2	No. species for each life form in the EVC benchmark.	No, but life forms determined by EVC benchmark
Boroondara Knox Maroondah Whitehorse	Inventory Boroondara 2005; SBS Knox 2010; SBS Maroondah 1997;	Full species list per site and often per vegetation type.	Any	Full species list, so no. of species could be calculated.	No.

	Bushland Reserves KPI's Manual 2013				

Documents that do not record this component: BAMP 2011, Weed Mapping Program 2013, Modified HHa 2010, Habitat Corridors Strategy 2005. Any records of quadrats or species composition with area surveyed can be used to calculate species richness. Also see section 8. Composition.

1.3.7 Understorey Life Forms

Table 8. List of councils and documents that measure Understorey Life Forms, using what definition, how this is done and whether the assessment is compared to a benchmark or reference value.

Councils	**Document**	**Difference in definition to Table 1**	**Area measured**	**Scale or Categories**	**Benchmark?**
Boroondara Whitehorse Knox	HHa 2004	None.	At least 1000 m^2	All strata and life forms: absent, up to 50% present, ≥50-90% present, ≥90% present	Yes, life form presence as a % of benchmark list
Maroondah	Habitat Corridors Strategy 2005	Score only (combination of life forms % present x level of modification)	Varies, commonly < 1000 m^2	Score out of 25 based on habitat hectares scores.	Yes, life form presence as a % of benchmark list
Knox	Modified HHa 2010	None.	At least 100 m^2	Presence/absence of 11 different life forms	Yes, presence of expected life forms only
Boroondara Knox	Inventory Boroondara 2005; SBS Knox 2010	Not derived from HHa 2004, but could be probably be converted retrospectively from notes and species list.	Any	From report: Notes on presence of canopy trees, trees/large shrubs, climbers, shrubs, ferns, ground flora	Not really- just notes on what observer saw and expected.
Boroondara	BAMP 2011	None.	Any (sites range from 0.005-143 ha)	Score between 0-4 corresponding to a word, corresponding to the following scale (of benchmark): <5%, 10-25, 25-50, 50-75, ~100. 6-9% and 76-99 not accounted for. Percent of life forms present.	Yes, percentage of expected life forms.
Maroondah	SBS Maroondah 1997	Not specifically surveyed so definition not given.	Any	Not specifically noted, but could derive some data from species list.	No.

Documents that do not record this component: Weed Mapping Program 2013

1.3.8 Composition [Species list]

Table 9. List of councils and documents that measure Composition, using what definition, how this is done and whether the assessment is compared to a benchmark or reference value.

Councils	Document	Difference in definition to Table 1	Area measured	Scale or Categories	Benchmark?
Boroondara Maroondah Knox	Inventory Boroondara 2005; SBS Maroondah 1997; SBS Knox 2010	None.	Typically 30 x 30 m, but some 10 x 10m.	From reports: List of plant species for each site, and often each vegetation type within a site. Also quadrats used to record species list with cover-abundance on Braun Blanquet scale, but also sometimes records best estimate of cover %.	No.
Whitehorse	Bushland Reserves KPI's Manual 2013	None.	Approx 20 x 20 m quadrats	Full plant species list. Also cover-abundance estimates on Braun Blanquet scale.	No.

Documents that do not record this component: BAMP 2011 (although there is a component called Composition, it is actually about life forms), HHa 2004, Habitat Corridors Strategy 2005, Modified HHa 2010, Weed Mapping Program 2013

Could be used to calculate species richness retrospectively.

1.3.9 Weed Cover %

Table 10. List of councils and documents that measure Weed Cover %, using what definition, how this is done and whether the assessment is compared to a benchmark or reference value.

Councils	Document	Difference in definition to Table 1	Area measured	Scale or Categories	Benchmark?
Boroondara Whitehorse Knox Yarra Ranges (YR)	HHa 2004; Weed Mapping Program 2013	None.	HHa: At least 1000 m^2 YR: Any	% cover: >50, 25-50, 5-25, <5%. HHa only: Proportion that are "high threat": none, ≤50, >50%	No, but benchmark gives indication of what species are considered weeds.
Maroondah	Habitat Corridors Strategy 2005	Score only (combination of weed cover % present x level of	Any	Score out of 15 based on habitat hectares scores.	No, but benchmark gives indication of what species are

