Are you interested in native plants and animals? Have your say on Our Natural Capital

Wellington's Draft Biodiversity Strategy and Action Plan 2014

Consultation closed Friday 6 March 2015 51 submissions recieved

Absolutely Positively **Wellington** City Council

Me Heke Ki Pōneke

No.	Name	Suburb	Organisation	Submission Source	Page Number
1	allan probert	wilton		Online	1
2	Bronwen Shepherd	Thorndon		Online	4
3	Simon Adams	Melrose		Online	7
4	Suze Keith	Kelburn		Online	10
5	Jamie Stewart	Karori	Makara Peak Mountain Bike Park Supporters Inc.	Online	13
6	Jessi Morgan	Courtenay Place	Morgan Foundation	Online	25
7	Wilbur Dovey	Wilton	Otari Wilton's Bush Trust	Online	29
8	Bob Stephens			Email	32
9	Paul Ward	Newtown		Online	38
10	Bill Hester	Ngaio		Email	44
11	Peter Henderson	Khandallah		Online	47
12	Jennifer Boshier	Northland	Creswick Valley Residents Association	Email	50
13	Ali Caddy		Greater Wellington Regional Council	Email	56
14	Marc Slade	Brooklyn	Polhill Restoration Project	Online	64
15	Russel Garlick	Miramar	Wellington Mountain Bike Club Incorporated.	Online	67
16	Murray Hosking	Epuni	Friends of Taputeranga Marine Reserve Trust	Online	71
17	Raewyn Empson		Zealandia	Email	78
18	Des Smith	Ngaio	Bell's track working group	Online	82
19	Geoffrey de Lisle	RD1	Wellington Branch of Birds New Zealand (Ornithological Society of New Zealand)	Online	85
20	Bev Abbott		Wellington Botanical Society	Email	90
21	Carol Comber		Mt Cook Mobilised	Email	117
22	Garth Baker	Highbury	Brooklyn Trail Builders	Email	120
23	Alex James	Hokowhitu		Online	128
24	Craig Starnes	Brooklyn		Online	132
25	Denis Asher	Norway St	Aro Valley Restoration Project/Tanera Gully	Online	135
26	Nicole Miller	Haitaitai	Wellington Underwater Club	Online	138
27	Peter Reimann	Ngaio	Trelissick Park Group	Email	143
28	Catharine Underwood	Brooklyn		Email	145
29	cheryl robilliard	Newtown	Newtown Residents' Association	Online	148
30	Robert Davies	Wilton		Email	153
31	Simon Wright		Environmental Reference Group	Email	155

32	Hadley Fierlinger	Kelburn		Online	157
33	Graeme Sawyer	Johnsonville		Online	257
34	Mike Orchard	Lyall Bay		Online	261
35	Barbara Fill	Island Bay	Island Bay Coast Care and Oku Reserve Group	Online	267
36	Alison Valentine	Highbury		Online	270
37	Karin Mahlfeld and Natasha Evans	Ngaio	Wellington Community Science and Learning Hub	Email	273
38	Martin Payne	Brooklyn	Friends of Owhiro Stream	Email	279
39	Paul Blaschke	Wellington		Email	284
40	Peter Hunt		Forest & Bird Wellington Branch	Email	287
41	Ann McCrone	Mt Cook		Email	290
42	Frank Cook	Mt Cook		Online	292
43	Rosamund Averton	Mount Victoria		Email	295
44	David Meyers	Brooklyn		Post	298
45	Peter Enderby Buxton	Wadestown		Post	301
46	Siobhan Leachman	Brooklyn		Post	304
47	Jessmayen Wakefield	Kilbirnie		Post	306
48	Julia Stace	Aro Valley	Aro Valley Community Council	Post	309
49	Brent Tandy	Lambton Quay	Department of Conservation	Email	312
50	Chris Horne and Barbara Mitcalfe	Northland		Email	313
51	Robin White	Ngaio	Ngaio Crofton Downs Residents Association	Email	322

Submitter Details

First Name: **allan**
Last Name: **probert**
Street: **10 churchill drive**
Suburb: **wilton**
City: **wellington**
Country: **New Zealand**
PostCode: **6012**
Daytime Phone: **0272414393**
eMail: **proberts@gasp.co.nz**

Trade competition and adverse effects:
○ I could ○ I could not
gain an advantage in trade competition through this submission
○ I am ○ I am not
directly affected by an effect of the subject matter of the submission that :
a. adversely affects the environment, and
b. does not relate to the trade competition or the effects of trade competitions.

Wishes to be heard:
◉ Yes
○ I do NOT wish to speak in support of my submission and ask that the following submission be fully considered.

Preferred hearing location:
○ Oral Hearings - Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

Hearing Needs:

Correspondence to:
◉ Submitter
○ Agent
○ Both

Submission

1. Overall, do you support or oppose the general direction of Our Natural Capital?

○ Strongly oppose ○ Oppose ○ Neither support nor oppose ○ Support ◉ Strongly support

Why do you say this?
its an important part of Wellington esp. coast line and Miramar peninsula

---

2. Do you support the Guiding Principles, Goals and Outcomes?

○ Strongly oppose ○ Oppose ○ Neither support nor oppose ◉ Support ○ Strongly support

Why do you say this?

3. Do you think we have identified the biggest issues facing indigenous biodiversity in Wellington?

(•) Yes ( ) No

Your comments
additionally pest control should be given greater priority in these areas esp. the Miramar Peninsula and local and regional council need to take greater responsibility esp. in regard to stray cat control.

4. Do you think we have identified the right priorities in order to achieve our desired outcomes for biodiversity in Wellington?

(•) Yes ( ) No

Your comments
as per (3)

5. Do you think we have identified the right organisations to partner with to achieve our objectives?

( ) Yes (•) No

Your comments
not all- stray cat control should be developed as a policy ie. as part of current animal control. This could become a contestable function such as Kitten Inn or SPCA

6. Do you think we have the right indicators and targets to measure our performance by?

(•) Yes ( ) No

Your comments

7. Do you agree with our direction for the tiered support for community groups?

(•) Yes ( ) No

Your comments

8. Is there anything you feel has not been adequately covered by the draft plan?

(•) Yes ( ) No

Your comments
as above wrt. stray cat control

9. Do you have additional comments? (please attach additional pages via the 'Supporting Information' tab)

(•) Yes ( ) No

Your comments
we have neutered 6500 stray cats and kittens over the last 5 years on behalf of kitten inn. They are outgrowing their facility which is home based. We believe that there should be a microchipping policy put in place for all wellington cats to enable a policy of id and return to complement stray cat capture and removal

Attached Documents

File
Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

Submitter Details

First Name: **Bronwen**
Last Name: **Shepherd**
Street: **29 Ballantrae Place**
Suburb: **Thorndon**
City: **Wellington**
Country:
PostCode: **6011**
Mobile: **0212836909**
eMail: **Brony.shepherd@gmail.com**

Trade competition and adverse effects:
○ I could ○ I could not
gain an advantage in trade competition through this submission
○ I am ○ I am not
directly affected by an effect of the subject matter of the submission that :
a. adversely affects the environment, and
b. does not relate to the trade competition or the effects of trade competitions.

Wishes to be heard:
○ Yes
◉ I do NOT wish to speak in support of my submission and ask that the following submission be fully considered.

Preferred hearing location:
○ Oral Hearings - Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

Hearing Needs:

Correspondence to:
◉ Submitter
○ Agent
○ Both

Submission

1. Overall, do you support or oppose the general direction of Our Natural Capital?

○ Strongly oppose ○ Oppose ○ Neither support nor oppose ○ Support ◉ Strongly support

Why do you say this?
Goals and outcomes are ambitious but more importantly achievable as Wellington has the community to support and drive with council backing. Good on the council for taking it to proposal stage

---

2. Do you support the Guiding Principles, Goals and Outcomes?

○ Strongly oppose ○ Oppose ○ Neither support nor oppose ○ Support ◉ Strongly support

Why do you say this?

3. Do you think we have identified the biggest issues facing indigenous biodiversity in Wellington?

◉ Yes ○ No

Your comments
There could be more resource support for existing entities such as zealandia and otari bush particularly regarding issues which need a wellington wide approach - eg replacing pines and pest monitoring and control

4. Do you think we have identified the right priorities in order to achieve our desired outcomes for biodiversity in Wellington?

◉ Yes ○ No

Your comments

5. Do you think we have identified the right organisations to partner with to achieve our objectives?

◉ Yes ○ No

Your comments

6. Do you think we have the right indicators and targets to measure our performance by?

◉ Yes ○ No

Your comments

7. Do you agree with our direction for the tiered support for community groups?

◉ Yes ○ No

Your comments

8. Is there anything you feel has not been adequately covered by the draft plan?

◉ Yes ○ No

Your comments
What happens with financial or resource support for zealandia which is really the centre hub of our green space and the source of our expanding biodiversity, community engagement and research.

9. Do you have additional comments? (please attach additional pages via the 'Supporting Information' tab)

◉ Yes ○ No

Your comments
Thank you for responding to wellingtonians desire to become a green capital!

Attached Documents

File
Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

Submitter Details

First Name: **Simon**
Last Name: **Adams**
Organisation: **None**
On behalf of: **Myself**
Street: **1 Manchester Street**
Suburb: **Melrose**
City: **Wellington**
Country:
PostCode: **6023**
Daytime Phone: **0277065812**
Mobile: **0277065812**
eMail: **si.j.adams@gmail.com**

Trade competition and adverse effects:
○ I could ○ I could not
gain an advantage in trade competition through this submission
○ I am ○ I am not
directly affected by an effect of the subject matter of the submission that :
a. adversely affects the environment, and
b. does not relate to the trade competition or the effects of trade competitions.

Wishes to be heard:
○ Yes
◉ I do NOT wish to speak in support of my submission and ask that the following submission be fully considered.

Preferred hearing location:
○ Oral Hearings - Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

Hearing Needs:

Correspondence to:
◉ Submitter
○ Agent
○ Both

Submission

1. Overall, do you support or oppose the general direction of Our Natural Capital?

○ Strongly oppose ○ Oppose ○ Neither support nor oppose ◉ Support ○ Strongly support

Why do you say this?
It's generally on the right track

---

2. Do you support the Guiding Principles, Goals and Outcomes?

○ Strongly oppose ◉ Oppose ○ Neither support nor oppose ○ Support ○ Strongly support

Why do you say this?
I have no problem with the ones that are there, but would like to make a suggestion for another one. It would be great if we could extend planting on road reserve to include planting fruit trees also (the current rules stipulate that only natives are allowed). The reason for this is that it would meet the council objectives for beautification of road reserve, but also provide delicious, healthy fruit for everyone. In future years, this would contribute to health outcomes for Local children, impoverished families etc as well as sustainability improvements. Most importantly I believe most residents support this. I have discussed this with individuals as well as one community group and they are wholeheartedly behind it. This need not come at any cost to the council. Residents would be expected to provide and maintain their own plants.

3. Do you think we have identified the biggest issues facing indigenous biodiversity in Wellington?

○ Yes ◉ No

Your comments
It generally only has focus on Native biodiversity. There is a place for exotic or imported diversity (e.g. pohutekawa trees, fruit trees, etc)

4. Do you think we have identified the right priorities in order to achieve our desired outcomes for biodiversity in Wellington?