Councils	Document	Difference in definition to Table 1	Area measured	Scale or Categories	Benchmark?
		threat)			considered weeds.
Knox	Modified HHa 2010	None.	At least 100 m^2	Min and max % values recorded.	No, but benchmark gives indication of what species are considered weeds.
Boroondara	BAMP 2011	None.	Any	Score between 0-4 corresponding to a word, corresponding to the following scale: >75%, 50-75, 25-50, 10-25, <5-10%	No, but benchmark gives indication of what species are considered weeds.
Boroondara Knox	Inventory Boroondara 2005; SBS Knox 2010	Not really projected cover- see scale. List of weed species supplied.	Any, but recorded at site level.	Categorised into very serious, serious, moderate, insignificant. On very weedy sites, only most serious weeds recorded.	No.

Documents that do not record this component: SBS Maroondah 1997 (but notes on weed infestations and lists of weed species present).

1.3.10 Recruitment

Table 11. List of councils and documents that measure Recruitment using what definition, how this is done and whether the assessment is compared to a benchmark or reference value.

Councils	Document	Difference in definition to Table 1	Area measured	Scale or Categories	Benchmark?
Boroondara Whitehorse Knox	HHa 2004	None (woody species only, unless EVC does not contain woody species).	At least 1000 m^2	Depends whether EVC classed as continuous or episodic recruitment type. For continuously recruiting EVCs: cohort of at least one life form: yes/no. If yes, proportion of woody species with adequate recruitment <30%, 30-70, >70. List of species demonstrating "adequate recruitment" -see HHa 2004.	Yes, determines whether continuous or episodic recruitment is occuring and therefore what is considered "adequate recruitment".
Maroondah	Habitat	Score only	Any	Score out of 10 based	Yes, determines

	Corridors Strategy 2005	(combination of "adequate recruitment" x diversity of cohort)		on habitat hectares scores.	recruitment type and expected diversity of cohort.
Boroondara	BAMP 2011	Includes woody and herbaceous species.	Any	Score between 0-4 corresponding to a word, corresponding to the following scale (of benchmark): <5%, 5-10, 10-25, 25-50, 50-75 (>75 NA).	Yes, determines the expected diversity and abundance of recruitment.
Yarra Ranges	Weed Mapping Program 2013	None (but called Regeneration).	Any	Categorical: Absent, Present-Low, Present-High	No.

Documents that do not record this component: Modified HHa 2010, Inventory Boroondara 2005, SBS Maroondah 1997, SBS Knox 2010

1.3.11 Disturbance

Table 12. List of councils and documents that measure Disturbance using what definition, how this is done and whether the assessment is compared to a benchmark or reference value.

Councils	**Document**	**Difference in definition to Table 1**	**Area measured**	**Scale or Categories**	**Benchmark?**
Boroondara Whitehorse Knox	HHa 2004	"…significant un-natural disturbance considered as European disturbances that have altered the primary attributes (ie. floristics, structure and growth stage) of the native vegetation. In general, this refers to actions such as grazing, mining, agricultural clearing, timber harvesting, fuel reduction burns and other disturbances such as road-making and Phytophthora infestation" HHa 2004.	At least 1000 m^2	Only patches > 20 ha rated as significantly disturbed, not significantly disturbed.	Yes, to compare "pristine condition" to conditions described under definition.
Boroondara	BAMP 2011	None.	Any	Score between 0-4 corresponding to a word, corresponding to the following scale: >75%, 50-75, 25-50, 10-25, <5-10	No.

Yarra Ranges	Weed Mapping Program 2013	None given, but general policy is to follow HHa 2004 descriptions.	Any	High degraded, substantially modified, moderate disturbance, near natural	Yes, to compare "pristine condition" to conditions described under definition.

Documents that do not record this component: Habitat Corridors Strategy 2005 (but does record presence of a list of threatening processes), Modified HHa 2010, Inventory Boroondara 2005, SBS Maroondah 1997, SBS Knox 2010.

1.3.12 Organic Litter Cover % (<10 cm dia.)

Table 13. List of councils and documents that measure Organic Litter Cover % using what definition, how this is done and whether the assessment is compared to a benchmark or reference value.

Councils	**Document**	**Difference in definition to Table 1**	**Area measured**	**Scale or Categories**	**Benchmark?**
Boroondara Whitehorse Knox	HHa 2004	None.	At least 1000 m^2	Of benchmark: <10%, <50 or > 150% (under or overabundance), ≥50 or ≤150%. Also whether dominated by native or non-native litter.	Yes
Maroondah	Habitat Corridors Strategy 2005	None.	Any	Score out of 5 based on habitat hectares scores. Scores can be back tracked to cover relative to benchmark, but not whether dominated by native litter.	Yes
Knox	Modified HHa 2010	None.	At least 100 m^2	Min and max % values recorded.	No, excel compares raw figure to benchmark
Boroondara	BAMP 2011		Any	Score between 0-4 corresponding to a word, corresponding to the following scale: <5-10%, 10-25, 25-50, 50-75, >75%	No.
Yarra Ranges	Weed Mapping Program 2013	None (but called organic matter).	Any	<10%, 10-50%, >50%	No.

Documents that do not record this component: Inventory Boroondara 2005, SBS Maroondah 1997, SBS Knox 2010

1.3.13 Logs (>10 cm dia.)

Table 14. List of councils and documents that measure Logs using what definition, how this is done and whether the assessment is compared to a benchmark or reference value.

Councils	Document	Difference in definition to Table 1	Area measured	Scale or Categories	Benchmark?
Boroondara Whitehorse Knox	HHa 2004	None.	At least 1000 m^2	<10%, <50%, ≥50% of benchmark length. Also large logs present or absent (defined as >0.5 of benchmark large tree DBH).	Yes, estimated as % of benchmark, large logs defined relative to benchmark.
Maroondah	Habitat Corridors Strategy 2005	None	Any	Score out of 5 based on habitat hectares scores. Scores can be back tracked to length relative to benchmark, but not whether large logs present.	Yes, estimated as % of benchmark.
Knox	Modified HHa 2010	None.	At least 100 m^2	Min and max % values recorded.	No, excel compares raw figure to benchmark

Documents that do not record this component: BAMP 2011, Inventory Boroondara 2005, SBS Maroondah 1997, SBS Knox 2010, Weed Mapping Program 2013

1.3.14 Patch size

Table 15. List of councils and documents that measure Patch Size using what definition, how this is done and whether the assessment is compared to a benchmark or reference value.

Councils	Document	Difference in definition to Table 1	Area measured	Scale or Categories	Benchmark?
Boroondara Whitehorse Knox	HHa 2004	None.	At least 1000 m^2	< 2 ha, 2-5 ha, 5-10 ha, 10-20 ha, ≥ 20 ha but significantly disturbed, ≥20 ha but not significantly disturbed.	Not really, but whether significantly disturbed is relative to "pristine condition".
Maroondah	Habitat Corridors Strategy 2005	None.	Any	Score out of 10 based on habitat hectares scores.	As above.
Yarra Ranges	Weed Mapping Program	None.	Any	<5ha or 1-5 m, 5-20 ha or 5-20 m, > 20 ha or > 20 m (length part a	No.

	2013			result of roadside assessments done in early edition)	

Documents that do not record this component: Modified HHa 2010, BAMP 2011, Inventory Boroondara 2005, SBS Maroondah 1997, SBS Knox 2010.

Debateable as to whether this is an essential element of vegetation condition.

1.3.15 Vegetation Link

Table 15. List of councils and documents that measure Vegetation Link using what definition, how this is done and whether the assessment is compared to a benchmark or reference value.

Councils	Document	Difference in definition to Table 1	Area measured	Scale or Categories	Benchmark?
Boroondara Whitehorse Knox	HHa 2004	Called "Neighbourhood"	At least 1000 m^2	Proportion of native vegetation in circles drawn around habitat being assessed. Radii of 100 m, 1 km or 5 km with centre in the middle of habitat assessment area. Round to nearest 20%.	No.
Maroondah	Habitat Corridors Strategy 2005	Score only (combination of % cover in three radii x weighting)	Any	Score out of 10 based on habitat hectares scores.	No.
Yarra Ranges	Weed Mapping Program 2013	None given, but general policy is to follow HHa 2004 descriptions.		No surrounding veg, partly surrounded veg, Fully surrounded veg	No.

Documents that do not record this component: Modified HHa 2010, BAMP 2011, Inventory Boroondara 2005, SBS Maroondah 1997, SBS Knox 2010

Debateable as to whether this is an essential element of vegetation condition.