○ Yes ◉ No

Your comments
As above

5. Do you think we have identified the right organisations to partner with to achieve our objectives?

◉ Yes ○ No

Your comments

6. Do you think we have the right indicators and targets to measure our performance by?

○ Yes ○ No

Your comments

7. Do you agree with our direction for the tiered support for community groups?

◉ Yes ○ No

Your comments

8. Is there anything you feel has not been adequately covered by the draft plan?

○ Yes ◉ No

Your comments
Need to allow for planting of edibles on council land. More consideration given to community orchards etc.

9. Do you have additional comments? (please attach additional pages via the 'Supporting Information' tab)

○ Yes ◉ No

Your comments

Attached Documents

File
Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

Submitter Details

First Name: **Suze**
Last Name: **Keith**
Street: **12 Cluny Avenue**
Suburb: **Kelburn**
City: **Wellington**
Country: **New Zealand**
PostCode: **6012**
eMail: **dk.sk@xtra.co.nz**

Trade competition and adverse effects:
○ I could ○ I could not
gain an advantage in trade competition through this submission
○ I am ○ I am not
directly affected by an effect of the subject matter of the submission that :
a. adversely affects the environment, and
b. does not relate to the trade competition or the effects of trade competitions.

Wishes to be heard:
○ Yes
◉ I do NOT wish to speak in support of my submission and ask that the following submission be fully considered.

Preferred hearing location:
○ Oral Hearings - Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

Hearing Needs:

Correspondence to:
◉ Submitter
○ Agent
○ Both

Submission

1. Overall, do you support or oppose the general direction of Our Natural Capital?

○ Strongly oppose ○ Oppose ○ Neither support nor oppose ○ Support ◉ Strongly support

Why do you say this?

---

2. Do you support the Guiding Principles, Goals and Outcomes?

○ Strongly oppose ○ Oppose ○ Neither support nor oppose ○ Support ◉ Strongly support

Why do you say this?

3. Do you think we have identified the biggest issues facing indigenous biodiversity in Wellington?

(•) Yes ( ) No

Your comments

4. Do you think we have identified the right priorities in order to achieve our desired outcomes for biodiversity in Wellington?

(•) Yes ( ) No

Your comments

5. Do you think we have identified the right organisations to partner with to achieve our objectives?

(•) Yes ( ) No

Your comments

6. Do you think we have the right indicators and targets to measure our performance by?

(•) Yes ( ) No

Your comments

7. Do you agree with our direction for the tiered support for community groups?

(•) Yes ( ) No

Your comments

8. Is there anything you feel has not been adequately covered by the draft plan?

( ) Yes (•) No

Your comments
I think central to finalising the plan is ensuring that spatial planning provides a foundation for the development of this plan and others related to it. This is to help identify the overlap and connectivity

between different pieces of legislation, institutions, and communities.

9. Do you have additional comments? (please attach additional pages via the 'Supporting Information' tab)

○ Yes ◉ No

Your comments

Attached Documents

File
Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

Submitter Details

First Name: **Jamie**
Last Name: **Stewart**
Organisation: **Makara Peak Mountain Bike Park Supporters Inc.**
Street: **70 Chamberlain Rd**
Suburb: **Karori**
City:
Country:
PostCode: **6012**
Daytime Phone: **+64226293621**
Mobile: **+64226293621**
eMail: **jamesbrianstewart@gmail.com**

Trade competition and adverse effects:
○ I could ○ I could not
gain an advantage in trade competition through this submission
○ I am ○ I am not
directly affected by an effect of the subject matter of the submission that :
a. adversely affects the environment, and
b. does not relate to the trade competition or the effects of trade competitions.

Wishes to be heard:
◉ Yes
○ I do NOT wish to speak in support of my submission and ask that the following submission be fully considered.

Preferred hearing location:
○ Oral Hearings - Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

Hearing Needs:

Correspondence to:
◉ Submitter
○ Agent
○ Both

Submission

1. Overall, do you support or oppose the general direction of Our Natural Capital?

○ Strongly oppose ○ Oppose ○ Neither support nor oppose ◉ Support ○ Strongly support

Why do you say this?
It is a worthy plan, but focuses too much on 'nice to haves' in a fragmented city-scape. It needs to focus more on the basics of land protection and pest control.

---

2. Do you support the Guiding Principles, Goals and Outcomes?

○ Strongly oppose ○ Oppose ○ Neither support nor oppose ◉ Support ○ Strongly support

Why do you say this?

3. Do you think we have identified the biggest issues facing indigenous biodiversity in Wellington?

○ Yes ◉ No

Your comments
Please see attached written submission

4. Do you think we have identified the right priorities in order to achieve our desired outcomes for biodiversity in Wellington?

○ Yes ◉ No

Your comments
Please see attached written submission

5. Do you think we have identified the right organisations to partner with to achieve our objectives?

○ Yes ○ No

Your comments

6. Do you think we have the right indicators and targets to measure our performance by?

○ Yes ○ No

Your comments

7. Do you agree with our direction for the tiered support for community groups?

◉ Yes ○ No

Your comments
Please see attached written submission

8. Is there anything you feel has not been adequately covered by the draft plan?

(•) Yes ( ) No

Your comments
Please see attached written submission

9. Do you have additional comments? (please attach additional pages via the 'Supporting Information' tab)

(•) Yes ( ) No

Your comments
Please see attached written submission

Attached Documents

File
MPS Our Natural Capital Submission
Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

Makara Peak Mountain Bike Park Supporters
C/O Chairperson
Jamie Stewart
70 Chamberlain Rd
Karori
jamesbrianstewart@gmail.com

Submission of the Makara Peak Mountain Bike Park Supporters

To the WCC Draft Suburban Reserves Management Plan

The Makara Peak Mountain Bike Supporters are a local community group with a membership of approximately 400 people. We work with Wellington City Council to manage the Makara Peak Mountain Bike Park with a goal to creating a "world class mountain bike park, with dual use tracks, in a restored native forest". Our Mountain Bike Park attracts close to 100,000 visitors a year and is well known for its setting in a regenerating native forest, its founding environmental ethic and its contribution to cycling culture within Wellington.

One of the special elements of Wellington's mountain bike culture is our desire to build and maintain permanent tracks in regenerating native forest of increasing ecological significance. We add richness to this forest through our use, appreciation and ecological restoration.

The Makara Peak Mountain Bike Park Supporters are one of, if not the, most active environmental group in Wellington. Our environmental activities include:

- Advocacy for the Makara Peak Mountain Bike Park to become a scenic reserve (largely achieved in 2013).
- Advocacy for an increased environmental ethic in the mountain biking community both locally and nationally.
- Possum control at Makara Peak Mountain Bike Park, through installation and servicing of bait stations.
- Stoat and rat control from the gates of Zealandia to Otari Wilton's Bush including Wrights Hill, South Karori, Makara Peak, Karori Park and Johnston's Hill.
- Revegetation of the Makara Peak Mountain Bike Park, including planting (approximately 50,000 seedlings since 1999, care of the seedlings and active encouragement of increased biodiversity through removing pest plants and creating light wells for climax species.

This submission includes both specific changes to this draft plan that are necessary for the continued success of our and others ecological restoration projects and another biodiversity concept plan "Te Kopahau Reserve 2050" that we feel add to the overall plan's ability to secure Wellingtons status as the Natural Capital.

Te Kopahau Reserve 2050

A concept to create a significant space for nature linking the sea with the skyline in our Natural Capital – Wellington.

Wellington has a long term opportunity to be a city that makes an ecologically significant space for nature. To be one of the first cities in the world to commit land the equivalent of its urban area to the protection and restoration of biodiversity. It is not enough to focus on urban ecology in a fragmented natural landscape. A long term vision is needed.

Zealandia has shown the benefits that biodiversity protection in the heart of the city can add to the lives of our citizens. The chorus of Kakas is becoming one of the trademarks of our city. Zealandia however has one important long term flaw – it is too small. In the long term a much greater area of predator free forest will be required to preserve viable populations of many species. To bring say the song of the kokako back to Wellington 2000 hectares of forest will be required rather than the current 200.

Zealandia needs more than a halo. It needs to be re-envisaged as the apex of a much larger reserve stretching from the sea to the skyline. A reserve that has the natural boundary of the South Coast, South Karori Stream and the Outer Green Belt. Our submission includes steps towards the achievement of this vision.

Detailed comments on draft plan provisions

Reference: (pg 17: 7. Guiding Principles – We will build on our natural capital)

Request: Please reword as follows: *This strategy will help to build and enhance Wellington's natural capital. We will respect the importance of indigenous biodiversity to Aotearoa/New Zealand and its right to exist. We will commit the equivalent of our urban area to nature in an unfragmented reserve stretching from the sea to the skyline. In our urban environment we will protect and restore the natural areas remaining and learn to live with our indigenous wildlife.*

Explanation: The change recognises that long term a large unfragmented natural area is required in Wellington City to achieve the goal of being the Natural Capital.

Reference: (pg 19. 9. Biodiversity Concept Plans)

Request: Please add 9.3 Te Kopahau Reserve 2050 as summarised above (the concept in the appropriate format is attached to this document).

Explanation: As per information above.

Reference: (pg 21. 1.1.1(a)

Request: Please reword as follows: "Ensure that all ecologically significant areas on Council-owned land are vested as scenic reserves

Explanation: The scenic reserve classification provides appropriate statutory protection for ecologically significant areas that other reserve classifications do not.

Reference: (pg 21. 1.1.1 (d))

Request: Please remove this action

Explanation: The creation of an ecological management plan for Te Kopahau is provided for in 1.1.1c. The action in d. premeditates the outcome of that planning process.

Reference: (pg 21. Goal 1.1.2)

Request: Please add 1.1.2 (d) as follows “Give priority through District Plan processes to the protection of regenerating indigenous vegetation within the Te Kopahau Reserve 2050 concept area.

Explanation: A step towards Te Kopahau Reserve 2050

Reference (pg 21. Goal 1.1)

Request: Please add 1.1.3 as follows: Obj “Seek to acquire title to all land in the Te Kopahau Reserve 2050 concept area” Action a. “Acquire land within the Te Kopahau Reserve 2050 area as opportunity arises” Funding: N, Priority: 1, Timeframe: Long

Explanation: A step towards Te Kopahau Reserve 2050

Reference (pg 22. Goal 1.3.1 (d))

Request: Please remove following words “particularly within Te Kopahau Reserve”

Explanation: Gaps in the possum control network should be identified and addressed where-ever they are identified. Possum and goat control must be a priority above all priorities.

Reference (pg 23. Goal 1.3.3 (b))

Request: Please reword as follows: “Gradually implement animal pest control on private land in the Te Kopahau Reserve 2050 area beginning with areas immediately to the south-west of Zealandia.

Explanation: Step towards Te Kopahau Reserve 2050

Reference (pg 24. Goal 1.4.4)

Request: Please reword Objective 1.4.4 and action (a) as follows: “Ensure the conservation and enhancement of existing biodiversity is encouraged on proposed development sites” & “Develop guidelines for track development on WCC owned land which balance recreational and ecological values”

Explanation: The importance of conserving and enhancing biodiversity may at times need to be weighed against the recreational opportunity a track development may provide. Wellington is committed through the Our Capital Spaces plan towards developing a World Class Mountain Bike track network. One of the special elements of Wellington's mountain bike culture is our desire to build and maintain permanent tracks in regenerating native forest of increasing ecological significance. We add richness to this forest through our use, appreciation and ecological restoration.

Reference (pg 27. Goal 3.1.2 (a)

Request: Please reword as follows "Ensure all Wellingtonians in suburban areas can access a natural space or multi-use trail network within a 10-minute walk or cycle.

Explanation: There is a common fallacy that people on bikes do not connect with nature. Cycling, including mountain biking, is the recreation of choice for many and this should be reflected in this action.

Reference (pg 28. Goal 3.2.3)

Request: Please reword the objective as follows "Give children and youth the opportunity to experience and learn about nature", and add g. Identify and promote opportunities for children and youth to recreate in our reserves"

Explanation: The existing goal and actions seek to shape children's encounters with nature rather than letting them encounter nature on their own terms.

Reference (pg 28. Goal 3.3.1)

Request. We especially support the actions proposed here.

Explanation: The culture around cat ownership will have to change for Wellington to become a natural capital with flourishing birdlife.

Reference (pg 30. Goal 3.4.4)

Request. Please add action (g) as follows “Where possible facilitate merger and strengthening of community environmental groups to ensure a sustainable community contribution to conservation.”

Explanation: There are too many environmental groups in Wellington. The council could assist in strengthening the contribution overall by encouraging the use of umbrella groups and bringing people together to ensure more lasting contributions.

Reference: (Pg 51. Guideline 13.1.4

Request: Please add a new guideline as follows. “We will prioritise the control of pests that prevent native forest regeneration, and ensure appropriate control of these pests over all significant ecological areas”

Explanation: The guidelines are very non-committal on the priority given to possum and goat control. It is fundamental to all ecological restoration projects in Wellington city that the control of goats and possums is continued and where possible enhanced. This should be prioritised over any “nice to haves”

Reference: (Pg 51. Guideline 13.1.4 (8)

Request: Please add “volunteers” to the list of suitably qualified people to undertake these activities.

Explanation: Our group has long standing volunteer possum and weed control activities that fit within this definition.

Reference: (Pg 51. Guideline 13.1.4 (11)

Request: Please add Makara Peak Mountain Bike Park to the list of ecologically sensitive areas adjacent to grazing areas where fencing should be prioritized

Explanation: Good fences are the best way to minimise goat incursions into our ecological restoration area where planting is taking place.

Reference: (Pg 51. Guideline 13.1.4 (16)

Request. Please reword as follows, “Develop guidelines for track development on WCC owned land which balance recreational and ecological values”

Explanation: The importance of conserving and enhancing biodiversity may at times need to be weighed against the recreational opportunity a track development may provide. Wellington is committed through the Our Capital Spaces plan towards developing a World Class Mountain Bike track network. One of the special elements of Wellington’s mountain bike culture is our desire to build and maintain permanent tracks in regenerating native forest of increasing ecological significance. We add richness to this forest through our use, appreciation and ecological restoration.

Reference: (Pg 51. Guideline 13.1.4)

Request. Please add (18) as follows. We will identify opportunities to purchase and further protect through District Planning Processes the Te Kopahau Reserve 2050 area.

Explanation: step towards Te Kopahau Reserve 2050

Reference: (Pg 55. Guidelines)

Request: Can you please add the following guideline 21. “We will work with community groups to deliver biodiversity outcomes, guided by existing agreements and the tiered support levels provided for in appendix 2”

Explanation: The current guidelines do not expressly recognise the WCC’s relationship with the community groups who do the work, despite recognising various other relationships

---

Reference: (Pg 63. Guidelines 1-5)

Request. Can you please remove or alternatively reword the guidelines 1 to 5 so that they mean something.

Explanation: We don’t understand how these guidelines could provide guidance.

Reference: (Pg 63. Guidelines)

Request: Can you please add the following guideline 16. “We will work with community groups to deliver biodiversity outcomes, guided by existing agreements and the tiered support levels provided for in appendix 2”

Explanation: The current guidelines do not expressly recognise the WCC’s relationship with the community groups who do the work, despite recognising various other relationships

---

Reference: (Pg 63. Guidelines)

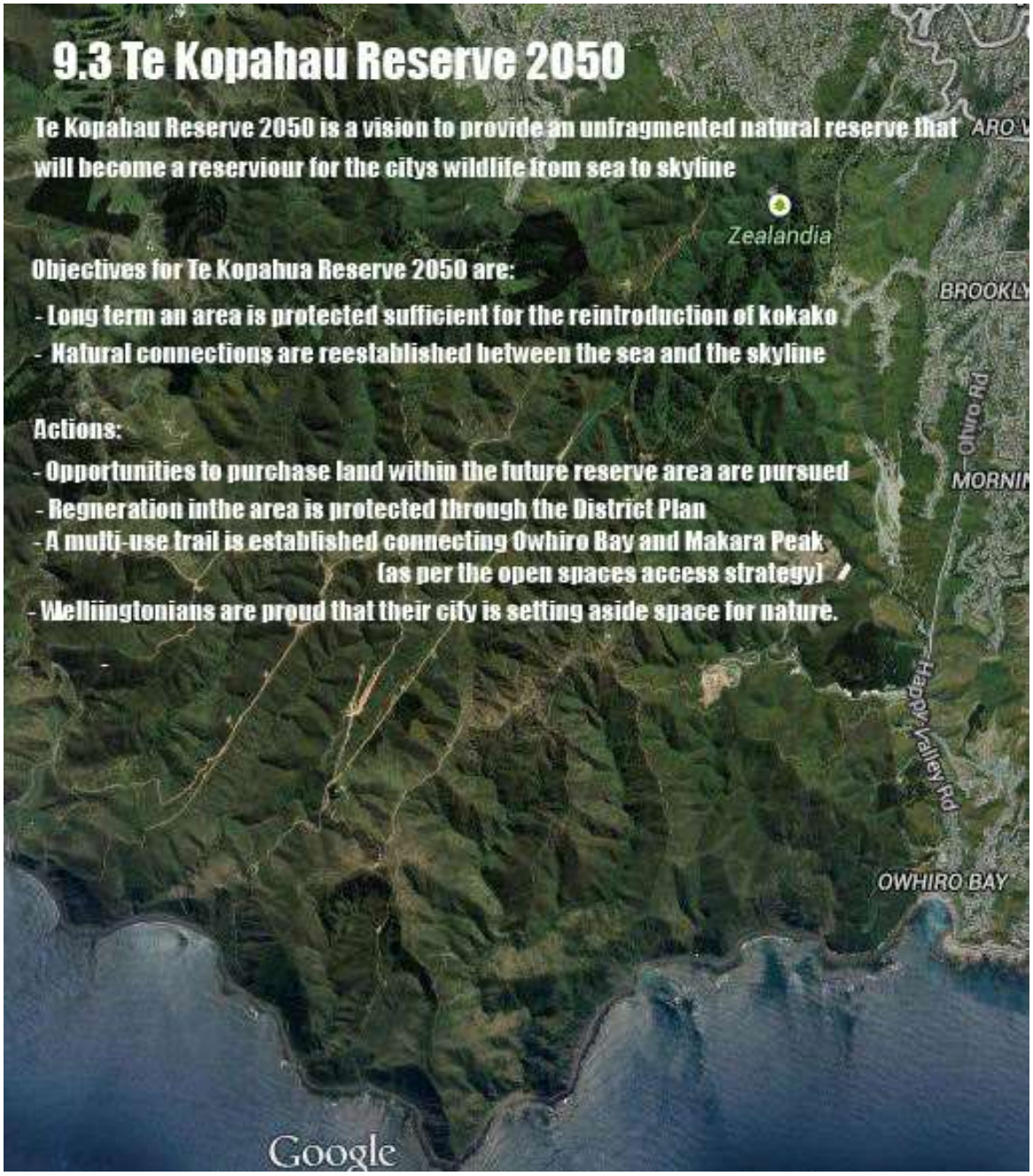
Request: Can you please add the following guideline 17. “We will ensure all Wellingtonians in suburban areas can access a natural space or multi-use trail network within a 10-minute walk or cycle.”

Explanation: People primarily connect with their natural environment by having access to it close to home.

Reference. Pg 76. Appendix 2

Request. Please add to support offered to Matai groups as follows: “Contractor briefing and supervision for any contractor hired by the WCC or group to work on the ecological restoration project” and “Ranger supervision of corporate work parties”. Please also add “further support may be negotiated through memorandums of understanding”

Explanation: The first two requests are support we have found we need as a volunteer organisation. The last is an observation that existing or future commitments through memorandums of understanding must be honoured.


9.3 Te Kopahau Reserve 2050
Te Kopahau Reserve 2050 is a vision to provide an unfragmented natural reserve that will become a reserviour for the citys wildlife from sea to skyline
Zealandia
Objectives for Te Kopahua Reserve 2050 are:
- Long term an area is protected sufficient for the reintroduction of kokako
- Natural connections are reestablished between the sea and the skyline
Actions:
- Opportunities to purchase land within the future reserve area are pursued
- Regneration inthe area is protected through the District Plan
- A multi-use trail is established connecting Owhiro Bay and Makara Peak (as per the open spaces access strategy)
- Welliingtonians are proud that their city is setting aside space for nature.
BROOKLY
Owiro Rd
MORNI
Happy Valley Rd
OWHIRO BAY
Google

Submitter Details

First Name: **Jessi**
Last Name: **Morgan**
Organisation: **Morgan Foundation**
On behalf of: **Geoff Simmons and Jessi Morgan**
Street: **PO Box 19218**
Suburb: **Courtenay Place**
City: **Wellington**
Country:
PostCode: **6149**
Daytime Phone: **+6421467122**
Mobile: **+6421467122**
eMail: **jessi.morgan@gmail.com**

Trade competition and adverse effects:
○ I could ○ I could not
gain an advantage in trade competition through this submission
○ I am ○ I am not
directly affected by an effect of the subject matter of the submission that :
a. adversely affects the environment, and
b. does not relate to the trade competition or the effects of trade competitions.

Wishes to be heard:
◉ Yes
○ I do NOT wish to speak in support of my submission and ask that the following submission be fully considered.

Preferred hearing location:
○ Oral Hearings - Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

Hearing Needs:

Correspondence to:
◉ Submitter
○ Agent
○ Both

Submission

1. Overall, do you support or oppose the general direction of Our Natural Capital?

◉ Strongly oppose ○ Oppose ○ Neither support nor oppose ○ Support ○ Strongly support

Why do you say this?
We support the use of the term Our Natural Capital and having a plan in place to increase biodiversity in Wellington. It is refreshing to see that you recognise the value that native biota bring to Wellington, both social and economic. Biodiversity is a real advantage for Wellington to leverage and created a place where skilled people want to live ala Sir Paul Callaghan. We congratulate you for recognizing the impact that cats have on our biodiversity and raising this as an issue. As a

council a lot of money and effort is spent on Zealandia and predator control in reserves and our urban area. This is futile if we don't control the damage and effect on native populations that the cats do. The Morgan Foundation, along with support from the Council, has put a significant amount of effort in the Enhancing the Halo program and this has been successful in getting urban trapping more mainstream. We would be happy to hand this over for the Council to build on.