1.3.16 Distance to Core area

Table 17. List of councils and documents that measure Distance to core area using what definition, how this is done and whether the assessment is compared to a benchmark or reference value.

Councils	Document	Difference in definition to Table 1	Area measured	Scale or Categories	Benchmark?
Boroondara Whitehorse Knox	HHa 2004	None.	At least 1000 m^2	>5km, 1-5 km, <1 km, contiguous (ie distance to nearest patch 50 ha or greater, unless it is	No.

				contiguous with a patch of that size).	
Maroondah	Habitat Corridors Strategy 2005	Score only (combination of distance to core area x whether core is significantly disturbed).	Any	Score out of 5 based on habitat hectares scores.	No (other than disturbance to core).

Documents that do not record this component: Modified HHa 2010, Inventory Boroondara 2005, SBS Maroondah 1997, SBS Knox 2010, Weed Mapping Program 2013

Debateable as to whether this is an essential element of vegetation condition.

2. Recommended Vegetation Condition Monitoring Components

After reviewing all of the current council documents or reports from each of the EAGA councils, we have compiled a list of vegetation condition components that are most suitable for trialling for future data collection, selected using the principles outlines in Section 1.2 above. The list below maximises the use of existing data, and includes metrics considered the most useful to monitor the effectiveness of management actions or monitor the impact of a changing climate. The definition of each component and its source document are listed below in Table 18. Definitions come from the Habitat Hectares methods unless otherwise stated.

Table 18. Vegetation condition components with corresponding scales for use to monitor management for biodiversity and climate change, and recommended ways of measurement to maximise the usefulness of each component in the future under a different climate. Definitions come from the Habitat Hectares methods unless otherwise stated.

Vegetation Condition Component	Definition	Usefulness to Monitor Vegetation Condition	Usefulness to Monitor Climate Change	How to record data to be "climate-ready"
Large Old Trees (LOTs)	Count of large old indigenous canopy species trees in a given area. Minimum diameter at breast height (DBH*) and whether a 'canopy species' determined by benchmark. Trees may be dead or alive (HHa 2004).	Large Old Trees are important habitat feature for many species, therefore a useful indicator of habitat quality.	Climate change could accelerate the loss of LOTs.	Count of all canopy trees in a plot, preferably with DBH and species. Could use categorical scale to make assessment of DBH quicker, with categories matching current benchmarks.
Large Old Tree (LOT) Canopy Health	For Large Old Trees as defined above. Comparative rating of foliage density at branch ends compared with full health, as a percentage (ie not missing due to tree death, decline, insect attack or mistletoe infestation). Compare to reference photos that illustrate benchmark (HHa 2004).	Large Old Trees are important habitat feature for many species, therefore a useful indicator of habitat quality. Declining canopy health could be an early sign of the potential loss of LOTs.	Climate change could cause or accelerate the loss of LOTs and canopy health could be an early sign of potential loss. Cause of decline in health could be investigated and potentially mitigated.	Average proportion of healthy cover for all trees on a continuous scale. Could record average health for each size class as above.

Vegetation Condition Component	**Definition**	**Usefulness to Monitor Vegetation Condition**	**Usefulness to Monitor Climate Change**	**How to record data to be "climate-ready"**
Tree canopy cover %	Percentage of projected foliage cover of mature (at least 80% adult height according to benchmark), indigenous, canopy tree species compared to benchmark. Diagrams provided to illustrate different levels of cover. Canopy layer only, not sub-branches.	Trees are an indication of habitat quality for many species. Similar to a count of trees.	Climate change could affect the density of tree growth or accelerate the loss of trees/branches. The density of canopy cover affects the microclimate in the understorey therefore affects how the ecosystem functions.	Continuous scale of % projected foliage cover. Need to test whether recording ranges (min, max) instead of absolute values is better at dealing with uncertainty. Uncertainty is usually dealt with through replication.
Tree Canopy Health	Mature canopy tree species as defined above. Comparative rating of foliage cover at branch ends compared with full health, as a percentage (ie. not missing due to tree death, decline, insect attack or mistletoe infestation). Compare to reference photos as a guide.	Trees are important habitat feature for many species, therefore a useful indicator of habitat quality. Declining canopy health could be an early sign of potential tree loss or other problems (eg. Mistletoe over-abundance could indicate there are few possums).	Similar to canopy cover % because canopy health is measured as foliage cover at branch ends. Climate change could cause or accelerate tree health issues.	Average proportion of healthy cover for all trees on a continuous scale. Could record average health for each size class or species as above.
Understorey Cover %	Projected cover of indigenous understorey as a percentage.	Important component of vegetation community, particularly threatened plant species. Would expect to see increase in indigenous understory cover with management actions like weed control, reduced trampling or revegetation.	Climate change could cause change to understorey cover eg loss due to drought or increase due to dominance by new species.	Average proportion of cover of understorey on a continuous scale. Quadrats that measure the cover of species would be useful to track increasing cover of individual species. Need to test whether recording ranges (min, max) instead of absolute values is better at dealing with uncertainty. Uncertainty is usually dealt with through replication.

Vegetation Condition Component	**Definition**	**Usefulness to Monitor Vegetation Condition**	**Usefulness to Monitor Climate Change**	**How to record data to be "climate-ready"**
Understory Species Richness [no. species]	Number of species comprising indigenous understorey.	Might expect to see species diversity increase with management actions like weed control or controlled burning.	Climate change could change understorey species richness.	No. of understory species that aren't weeds. Need to keep list of weed species so that changes to weed status can be tracked.
Understorey Life Forms	Presence/absence of indigenous life forms (eg vines, immature trees etc . see HHa 2004 list and definitions).	Presence or absence of life forms can indicate management actions necessary like reintroduction of species.	Changes to presence or absence of categories of life forms could represent major shifts in vegetation communities and function. If a whole life form is lost due to climate change, an ecological replacement could be chosen based on life form to fill the niche.	Presence/absence of all categories of life forms (instead of just those in the benchmark).
Composition [Species list]^	List of all flora species in a given area (quadrat, site)	Presence or absence of species can inform many management actions like burning, mowing regime, reintroduction of species, weed control or fencing.	Climate change is very likely to cause changes to species composition. Particularly need to monitor region-wide extinction and arrival of new species from other bioregions.	Full flora species list. Cover-abundance estimates could give early warning of changes.

Vegetation Condition Component	**Definition**	**Usefulness to Monitor Vegetation Condition**	**Usefulness to Monitor Climate Change**	**How to record data to be "climate-ready"**
Weeds cover %	Projected cover of weeds as a percentage. EVC benchmarks provide some guidance for what weed species may be present.	Weeds have major impact on survival and reproduction of indigenous species. Expect to see reduction in weed cover with management actions.	Climate change likely to allow new species to become weeds and reduce the cover of others.	Average proportion of cover of weeds on a continuous scale. Quadrats that measure the cover of species would be useful to track increasing cover of individual species. Need to test whether recording ranges (min, max) instead of absolute values is better at dealing with uncertainty. Uncertainty is usually dealt with through replication.
Recruitment	Recruitment is the establishment of individual indigenous plants beyond the initial seedling stage to maintain or improve site condition. Recruitment only includes woody species taller than prostrate shrubs to reduce impact of seasonality.	Recruitment is useful to indicate whether supplementation through planting is needed. It also gives an indication of what vegetation may look like in the future, but this can be an unreliable predictor. Trying to measure whether recruitment is 'adequate' is controversial. Reasons for lack of recruitment like excessive mulch are worth monitoring.	Climate change could have many impacts on recruitment, but not sure any of the current methods used really capture them.	Yarra Ranges' categories of: Absent, Present-Low, Present-High probably the best match of scale with accuracy.