---

2. Do you support the Guiding Principles, Goals and Outcomes?

○ Strongly oppose ○ Oppose ○ Neither support nor oppose ○ Support ◉ Strongly support

Why do you say this?
Generally we agree with the thrust of these, however we would go further - Wellington has the potential to be the first functionally predator free city in the world. We would like this to be the ultimate long-term vision and see a plan to move towards that.

---

3. Do you think we have identified the biggest issues facing indigenous biodiversity in Wellington?

○ Yes ◉ No

Your comments
With the burgeoning number of cats in Wellington (owned, feral and in colonies) there is a huge impact on our biodiversity. Wandering cats kill native birds. Studies have shown that in our cities cats kill native birds faster than they can breed.* The damage inflicted on native lizards and invertebrates is unknown but probably even greater- the Victoria University cat camera study suggested on average pet cats kill one lizard and three invertebrates each per day.^ This is a huge issue for our native wildlife, and one we need to deal with. The current definitions of feral, stray and companion cats are unworkable from a cat management perspective. Cats can wander and kill, cause damage or spread disease, while property owners have no reasonable recourse. Part of the solution is being able to identify companion cats and their owners, which can only be done through micro-chipping. Encouraging responsible cat ownership, including compulsory micro-chipping of cats, should be a priority for council - similar to what we have in place for dogs. * van Heezik, Y., et al. (2010) Do domestic cats impose an unsustainable harvest on urban bird populations? Biol. Conserv. 143, 121-130 ^ http://wellington.govt.nz/~/media/about-wellington/research-and-evaluation/natural-environment/2014-what-do-owned-free-ranging-domestic-cats-get-up-to.pdf

---

4. Do you think we have identified the right priorities in order to achieve our desired outcomes for biodiversity in Wellington?

○ Yes ◉ No

Your comments
Cat management, especially within the Halo area around Zealandia needs urgent attention. With the significant network of predator control in reserves, and increasingly in backyards, cats are now the most prolific wandering predator of native birds and reptiles within the city*. Without appropriate controls on cats investing money in Zealandia is a waste of time as birds aren't safe outside the fence. The Morgan Foundation has pulled together a huge amount of research on cat predation, both domestic and international, and would be happy to share this. Our motion cameras in

properties around Wellington showed that there are over 49 million cat trespasses each year. We are miles behind cat management in Australia (where most cities have cat management regimes in place) and Wellington has the opportunity to be a leader within NZ. * http://halo.org.nz/cat-control/

5. Do you think we have identified the right organisations to partner with to achieve our objectives?

○ Yes ○ No

Your comments

6. Do you think we have the right indicators and targets to measure our performance by?

◉ Yes ○ No

Your comments
Overall outcomes sound right. However need to include lizards in our native species. Lizards are extremely vulnerable to cat predation.

7. Do you agree with our direction for the tiered support for community groups?

◉ Yes ○ No

Your comments
We would support more education and support around predator control if these areas are not being adequately managed by contractors. The more involved these people are are protecting these areas from predators the better.

8. Is there anything you feel has not been adequately covered by the draft plan?

◉ Yes ○ No

Your comments
We need clear definitions of feral, stray and companion cats. We also need a plan for managing wandering cats, particularly within sensitive wildlife areas.

9. Do you have additional comments? (please attach additional pages via the 'Supporting Information' tab)

◉ Yes ○ No

Your comments

The recent finding of 18 Tui remains being found in Mapuia highlights the need for responsible cat ownership. It is futile to continue to spend ratepayer money to enhance biodiversity, in Wellington, while we don't have any means of enforcing responsible cat ownership. Anecdotally we are told that increasingly frustrated property owners are taking the law into their own hands - trapping and killing cats that trespass. There are a number of known cat colonies in Wellington. People are feeding these cats but the cats are not 'owned'. These colonies can be on council land but currently the council have no means to deal with them. This is not about devaluing or degrading cats. It is about making them more valuable, by making people more responsible for their cats. We need to manage cats like dogs. Zealandia, the Wellington Zoo and other council properties should be used to educate public about the risk of cats to our indigenous biodiversity and the importance of responsible pet ownership.

Attached Documents

File
Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

Submitter Details

First Name: **Wilbur**
Last Name: **Dovey**
On behalf of: **Otari Wilton's Bush Trust**
Street: **40 Warwick Street**
Suburb: **Wilton**
City: **Wellington**
Country: **New Zealand**
PostCode: **6012**
Daytime Phone: **04 499 1044**
Mobile: **027 499 1044**
eMail: **cweag.dovey@xtra.co.nz**

Trade competition and adverse effects:
○ I could ○ I could not
gain an advantage in trade competition through this submission
○ I am ○ I am not
directly affected by an effect of the subject matter of the submission that :
a. adversely affects the environment, and
b. does not relate to the trade competition or the effects of trade competitions.

Wishes to be heard:
◉ Yes
○ I do NOT wish to speak in support of my submission and ask that the following submission be fully considered.

Preferred hearing location:
○ Oral Hearings - Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

Hearing Needs:

Correspondence to:
◉ Submitter
○ Agent
○ Both

Submission

1. Overall, do you support or oppose the general direction of Our Natural Capital?

○ Strongly oppose ○ Oppose ○ Neither support nor oppose ○ Support ◉ Strongly support

Why do you say this?
With the increasing pressure on the natural environment due to pollution, increased mobility of the population and increasing population pressure, public education on threats to biodiversity and the value of preserving native biodiversity is of increasing importance. The enhancement of the city's status thanks to its policy on the conservation of its biodiversity must make it an increasingly attractive city to live in and for outside people to visit.

---

2. Do you support the Guiding Principles, Goals and Outcomes?

○ Strongly oppose ○ Oppose ○ Neither support nor oppose ○ Support ◉ Strongly support

Why do you say this?
The guiding principles, goals and outcomes are in line with international best practice in the area of managing indigenous biodiversity

3. Do you think we have identified the biggest issues facing indigenous biodiversity in Wellington?

◉ Yes ○ No

Your comments

4. Do you think we have identified the right priorities in order to achieve our desired outcomes for biodiversity in Wellington?

◉ Yes ○ No

Your comments

5. Do you think we have identified the right organisations to partner with to achieve our objectives?

◉ Yes ○ No

Your comments
We would like to add Otari Wilton's Bush to the list of organisations in Goal 4.3.1c in the development of a Centre of Excellence in ecological restoration. The highly qualified staff at Otari is already conducting research in the restoration of endangered plant species and the plant biodiversity present in the reserve is the best in the Welllington City area. A number of research projects have also been completed or are under way in conjunction with Victoria University on subjects utilising the biodiversity present in Otari Wilton's Bush.

6. Do you think we have the right indicators and targets to measure our performance by?

◉ Yes ○ No

Your comments
We are pleased to see that these are based on the City Biodiversity Index.

7. Do you agree with our direction for the tiered support for community groups?

(•) Yes ( ) No

Your comments
We are pleased with the emphasis placed on working with community groups for the implementation of the Wellington Bioidiversity Strategy and look forward to contributing towards this. We particularly value the cooperation and good working relationship we have with Council staff in protecting the biodiversity of Otari Wilton's Bush as an important element in the protection of biodiversity in the whole of Wellington City and the region.

8. Is there anything you feel has not been adequately covered by the draft plan?

(•) Yes ( ) No

Your comments
While we appreciate that Our National Capital is a draft strategy document at this stage we would very much like to see the development of a timeline with costings to give an idea of how the Council sees the strategy being implemented over the period of the Action Plan's implementation. In its present form it appears to us very much of a wish-list based on very sound principles more than an actual action plan.

9. Do you have additional comments? (please attach additional pages via the 'Supporting Information' tab)

( ) Yes (•) No

Your comments

Attached Documents

File
Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

Comments on Draft WCC Plan for Consultation

Our Natural Capital – Biodiversity Strategy and Action Plans

Bob Stephens
Senior Research Associate, School of Government, Victoria University of Wellington

Introduction

I would like to thank the WCC for the opportunity to comment on the Draft Report on Natural Capital – Biodiversity Strategy and Action Plan. In general it is an excellent report, indicating the commitment that WCC is making towards the natural environment and the restoration of the natural environment towards its original state. The report thus links in with other reports on the Town Belt and Botanical Gardens, and shows that the Council has a strong commitment in the area of conservation. From my perspective there are, of course, aspects that are missing or require further elaboration in the draft plan, and these are noted below.

Summary and Introduction

1. While there is an excellent definition on what constitutes Wellington's indigenous vegetation, there is some confusion in the document about biodiversity and indigenous biodiversity (in the Wellington region). This seen in 2.2 *What is Biodiversity*? The Botanic Gardens view on biodiversity incorporates exotic and indigenous plant species, and Otari takes a New Zealand perspective on indigenous biodiversity, not just the Greater Wellington region, whereas the emphasis for community groups planting species relates to Wellington indigenous species.
2. The report is aspirational (excellent), but has limited comment on how to implement the strategy, nor the costs of the policy – both direct and indirect in terms of other projects or plantings etc. foregone. Moreover, there is limited comment on monitoring progress to the objectives, and who is to do the monitoring. The Council needs to set a mechanism whereby the conflict between economic (including housing) development and environmental issues can be resolved. This Biodiversity Strategy cannot be seen in isolation of other Council initiatives.
3. Community groups should include the Wellington Branch of Forest and Bird as they make a significant contribution to alerting the public to adverse biodiversity impacts as well as undertaking significant pro-biodiversity work.
4. In 2.2 it could be stated that later sections give advice and guidelines to both individuals and nurseries on what constitutes Wellington indigenous biodiversity (not pohutukawa). Comment could also be made on how to ensure

that new housing estates incorporate both preservation and development of Wellington indigenous biodiversity into their plans.

5. In Section 4 comment is made about the Resource Management Act 1991 – of course it is currently subject to amendment and these amendments, if implemented could have a substantial effect on the relationship between the environment and economic development strategies.

Vision, Principles and Goals

1. Wellington is a 'living city', but living is more than just Wellington indigenous biodiversity: it covers coffee bars, shopping precincts, Weta, and an uncluttered (with buildings) Waterfront. The Draft Plan should show how Wellington indigenous biodiversity can be included into these other aspects of a 'living city', rather than standing in isolation from them.
2. The Future needs to also state how corridors of vegetation can be included into district plans [incidentally, I would like to know where Kinnoull Station is].
3. Building on 'natural capital' needs to show how this principle can be included into new developments such as estates, ports, car parks (and by implication roads and public transport).
4. The principles should cover the gradual weeding out of non-Wellington indigenous biodiversity plants (the Botanical Gardens includes many pest plants such as agapanthus, Mexican daisy and even barberry), and their replacement with Wellington indigenous biodiversity plants. The latter will require a substantial increase in the production and provision of Wellington indigenous biodiversity plants through nurseries such as WCC Berhampore nursery, Forest and Bird's nursery and that of many community groups: there will be a financial cost associated with this expansion.
5. There is limited knowledge in the general public, or even among some of the community groups, of what constitutes Wellington indigenous biodiversity as opposed to National (karo, pohutakawa for example). So a goal could be to increase the knowledge of both the population and nurseries of what constitutes Wellington indigenous biodiversity.