Vegetation Condition Component	**Definition**	**Usefulness to Monitor Vegetation Condition**	**Usefulness to Monitor Climate Change**	**How to record data to be "climate-ready"**
Disturbance ^	"Disturbance is defined as the disruption of normal processes or conditions. It may be visible as soil upheaval, fire, erosion by wind or water, major weed control or heavy mulch application. Disturbance is expressed as an observed presence or absence." (BAMP 2011)	Recording disturbance is an important aspect of site history. Large fires, grazing, weed control events etc. can help to explain sites develop in certain ways. Currently, disturbance is used as a scale to rate site significance, with natural sites given higher protection status.	Climate change is expected to increase the frequency of disturbance events. Therefore keeping record of the frequency and severity of such events may be useful in the future.	Two aspects to disturbance: 1) Current level of disturbance and 2) history of disturbance events. Currently only Yarra Ranges record a categorical level of current disturbance. Could add a category for type, extent and approximate date of last disturbance event.
Organic Litter Cover % (<10 cm dia.)	Projected cover of organic matter detached from the parent plant (ie. leaves and branches) at ground level. Includes branches up to 10 cm in diameter, with thicker wood included under logs.	Organic litter is important habitat feature for many species, therefore a useful indicator of habitat quality. It can also be an indicator of ecosystem productivity, nutrient cycling and soil fertility. Perturbations from benchmark levels of organic litter cover might indicate necessary management actions.	Climate change is likely to alter rates of decay and litter production, and the impact on habitat quality is unknown.	Projected cover % of organic matter on a continuous scale. Need to test whether recording ranges (min, max) instead of absolute values is better at dealing with uncertainty. Uncertainty is usually dealt with through replication.

Vegetation Condition Component	**Definition**	**Usefulness to Monitor Vegetation Condition**	**Usefulness to Monitor Climate Change**	**How to record data to be "climate-ready"**
Logs (>10 cm dia.)	The cumulative length of fallen wood ≥10 cm thick, plus 0.5 m for each cut stump >10 cm diameter and <1.3 m high.	Similar to organic litter, logs are an important habitat feature for many species and promote biodiversity.	The impact of climate change on logs is unknown. Formation of logs might increase with extreme weather events that cause fire or storms, but rate of decay may also increase (as it does with decreasing latitude).	The cumulative length of fallen wood ≥10 cm thick, plus 0.5 m for each cut stump >10 cm diameter and <1.3 m high. Recorded as a raw figure, not against a benchmark. Need to test whether recording ranges (min, max) instead of absolute values is better at dealing with uncertainty.
Patch size	Total size of patch of native vegetation containing assessed area. Corridors should be ≥50 m wide to be considered contiguous.			This component should not be included with vegetation condition because it is largely a GIS exercise and can be accounted for with vegetation extent.
Vegetation Link/Neighbourhood	Amount of vegetation in surrounding landscape. Include freshwater as vegetation.			This component should not be included with vegetation condition because it is largely a GIS exercise and can be accounted for with vegetation extent.
Distance to Core area	Distance to edge of nearest patch of native vegetation>50 ha (or whether contiguous with one).			This component should not be included with vegetation condition because it is largely a GIS exercise and can be accounted for with vegetation extent.

^ Not part of Habitat Hectares Vegetation Assessment (HHa 2004).

2.1 Recommended Methods for trial period 2014-2015

The two methods that are currently used by councils that pick up the most desired components of vegetation condition are Yarra Ranges' Weed Mapping Program 2013 and Lorimer's Modified HHa 2010. This is because they record the most amount of raw data in the field, rather than recording or scoring a site relative to a benchmark/reference condition in the field. If instead of collecting raw data, a site is scored in relation to a benchmark in the field, then the actual value for each parameter is lost, and only the benchmark comparison score is recorded. Instead, it is recommended that all actual data for each vegetation component be recorded in the field, and compared to a benchmark afterwards if desired. The two recommended methods still record some data relative to benchmarks in the field, and also reduce some continuous variables to categorical scales, both of which are undesirable methods. Therefore a new data sheet has been written that includes the best aspects of each method, but removes categories and benchmarks where ever possible (Appendix A). Data recorded in this way are still comparable with older methods, because raw data can be converted to relevant benchmarks or categories once collected. Where suitable alternatives to categories could not be found (eg. for recruitment), then existing methods have been used. Data on this new data sheet is compatible with most current methods, but it does omit details where they were not found in common between council assessment methods. Councils can still collect data using their current approaches if desired, however should consider the general principles outlined in section 1.1 if they chose not to trial this new recommended method.

3. References

Strategy or method documents cited. Information gathered was from a combination of documents in addition to raw data sheets supplied separately. The EAGA councils that do not record any vegetation condition data and therefore do not have references included in the following list are Monash and Stonnington.

In-text citation	**Full Reference**
BAMP 2011	Regional Envirosense 2011. Biodiversity Asset Management Plan Part One. Prepared for City of Boroondara, Camberwell, Victoria.
Bushland Reserves KPI's Manual 2013	Practical Ecology 2013. Whitehorse Bushland Reserves and Bushland Management Works - KPI's Monitoring Manual. Prepared for City of Whitehorse.
Carr et al. 1992	Carr G., Yugovic J. & Robinson K. 1992. Environmental Weed Invasions in Victoria: Conservation and Management Implications'. 1st Edition. Department of Conservation & Environment, Melbourne.
Inventory Boroondara 2005	Lorimer, G. 2005. Inventory and Assessment of Indigenous Flora and Fauna in Boroondara. Prepared for City of Boroondara, Camberwell, Victoria.
Habitat Corridors Strategy 2005	Context, 2005. Maroondah Habitat Corridors Strategy. Prepared for Maroondah City Council, Ringwood, Victoria.
HHa 2004	DSE (Department of Sustainability and Environment) 2004. Vegetation Quality Assessment Manual-Guidelines for applying the Habitat Hectares scoring method. Version 1.3. Victorian Government Department of Sustainability and Environment, Melbourne.
Modified HHa 2010	Lorimer, G. 2010. Bushland Condition Monitoring Manual Version 1.0.
SBS Knox 2010	Lorimer, G. 2010. Sites of Biological Significance in Knox. Knox City Council Wantirna South, Victoria.
SBS Maroondah 1997	Lorimer, G., J. Reid, L. Smith, & H. Moss 1997.Sites of Biological Significance in Maroondah Vol. 1. Prepared for Maroondah City Council, Ringwood, Victoria.
Weed Mapping Program 2013	Yarra Ranges 2013. Weed Mapping Program 2012-2013 (Report). Yarra Ranges Shire Council.

Vegetation Condition Data Sheet for Trial period

Monitoring Plot No: Jim's Reserve plot 2 (JR2)

Date: 17-11-14

Recorder: Pamela Lillian Isley

Photos taken? Yes, from south-east corner of quadrat looking towards the north-west, north-east, and south-west.

GPS waypoints & description of location:

South-east corner of 20 x 20 m quadrat is marked by 220 cm DBH yellow box tree at (easting xxxx northing xxxxx). Quadrat is square and the eastern side of quadrat follows existing fence line and runs north-south.

Size of plot: 100m^2 or 400m^2, to be discussed during the trial period

EVC: 55 Plains Grassy Woodland

Canopy tree species		**Count*/Diameter at Breast Height (cm)**
1	Eucalyptus mellidora	50, 25, 10, 15
2	E. blakelyi	110, 80, 25, 30
3		
4		
5		
6		
7		
8		
*Plot size if different from quadrat: 1 ha, starting from same point as describe above, but extending for 100 m x 100 m.		

*If no trees are present in the quadrat, but are present in the vegetation class at the site, record trees for a larger area (eg 1 ha) for tree parameters only.

Canopy tree species		**Average canopy health %**		
		Best	**Min.**	**Max**
1	Eucalyptus mellidora	70	65	75
2	E. blakelyi	55	50	75
3				
4				
5				
6				
7				
8				

Compare using reference photos, found in DSE 2004 Appendix 4.

	Average/Best estimate	**Range**	
		Min	**Max**
***Tree Canopy Cover %**	25	24	33
Understorey Cover %	72	68	76
Weed Cover %	5	5	10
Organic Litter Cover %	45	45	51
Cumulative log length (m)	15	12	16
Recruitment (circle)	Absent	Present-low	Present-high
Current disturbance level (circle)	high degraded substantially modified	moderate disturbance near natural	
Recent disturbance (type, area, approx date):	About 60% of quadrat was burnt in late October 2014 during a controlled ecological burn. Total area of burn at the site was approx. 2 x 1 ha patches.		
Number of Understorey Species (Richness)	25		

Life forms present				
	Woody > 5 m	Y	^Graminoids > 1m	Y
	Woody 1-5 m	Y	Graminoids 10 cm – 1 m	
	Woody 20 cm -1 m		Graminoids < 10 cm	
	Woody < 20 cm		Bryophytes & Lichens	
	Herb > 50 cm		Ground ferns	
	Herb 5-50 cm		Tree ferns/Palms	
	Herb < 5 cm		Scramblers or climbers	
			Epiphytes	

*Compare using reference photos, found in DSE 2004 Appendix 5.

^Graminoids = grass-like or strappy leaves, eg. including lilies.

Full Species List (Optional) with cover-abundance estimates (also optional)