Concepts and Action Plan

1. Given point 5 above, it would be useful in the Concepts section to specify that it is *Wellington-based* indigenous species.
2. Spreading out from Zealandia is too limiting, given Otari Bush and Ngaio Gorge, and even the southern reaches of the Botanical Gardens, all of which have a far greater native bush coverage.
3. In terms of Objectives, a very important first step is to get people to visit these areas above – I am always surprised as to how few Wellingtonians have heard of Otari and Ngaio Gorge, let alone visit them, or even the Southern end of the Botanical Gardens. To get buy-in from the general public, it is necessary to get

people (aka ratepayers) to enjoy and be willing to preserve and develop Wellington-based indigenous flora and fauna.

4. While the paper states pest traps, it is silent on the eradication of weeds and even wilding pines, which are starting to reappear on Te Ahumairangi.
5. In terms of the Blue Belt, there are several items that can be added: the need to increase the size and number of Marine Reserves; recognising the role of wading birds and their need for a clean and extensive water habitat; vigilance in stopping poaching of paua etc., and overfishing; and also to reduce water run-off from roads and footpaths – there was an earlier Council document relating to the filtering of rain flow through wetlands – Waitangi Park, or cobblestones rather than concrete.

The Action Plans are very detailed, and I find it commendable that most of those actions needed are listed. I also like the distinction made between Protect, Restore, Connect and Research. However, it is probably optimistic to expect much of the way of grants etc. from liaison with other parties, so that the bulk of the work will either have to be paid for by the Council, or rely upon volunteers/community groups to achieve the Objectives. Council will thus need to be vigilant to ensure that this conservation plan is placed high in the Council's list of objectives, and receives the appropriate level of funding to achieve the conservation objectives. A few detailed points:

1. S.1.1.1 – It is not just limiting new developments on Te Kopahau, but starting to restore it, especially be the continued eradication of goats, and to a lesser extent possums that continually travel into Wellington Central.
2. S.1.2.2b – Should have a priority of 1 – without that being of high priority much of the other objectives will be difficult to achieve.
3. S1.3.1d – Add Makara Peak and British Peak – possums continuously come across from those areas to Johnson's Hill and Wrights Hill. This also applies to S1.3.3b.
4. S1.4.2 – Ensure that private developers, especially new housing estates, preserve biodiversity rules
5. S.2.1. Add 'quality' to air and water
6. Encouragement, information and funding for Community Groups and Forest and Bird Wellington Branch to provide native eco-sourced plants.'
7. S2.1.3: an observation – the Botanical Gardens seem to be the worst example of supporting this objective: there are a large number of weed species that are allowed to grow, and the new planting on Magpie Lawn defies description and sense.
8. S2.4 – the ecological networks need to link with the Hutt Valley, Porirua to provide ecological corridors.
9. S2.4.2 – it is not just 'assist landowners with seeking grants', but often informing them that they have ecological potential areas, and then providing encouragement.
10. S3.1.1 – Northern Rata not Pohutukawa; tawa not kauri etc.

11. S3.2.3b seems to have several different objectives: edible planting is a great idea, but does not fit in with conservation ideas.
12. S3.3.6 – BioBlitz needs to be undertaken more frequently – every 2-3 years as a lot of damage and growth of pest animals and species can occur over a 5 year cycle. I think DoC has a 4 year cycle for bio-diversity control and monitoring.
13. S3.4.2/3 – Forest and Bird should be added to the list with a strong bio-diversity focus.
14. S3.4.4f – add: areas where there is a lack of community groups working and are needed. Also inform people of native alternatives to existing plantings – renga-renga rather than agapanthus. This should also applies to plant nurseries.

Biodiversity

S.12 – useful to include habitats that are potentially regenerating – areas covered in gorse, or retired, retiring farm land. Some of the regenerating mahoe etc. may run into the difficulty of becoming a single species forest as there is little light getting through for any seeds to propagate, and for many areas, the degree of propagation is likely to be minimal or of weed species such as karo and tree lupin.
The coastal dunes from Owhiro Bay to Karori Rocks have been ruined by 4-wheel drive vehicles, with most of the native vegetation that was there 20 years ago having totally disappeared. Here is the typical conflict between recreation and conservation.
Introduced species can alter the composition of birds and geckos: karo increases tuis and tree lupins Kereru, probably compared to pre-European and even Maori times.

Context

Most of this large and important section is excellent. There are a few issues, of course:

1. It may be useful to start this section with some brief economics. The Guidelines (13.1.4) should come at the start of this section as it sets the criteria by which the other actions are to analysed.
2. Thus add a section on economics and financial planning. There are a range of benefits to be achieved by each action and areas of habit loss and pest control. But each has different costs associated with them, and likelihoods of success. One would not want a Cost-Benefit Analysis to be done of options, but some guts-feel from environmental council staff may suffice – control of goats may have a huge impact on the development of Te Kopahou or Terawhiti, at relatively low cost, while eliminating karo from the South Coast may reap the same benefits, but at a huge cost. Prioritisation is not just about biological control mechanisms, but also likelihood of biological success and the cost of implementing the control mechanism. The guidelines may also have to indicate the relative roles of council staff and volunteers, and how the volunteers have to follow the overall council plan.

3. 13.1.3(a). Control of species – what is the response when it happens of landowners cannot, or are unable, to control an area, and even when old man's beard, for example, grows on Council land. Is it appropriate to inform the Council (they cannot cover every inch of Wellington)? Some species currently stabilise banks – agapanthus, gorse, for example – there is an issue of control of these species when eradication may cause worse, immediate damage. There is discussion on the fencing of properties to exclude goats etc. – who should pay for that fencing (and goats are notorious for getting around fences).
4. 13.1.3 (c). Pollution and sedimentation do not just influence the direct sea life, but also birds which feed on those molluscs etc. Many of the streams pass through old tip areas – Kaiwharawhara Stream goes under Ian Galloway and Appleton Parks, where leaching from the tips seem to enter the water ways: may be impossible to deal with, or very expensive filtration plants are required.
5. 13.1.3 (d). Acceptance of climate change is almost the starting point of the whole document: it is the largest long-term impact on the natural environment, within which the short-term impacts occur. Many plant and bird species will gradually extend their range south; the heavier rainfall makes the introduction of Waitangi Park filtration-type systems more necessary (the Water sensitivity water design).
6. 13.2.2 Add Forest and Bird nursery to restoration planting programme. Restoring the integrity of areas – the first growth species of mahoe and kohekohe often have a tendency to block out the light, and thus preventing the next stage of ecological recovery: natural regeneration may have to be controlled, to ensure long-term appropriate regeneration. Track building should include weed control as well as the maintenance of tracks. Beyond planting: windfall of macrocarpa etc. is useful for food sources etc. but care must be taken about wilding pines that often result from the open spaces created by the windfall.
7. 13.2.5 (13) 'move birds' this raises the question of what to do with blackbirds, starlings, pigeons, all of which are introduced pests. (18) 'strategic approach' – without specifying the strategy, that says nothing.
8. 13.3. The CBD is an area where there is little relationship to the natural environment: a case for more parks along the lines of Midland Park. Also, the Waterfront needs to be kept as a natural environment as far as feasible, not as a place for more buildings. An interesting and often not understood reason for indigenous forest biodiversity, as opposed to pine trees etc. is how native forest provides such a shelter from Wellington's gentle zephyrs so that they provide recreational opportunities when the wind is blowing.
9. Community restoration groups – provide a reference to where these can be located, who to contact, what is the relationship between the community group and the Council, and how to establish a new site if there is a gap.
10. 13.4.3 A distinction can be made between improving the existing Wellington-based indigenous biodiversity in area, from increasing the level and size of

Wellington-based indigenous biodiversity- the former would relate to something like Ngaio Gorge, the latter to Te Kopahue. In terms of lizard distribution, my daughter found, on Stephens Island, that lizards and skinks were prevalent on the grasslands but rare in the areas of regeneration. In other words, a range of habitats need to be created, so that different species can have areas ecologically suited to them.

Conclusions

1. A well-thought out document that should add to the pressure for greater Wellington-based indigenous biodiversity, providing information to the Council and the general population.
2. The Report needs to be integrated with other aspects of the WCC strategy, and not be a stand-alone document.
3. Cost impacts should be added to the priority – many small gain but low cost approaches may be more cost effective than a couple of big schemes.
4. In addition, the effectiveness of the different approaches to increase Wellington-based indigenous biodiversity should be considered, given cost (rates) limitations. Is it feasible to control goats, or mustelids to a sufficient level that Wellington can become a haven for all Wellington-based indigenous biodiversity plant and animal species.
5. This needs to link in with the areas of highest priorities – is it Te Kopahou, which few people visit but has potentially high ecological significance, or Massey memorial with high visitation rates, but is an area which has ecological alternatives such as the Eastern Walkway.
6. The division between Council and voluntary groups, and how to ensure that the voluntary groups are co-ordinated into the Council plan for all of Wellington.
7. The report needs to indicate how the strategy is to be implemented, and the costs of the policy – both direct and indirect in terms of other projects or plantings etc. foregone. Moreover, comment needs to be made on the mechanisms for monitoring progress to the objectives, and who is to do the monitoring.

Again, thank you for the opportunity to participate in this development of a Wellington-based indigenous biodiversity strategy, and I wish it every success in its progression through Council. I am willing to make an oral presentation to Council if that would be beneficial.

Yours truly,
Robert Stephens
Senior Research Associate, School of Government, Victoria University of Wellington

Submitter Details

First Name: **Paul**
Last Name: **Ward**
Organisation: **NA**
On behalf of: **NA**
Street: **25 Owen Street**
Suburb: **Newtown**
City: **Wellington**
Country:
PostCode: **6021**
Daytime Phone: **04 389 2097**
Mobile: **0211184329**
eMail: **pstanleyward@yahoo.com.au**

Trade competition and adverse effects:
○ I could ○ I could not
gain an advantage in trade competition through this submission
○ I am ○ I am not
directly affected by an effect of the subject matter of the submission that :
a. adversely affects the environment, and
b. does not relate to the trade competition or the effects of trade competitions.

Wishes to be heard:
◉ Yes
○ I do NOT wish to speak in support of my submission and ask that the following submission be fully considered.

Preferred hearing location:
○ Oral Hearings - Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

Hearing Needs:

Correspondence to:
◉ Submitter
○ Agent
○ Both

Submission

1. Overall, do you support or oppose the general direction of Our Natural Capital?

○ Strongly oppose ○ Oppose ○ Neither support nor oppose ○ Support ◉ Strongly support

Why do you say this?
Living in a city and environment intrinsically connected to its natural values is a core reason myself and my partner returned to Wellington from overseas to raise a family here. Our OE encompassed an Oxford masters, working for Discovery Channel, and working as a corporate lawyer respectively, and we returned, keen to contribute those experiences in our hometown. Raising kids amongst extended whanau and in a 'livable' city where people walked and talked to each other and have the

freedom to explore was also influential in our decision. Soon after returning, while paused on a dawn run above Aro Valley to check out a curious kaka parrot in a tree, it flopped down and landed on my arm. That moment encompassed why our decision to return home was a good one.

2. Do you support the Guiding Principles, Goals and Outcomes?

○ Strongly oppose ○ Oppose ○ Neither support nor oppose ○ Support ◉ Strongly support

Why do you say this?
See above

3. Do you think we have identified the biggest issues facing indigenous biodiversity in Wellington?

◉ Yes ○ No

Your comments

4. Do you think we have identified the right priorities in order to achieve our desired outcomes for biodiversity in Wellington?

◉ Yes ○ No

Your comments

5. Do you think we have identified the right organisations to partner with to achieve our objectives?

◉ Yes ○ No

Your comments
As organizations like Predator Free NZ gather steam new partnerships may become apparent

6. Do you think we have the right indicators and targets to measure our performance by?

◉ Yes ○ No

Your comments

7. Do you agree with our direction for the tiered support for community groups?

Yes No

Your comments

8. Is there anything you feel has not been adequately covered by the draft plan?

Yes No

Your comments

9. Do you have additional comments? (please attach additional pages via the 'Supporting Information' tab)

Yes No

Your comments

I've been involved in a volunteer group of residents helping restore the natural capital of Polhill Reserve, abutting Zealandia and the suburbs of Aro Valley, Highbury and Brooklyn. The Polhill Restoration Group uses volunteers to run trap and monitoring lines in the reserve and complement the work that the WCC and WRC have been doing there. It is a unique space because it's so close to the city, but also - as part of 'The Halo' - enjoys significant spillover birds from Zealandia. The reserve is well patronised by residents, students, runners, mountain bikers, dog walkers and ramblers. I regularly use the park as part of a running route and got involved when I noticed the rare birds that were inhabiting it and wondering about what their survival chances were 'in the wild'. The most high profile of these is the saddleback, which in October last year were discovered to be nesting, just up from Holloway Road. They were the first known tieke to nest in the wild on mainland New Zealand outside of a sanctuary, in over a century. These charismatic ancient wattlebirds (cousins with huia and kokako) would've been common in Wellington when settlers arrived. I've been documenting the survivor story - photographing the progress of the trailblazing tieke family - and sharing it on social networks. The story has received national and international attention. Dom Post and Stuff have run pieces and photo albums shared on Facebook by umbrella groups like Forest & Bird and Zealandia have received thousands of likes and been shared hundreds of times, inspiring similar groups the length of the country. Typical of responses was this one from Avon River Park in Christchurch who shared a post with this message: 'So you know we want tui and more pork in the red zone. How about saddleback, kaka and robins? Far-fetched? ... We can do this Christchurch!' People were fascinated by the pictures of these rare birds in the wild, not inside a sanctuary fence. These birds - kaka, kakariki, saddleback/tieke, robin, whitehead, hihi/stichbird - are usually associated with trips to offshore sanctuaries like Kapiti or Tiritiri Matangi, not a scrappy piece of regenerating bush just five minutes from the top of Willis St and the heart of Wellington City. Many comments under the photos of kaka and saddleback asked: 'where is this?' and expressed surprise at the urban location. Punters were also entranced by the survivor story, as the birds faced up to the threats of predators (cats, stoats etc). One of the juveniles went missing a few weeks after fledging, and the other lost most of its tail feathers. These have since regrown and the tyro tieke has been raised to independence. This is a fantastic success (it has been described as a 'significant conservation story') and credit to the Halo vision of Zealandia and the pest suppression work done by the councils (regional and local) to enable it. I sincerely hope that this pest and weed control continues as a base line of the 'natural capital' being fostered in the reserve, around the halo and further afield. It is also clear that we need to undertake more monitoring of the animal population in the gully so we can quantify how effective the restoration efforts are. We look forward to further coordinating the work with other community groups working around the halo

(Makara Peak, Crofton Downs) and joining the dots with projects in Miramar and elsewhere. Council support is key in the ongoing vitality of these volunteer efforts. On the hillsides of the gully I've had kaka come within touching distance and robin land on my arm: encounters inconceivable in Wellington not so long ago. I have met dozens of people while tracking the saddleback (from mountain bikers and kids to tourists) who are passionate about Polhill and excited about the prospects for the city: the burgeoning spillover clearly means something special to them, and is part of their Wellington identity. Like the kaka and tui boom in the city, these Polhill birds are backyard ambassadors for a powerful and world-leading vision of what urban + nature can mean in the 21st Century. I fully endorse the Our Natural Capital vision.

Attached Documents

File
Polhillsocialmedia
Polhillsocialmedia2
Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

2 people like this.

Forest & Bird shared Paul Stanley Ward's album.
28 November 2014 ·

Some great tieke / saddleback shots from Paul Stanley Ward as he documents a tieke family surviving outside a predator free fence. Phil

Show Attachment

Unlike · Comment · Share · 492 16 1

Alfie Kaka shared Paul Stanley Ward's album.
28 November 2014 ·

Wonderful news that the saddleback fledglings over the fence in Polhill Reserve are still doing so well!

Show Attachment

Like · Comment · Share · 152 5

Enhancing the Halo shared Paul Stanley Ward's album.
27 November 2014 ·

Great to see the tieke are still surviving in Polhill...

Show Attachment

Unlike · Comment · Share · 17 1

Paul Stanley Ward shared an album to the group: Polhill

Avon River Park shared Paul Stanley Ward's album.

6 January at 20:06 ·

So we know we want tui and morepork in the red zone - how about saddlebacks, kaka and robins? Far fetched? Well, all these photos were taken OUTSIDE Zealandia, in suburban Wellington. Here's what the photographer said : "Yip, they're all taken in Polhill Gully, which borders Zealandia Ecosanctuary on its western side, and the suburbs of Brooklyn, Highbury and Aro Valley on the others; it's five minutes walk from the top of Willis St in the city. The sanctuary spillover (combined with sustained possum suppression courtesy of the Regional council) is going strong, and many of these birds (eg. kaka, kakariki) are frequenting backyards as far away as Miramar. They're ambassadors for the Enhancing the Halo vision and spurs for residents to get engaged with pest control and restoration. Polhill is patronised by mountain bikers, runners, ramblers and residents, and volunteers run a couple of trap lines there." We can do this Christchurch.

Show Attachment

Like · Comment · Share · 49 5

Biodiversity – WCC 3 March 2015

Four points, based on personal observations.

1) Pest Plants - **include Himalayan Balsam please**.
2) lack of mention of **dogs impact to biodiversity. Please consider.**
3) **Old Man's Beard** infestations on neighbouring properties to Parks not treated adequately by Regional Council.
4) **Native Fish and eel migration** impediments – also Korimako catchment

In more detail, below

1) Pest Plants - **include Himalayan Balsam please**.

The pest list could be endless I know, but one plant left off your list is Himalayan Balsam (*Impatiens glandulifera).* This plant was intensely prevalent in Trelissick Park 5 or 6 years ago - with large stream side infestations - crowding out stream side plantings. Annual removals have reduced the prevalence - so that we have been able to focus on the source of the seeds.

A main sources of seeding in the Korimako catchment were plants in Cummings Park. In the Kaiwharawhara catchment the sources were Otari/Wilton and Churchill Reserve. Volunteers have substantially reduced the numbers of such plants in the past two years. (In the case of Otari/Wilton their staff did the major portion of removal upstream of the picnic area.)

The above is specific to one pest plant - others are just as bad - all take time and effort and coordination between various areas to alleviate impact.

2) lack of mention of **dogs impact to biodiversity. Please consider.**

In the 82 pages of strategy, there is one reference to dogs - mainly to say to keep on leash near penguins. There are other considerations beyond penguins.

As Myfanwy has been quoted.... "Huntleigh Park is part of a predator-free community and they are putting in hundreds of hours of effort to protect these birds. So to see this sort of needless event is quite heart-breaking. replace Huntleigh with Trelissick and the same is true, excepting that the City has made Trelissick Park off-leash for its entire 20+ hectares, both on track and off-tracks, at all times of day and year.

As someone who spends a fair amount of my time in the Park off-track, I am often visited by dogs which are not under control. Not a problem to an adult human, but it is a problem to fledgling birds in season.

In the longer term it will require education of responsible dog owners to keep their dogs under control on (and off) the Trelissick Park tracks. It could also require sign posting in season to require dogs to be on leash on the lesser used wilderness tracks in Trelissick. In the open areas near the magazines and in Wightwick's Field

this isn't an issue - but on and off the lesser tracks are likely to be locations for potential native bird nestings.

While I can't verify specific dog kills of native birds in Trelissick Park, Kakas are particularly vulnerable in trying to establish safe nesting areas.

Baby ducklings (not sure if considered native or not) have been reported as being killed by dogs, particularly in the Kaiwharawhara catchment.

The City made Trelissick Park totally open to dogs, on and off track in its last revision to dog policy in Wellington. This change was not part of the proposed changes to dog policy at that time - so was hard to object to in advance. There was no preparation by WCC Animal Control to mitigate or educate on adverse effects, or responsibilities of dog owners. The only thing done was to signpost Park entrances saying 'dogs off leash' in the Park.

As Myfanwy is quoted the Council provides appropriate areas for this where our native wildlife isn't at risk

Trelissick Park wilderness and biodiversity aspects suffer in comparison to Wilton Bush in this regard. Dogs are not allowed off-leash in the 100+ hectares of Wilton Bush at any time for instance.

3) **Old Man's Beard** infestations on neighbouring properties to Park not treated adequately by Regional Council.

Since OMB is no longer treated as a noxious weed in Wellington City (contrasted to Hutt), the Regional Council refuses to do anything with neighbouring properties to Trelissick Park. They will only take action if an adjoining private property owner makes a formal complaint about their neighbour, and attests that they have no OMB on their own property. WCC should be able to represent Trelissick Park and make representation to the Regional Council on behalf of the Park. Much OMB infiltration is suspected from adjoining private properties.

4) **Native Fish and eel migration** impediments – also Korimako catchment

There is adequate strategy on native fish – but the following points come to mind.

- The reference to the Kaiwharawhara Stream should be expanded to recognise the Korimako Stream. While maybe meant to be a tributary of the Kaiwharawhara in your document, I believe the Korimako is a larger catchment and also subject to more damaging storm water intrusion. *The number of eels in the Korimako are definitely much depleted from a decade or two ago.*
- Man made dams impede migration of both fish and eels. Some of the observed dams are short lived between storms and likely to be built by energetic kids, but some more major structures were erected in recent years by a particularly assertive dog owner – wanting water play areas for his dogs. These have been dismantled when found to insure at least one fish/eel migration path through the rocks.

- The City debris trap on the Kaiwharawhara has been lowered to be more fish and eel friendly. Thanks to the City for their efforts to reduce the detrimental effects. It may take many years for the damage to fish/eel migration to be undone. The volunteers keep a watchful eye to ensure fish/eel passages remain open.

Regards,

Bill Hester

6A Trelissick Crescent, Ngaio, 04 934 1404

Submitter Details

First Name: **Peter**
Last Name: **Henderson**
Street: **78 Homebush Road**
Suburb: **Khandallah**
City: **Wellington**
Country: **New Zealand**
PostCode: **6035**
Daytime Phone: **04 479 0679**
eMail: **peter.henderson@xtra.co.nz**

Trade competition and adverse effects:
○ I could ○ I could not
gain an advantage in trade competition through this submission
○ I am ○ I am not
directly affected by an effect of the subject matter of the submission that :
a. adversely affects the environment, and
b. does not relate to the trade competition or the effects of trade competitions.

Wishes to be heard:
◉ Yes
○ I do NOT wish to speak in support of my submission and ask that the following submission be fully considered.

Preferred hearing location:
○ Oral Hearings - Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

Hearing Needs: The draft Biodiversity Strategy and Action Plan, as a document, has much to commend it. The question is, however, will this document have the same lack of impact as previous excellent environmental policies and proposed strategies because of Council's commercial opportunism along with its support of property speculators? It will be a great day when the environment receives adequate funding and volunteers construct the runway extension, build a film museum or whatever. .

Correspondence to:
◉ Submitter
○ Agent
○ Both

Submission

1. Overall, do you support or oppose the general direction of Our Natural Capital?

○ Strongly oppose ○ Oppose ○ Neither support nor oppose ○ Support ◉ Strongly support

Why do you say this?

---

2. Do you support the Guiding Principles, Goals and Outcomes?

○ Strongly oppose ○ Oppose ○ Neither support nor oppose ○ Support ◉ Strongly support

Why do you say this?

3. Do you think we have identified the biggest issues facing indigenous biodiversity in Wellington?

◉ Yes ○ No

Your comments

4. Do you think we have identified the right priorities in order to achieve our desired outcomes for biodiversity in Wellington?

◉ Yes ○ No

Your comments

5. Do you think we have identified the right organisations to partner with to achieve our objectives?

◉ Yes ○ No

Your comments

6. Do you think we have the right indicators and targets to measure our performance by?

◉ Yes ○ No

Your comments

7. Do you agree with our direction for the tiered support for community groups?

◉ Yes ○ No

Your comments

8. Is there anything you feel has not been adequately covered by the draft plan?

Yes No

Your comments

9. Do you have additional comments? (please attach additional pages via the 'Supporting Information' tab)

Yes No

Your comments

Attached Documents

File
Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

SUBMISSION ON WCC DRAFT BIODIVERSITY STRATEGY AND ACTION PLAN 2014

Name and contact details

Jennifer Boshier
68 Creswick Terrace
Wellington 6012
Phone 022 037 0136

Making a submission

I am making a submission on behalf of the Creswick Valley Residents Association, which has both a practical and a strategic interest in the city's biodiversity.

I would like to make an oral submission on the morning of 19 March 2015.

Submission

1 Assessment of the success of the previous biodiversity action plan is not mentioned in this document.

There is no section in this strategy document where results of the success or progress of the 2007 biodiversity action plan are mentioned. It therefore is somewhat difficult to assess whether the priorities in the current draft plan and the related actions are relevant to the ongoing need to mitigate current and future threats to biodiversity in the Wellington City area.

2 Comments on the goals and outcomes

2.1 Goal 1 Protect biodiversity

The document states that most of the indigenous biodiversity has been lost over time, ie

- less than 5 per cent remains of the podocarp-broadleaved forest which once was the dominant land cover within the Wellington City area
- about 2 per cent of original sand dunes remain
- about 1 per cent of wetlands are left today.

Therefore the identification of ecologically significant sites (at a scale much greater than Map 1 in the document) is essential. These areas should include critical locations to maintain connectivity in the landscape. The sites identified by the Wellington Regional Council as regionally significant should be added into the list of ecologically significant sites. It is not clear whether this has been done.

The focus of this draft Biodiversity Strategy and action plan should be to identify both the ecologically significant areas and those areas that have potential to be restored to provide functioning ecosystems, and protecting them from inappropriate land development.

Once these areas have been identified and made public, they should be listed in the District Plan as areas to protect, with no ability for land development to remove significant areas of vegetation.

2.2 Restore biodiversity

The first goal (page 18):

"The loss or decline of our indigenous biodiversity is reversed and self-sustaining and resilient ecosystems created".

This seemingly laudable statement requires further thought and some careful definitions eg what is a "resilient ecosystem" and why does an ecosystem need to be resilient? How do we reverse a loss? How do we demonstrate that decline in our indigenous biodiversity has been reversed?

Resilience is the capacity of a system to absorb disturbance and still retain its basic function and structure (Walker and Salt 2006). Resilience science identifies two kinds of resilience: general resilience and specified resilience. General resilience refers to a system's preparedness and capacity to cope with a wide range of known and unknown disturbances. Specified resilience refers to the ability of a particular part of a system to respond to a particular kind of disturbance. Resilience management should aim to address both general and specified resilience to ensure both predictable and unpredictable or sudden changes are catered for.

The biodiversity strategy should be clear about what is meant by resilient ecosystems.

The related outcome statement (page 18) needs a more careful description – "All known original ecosystems within Wellington are well-represented and are self-sustaining…" This statement is meaningless and needs to be re-worked. What does "well-represented" mean and what does a self-sustaining ecosystem mean? Without clear definitions, relevant outcomes and actions cannot be devised and monitoring to achieve these outcomes cannot be detailed.

The Greater Wellington Regional Council (GWRC) identifies and prioritises sites with the highest biodiversity values for management. These sites are managed as Key Native Ecosystem (KNE) sites to maintain or enhance the biodiversity values present. It would be useful for the Wellington City Council to liaise with the GWRC to ensure there are no gaps or dual identification of sites between the two councils' biodiversity strategies.

There is an underlying assumption in the draft Biodiversity Strategy that restoration of habitats and ecosystems will produce habitat of good condition and functionality. Restoration of habitats is a long term goal and requires careful monitoring to ascertain that the condition and functionality of habitats has improved. Substituting new plantings for a mature stand of vegetation does reduce the functionality of the vegetation; it takes many years to create mature vegetation as habitat for species.

There seems a risk too, that the focus will be on selected, but disconnected, habitats of "good" condition. CVRA values open spaces for their undeveloped character and ability to provide connectivity through the surrounding urban landscape. That attribute should be an important part of biodiversity and

landscape values in a biodiversity strategy. The retention of open spaces can coincide with the concept of creating "stepping stones" to areas of established biodiversity habitat, biodiversity corridors for indigenous fauna and flora and buffers for habitats of higher value or at greater risk.

2.3 Outcome to connect people to biodiversity

There may be a tendency for the Council to focus its efforts on this set of goals and outcomes, as it is "easier" than attempting the more difficult task of achieving biodiversity outcomes. However, this tendency should be resisted and the amount of effort allocated to the outcome should be commensurate with its value to the biodiversity outcomes.

This aspirational goal is notoriously difficult to assess whether it is being achieved. There is a tendency to rely on input and output measures to demonstrate that people are more "connected" to biodiversity (although it is not clear what is actually meant by the term "connected" in this context).

A robust way of assessing change in the "connection" of people to biodiversity could be to conduct five-yearly surveys of a sample of the Wellington city population to see if attitudes to the value of biodiversity to the city, and participation in biodiversity-related activities is changing over time. Contextual information is also required to be able to interpret the data in a sensible fashion.

2.4 Outcome to research biodiversity

This section is particularly opaque and not at all clear why research is needed, what needs to be researched, how the research will assist in the management of some aspect of biodiversity and who will do the research.

2.4.1 To be world leaders in urban biodiversity

This goal, and its associated outcome (page 18), is not at all requires further clarity. The outcome "We are leaders in managing indigenous biodiversity in an urban context" seems to be aspirational and, in CVRA's view, requires much more definition to make this a workable outcome.

There is no indication as to how this outcome might be achieved and why this is seen to be a goal for research. If one wants to be a world leader in managing biodiversity in an urban context, surely the focus should be on innovative management of biodiversity.

Internationally, there are some resources that may be helpful to the Council. For example the Curitiba Meeting on Cities and Biodiversity: Achieving the 2010 Target
http://www.unep.org/urban_environment/events/citiesbiodiversity.asp

(accessed 25 February 2015).

UNEP noted " However, there are common aspects to successful interventions which indicate that, in order to manage biodiversity successfully, cities have to mainstream biodiversity into planning; establish functioning governance structures that are able to enforce legislation; involve citizens and especially

poor communities from the start; invest in education and awareness; and cooperate with other levels of government." (ibid)

2.5 Research on biodiversity assets

Research should be conducted on Wellington's little-known biodiversity assets eg there are several glowworm colonies present in the Wellington area but there is little research on their environmental needs to maintain the glowworm populations, how the populations fluctuate over time, and what management actions would be required to ensure their survival. Anecdotal information from some of our members is that part of the previously extensive glow-worm colony near the Curtis Street end of the Old Karori Road pathway has not been seen since security lighting was installed for an adjacent childcare centre. Planning documents that stipulate a maximum of 8 Lux fail to appreciate that this is the light level of twilight; at 8 Lux ambient lighting there is simply no nightfall for nocturnal fauna.

The concept of citizen science to assist in gathering information could be useful in some situations but requires careful planning and management to ensure that consistent methodologies are used by all participants and that relevant locations are well represented in any research design. Otherwise the data can be quite variable in quality and there may be insufficient data points to draw robust conclusions.

If the concept of resilience thinking is to be adopted (refer to earlier comments in section 2.2), then research would be needed to identify the critical biodiversity assets for Wellington and also identify the critical thresholds for each of the assets. For example, the amount of vegetation present in a sub-catchment may be a critical asset. The critical threshold may be retaining more than 70% of this vegetation in the sub-catchment.

3 Threats to biodiversity

The draft Biodiversity Strategy covers some of the threats to biodiversity but not all. In CVRA's view, the significant threats to Wellington's biodiversity are:

- The spread of environmental pest plants and animals
- The loss of habitat through inappropriate land development and through vegetation clearance
- Fragmentation and loss of connectivity due to land development and significant vegetation clearance
- The cumulative loss of habitat and vegetation where land is developed in stages, or land uses change over time
- Invasive diseases or new pest insects becoming established in Wellington

The draft Biodiversity Strategy rightly points out that sustained pest control eg for possums over time is critical to the continued regeneration of vegetation both in reserves and in surrounding land. Where pest animals have been excluded from a block of land eg in Zealandia's 225 hectares, the resulting change in indigenous vegetation since 1999 is dramatic and positive.

The spread of native birds from Zealandia into other areas of the city will ultimately not be successful in the long term if pest control outside the sanctuary reduces over time.

4 Actions

The actions in the draft Biodiversity Strategy should focus on mitigating or eliminating these threats, and giving effect to the actions through developing relevant rules in the District Plan. Otherwise, all these laudable aspirations will not translate into effective management of the city's remaining diminished, fractured and therefore increasingly important areas for biodiversity.

Where actions do mention the inclusion of mechanisms in the District Plan to better protect significant ecological areas (see page 21), the time frame suggested is medium (3 to 5 years). This timeframe fails to recognize the importance of getting actions reflected in the District Plan as soon as possible, otherwise this Strategy will be reviewed in 5 years with the distinct possibility that these actions haven't been achieved and implemented.

5 Monitoring and indicators

This area of the draft Biodiversity Strategy requires much more careful thought as to what might be monitored and why. Just because UNEP and the CBD have created a set of indicators is not a great reason to follow them.

The purpose of using indicators is to demonstrate change in the outcomes in the Biodiversity Strategy. A test might be to use the SMART acronym, ie indicators should be: Simple, Measurable, Attainable, Relevant and Time-bound.

A useful technique to assess change in condition of vegetation is the establishment of photo points in key areas using a consistent methodology each time. Photos taken yearly and made accessible to the Wellington community could both add value to the city's monitoring effort and tell the biodiversity story of investment in biodiversity actions and what has changed over time.

In our view, it would be best to use a few relevant indicators that would enable the community to see progress against the outcome statements rather than to struggle with a larger set of "nice to have " indicators.

We recommend that the outcome statements are reviewed to ensure that they are capable of demonstrating change in a biodiversity outcome over time (taking into account that some changes will take 10 to 20 years).

6 Need for baseline information

One of the major gaps in this draft Biodiversity Strategy is the lack of any baseline measurements of biodiversity from the previous action plan. Without a baseline, change over the period of this strategy and action plan cannot be properly assessed. Contextual information should also be collected so that data interpretation takes account of variability in the climate over the five years that could affect the condition of vegetation or of ecological habitats.

7 Summary

The CVRA supports the aspirations of this draft Biodiversity Strategy, but there are several issues to be addressed to make this a useful Strategy and action plan.

Several of the goals and outcomes are ill-defined or overly aspirational and need further clarification to ensure they are practical and achievable.

CVRA considers that the issue of cumulative habitat loss, and fragmentation of vegetation due to inappropriate land development are the major threats to biodiversity in Wellington.

The priorities in the draft Biodiversity Strategy do not recognize the value of undeveloped or natural open spaces as potential “stepping stones” for biodiversity.

The proposed set of indicators to assess progress against the outcomes should be reduced and only those that meet the SMART test should be used.

The lack of baseline biodiversity information on progress towards the goals and outcomes of the 2007 action plan is a significant information gap for this draft strategy.

The means by which the goals and outcomes of this biodiversity strategy will be given effect to ensure they are taken into account in future decision-making are not given sufficient weight or urgency.

06 March 2015

Shed 39, Harbour Quays
PO Box 11646
Manners Street
Wellington 6142
T 04 384 5708
F 04 385 6960
www.gw.govt.nz

File Ref: X/26/02/196

FREEPOST
Our Natural Capital
Parks, Sport and Recreation (REPL01)
PO Box 2199
Wellington 6140

ournaturalcapital@wcc.govt.nz

For: Myfanwy Emeny

Dear Myfanwy

Submission on Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

Please find enclosed the Greater Wellington Regional Council's submission on *Our Natural Capital: Wellington's Draft Biodiversity Strategy and Action Plan 2014.*

Please feel free to contact me on 04 830 4083 or ali.caddy@gw.govt.nz if you have any questions or concerns.

Yours sincerely

Ali Caddy
Biodiversity Adviser, Biodiversity Department

Encl: Submission

greater WELLINGTON
REGIONAL COUNCIL
Te Pane Matua Taiao

Greater Wellington Regional Council: Submission

To:	Wellington City Council
Submission on:	*Our Natural Capital: Wellington's Draft Biodiversity Strategy and Action Plan 2014*

1. Reason for submission

1.1 The Greater Wellington Regional Council (GWRC) wishes to make a submission on *Our Natural Capital: Wellington's Draft Biodiversity Strategy and Action Plan 2014* (the Strategy).

1.2 GWRC supports *Our Natural Capital: Wellington's Draft Biodiversity Strategy and Action Plan 2014*.

1.3 The primary reasons for supporting the Strategy are:

- The intention and strategic approach to biodiversity work is comprehensive and clearly set out in the Strategy.
- Wellington City Council (WCC) demonstrates a strong commitment to biodiversity work through the Strategy and we have confidence in their expertise and capacity to deliver on the Strategy's goals.

2. Policy framework

2.1 GWRC is particularly interested in how the Strategy will support and contribute to achieving the sustainable management of natural and physical resources in the Wellington region.

Regional Policy Statement for the Wellington Region

2.2 Although the Strategy is not a statutory document, some of the actions within it involve the need for changes to the Wellington City District Plan. When these district plan changes are undertaken, the policies contained within the Regional Policy Statement (RPS) must be given effect to.

2.3 The RPS gives regional guidance on the future direction for the sustainable management of natural and physical resources in the Wellington region. The RPS sets out objectives and policies to address regionally significant issues.

3. Key comments

3.1 GWRC supports the intention and approach to biodiversity work that is set out in the Strategy. The strategic direction, from vision and guiding principles to goals and outcomes, is clear and well set out (p.16-18). We commend this commitment to biodiversity work and have confidence in WCC's expertise in this area and their capacity to deliver on the goals included in the Strategy.

3.2 The comprehensive scope of the work laid out in the action plan section is impressive. In particular, we commend the expansion of integrated pest control efforts (under Objectives 1.2.2 and 1.3.1) and the strengthening of provisions

for biodiversity in the Wellington City District Plan (particularly under Objective 1.1.2 and Goal 1.4).

Areas where WCC and GWRC work together

3.3 There are some areas where WCC's and GWRC's mandates overlap and there are opportunities to work together. We value the working relationship that has already been built and are committed to strengthening it as we continue to communicate and collaborate in areas that concern both agencies.

3.4 The Strategy appropriately recognises the partnership between WCC and GWRC on matters of biodiversity protection and restoration. Goal 3.4 of the Strategy sets out how WCC will work with partners to develop a shared vision for Wellington City's biodiversity (pp.29-30). GWRC's Biodiversity department is available to work with WCC and others on this.

3.5 Under Goal 1.2 of the Strategy (p.16), WCC intends to work with partners (including GWRC) to retain nationally and regionally threatened species in the district. While we support the intention to do this, partnering in the area of species management does not fully align with our focus on site-led management. GWRC supports some of the significant sites for biodiversity region-wide, particularly through the Key Native Ecosystem (KNE) programme. This, and other programmes, focus on sites as ecosystems, rather than on the individual species within them.

3.6 The KNE programme is referred to in the Response section that describes how biodiversity will be protected under the Strategy (p.46). This is an appropriate place to mention this work, and we continue to work closely with WCC on the three KNE sites that are within Wellington City. However, the current wording may overstate GWRC's contribution to possum control at Wellington City KNE sites as we only fund this work at one of these sites.

Opportunities to align the Strategy with regional policy

3.7 Although the Strategy will be a non-statutory document, several objectives and initiatives in it direct efforts towards influencing statutory processes to support biodiversity. It may be useful to align these efforts with regional policy direction set out in the RPS.[1] We have appended all relevant RPS policies in Appendix 1.

3.8 The Strategy contains several actions around the identification and protection of sites of ecological significance in Wellington City (Actions 1.1.2.a, 1.1.2.b, 1.4.2.b and 4.1.1.c). Work in this area could be usefully aligned with the regional direction in Polices 23 and 24 of the RPS which provides criteria to identify and evaluate indigenous ecosystems and habitats with significant indigenous biodiversity values. Under Method 21 of the RPS, GWRC is preparing guidance for territorial authorities that will aid this work. We look forward to working with WCC on this.

3.9 The ecological significance criteria appended to the Strategy (pp.74-5) are comprehensive and will be useful for directing biodiversity management decisions. These criteria also appear to be the basis for defining areas for protection through district plan provisions. While the criteria in the Strategy do

1 http://www.gw.govt.nz/rps/

not necessarily need to be consistent with criteria provided in RPS Policy 23, doing so would allow WCC to also apply these directly to work under RMA processes such as district plan changes. For example, this would mean that they then could be used for assessing sites to afford protection under Policy 24 of the RPS and when considering resource consent applications.. Alternatively, it may be useful to clarify the purpose of these criteria in the Strategy and the likely extent of their application.

Flood protection operations

3.10 GWRC shares responsibility for flood risk management with territorial authorities across the region. In Wellington City, this responsibility is focused primarily on rural watercourses with the exception of Porirua Stream and its tributaries. Flood protection activities for the Porirua Stream involve dams on the Stebbings Stream and at Seton Nossiter Park, and flood protection works at the mouth of the stream in Porirua City. Planning measures for Tawa are also included in the district plan. GWRC also maintains watercourses in Wellington City, including the Porirua Stream, under the Watercourses Agreement with WCC.

3.11 GWRC requires access along watercourses to maintain the flood carrying capacity of the watercourse, and generally needs to be able to access the watercourse from the bank edge to minimise any disturbance to the stream bed. In some cases the stream bank is steep and/or eroding, and heavy excavating machines are not able to sit too close to the bank edge for safety reasons. Access for heavy machinery also needs to be provided without conflicting with public access (e.g. Porirua Stream walkway) and damaging walkway surfaces.

Riparian set-backs

3.12 GWRC supports Objective 1.4.3 Action (e) that provides for rivers to retain their natural state (p.23). For this to happen, sufficient 'room' needs to be left for the river to allow its natural processes to occur, which in most cases means allowing or requiring riparian set-backs as the riparian area may be eroded over time as the stream channel migrates. The Strategy also highlights that riparian areas are an important part of stream biodiversity in that they improve water quality and habitat by providing shelter for fish, lower water temperature and can filter pollutants.

3.13 GWRC supports Objective 1.4.3 Action (l) to "ensure there are provisions in the District Plan to protect and enhance streamside (riparian) strips alongside streams where practicable".

3.14 GWRC also supports the provisions on the daylighting of streams (Objective 2.2.1 (d)), providing for fish passage (Objective 1.4.3 (b)(c)(e)) and actions to protect and restore riparian margins (Objective 2.2.1 Action (a)), which are consistent with policies in the RPS that seek the maintenance and enhancement of aquatic ecological functioning of water bodies (RPS Policy 43).

Other comments

3.15 We recognise and commend WCC's intention to reduce impacts on aquatic ecosystems and restore streams in Wellington City (through actions under Objectives 1.4.3 and 2.2.1). This effort could be further supported in the

Strategy by adding guidelines on aquatic ecosystem degradation to the Protect section (pp. 50-1) and on restoration of waterways to the Restore section (pp.55-6).

3.16 Consistency of monitoring across the city, region and country (Goal 4.2) will provide valuable information for biodiversity management and policy decisions. Sharing knowledge of research outcomes also aids both agencies in developing a greater understanding of local ecology. We commend the inclusion of this goal.

3.17 NatureWatch is referred to (on p.29) as a tool for citizen science monitoring. While NatureWatch may be easier for the general public to use, eBird is emerging as a powerful tool that will provide us with the ability to monitor regional bird occupancy in the near future. Similarly the use of the National Vegetation Database to store vegetation plot data will assist regional vegetation data analysis.

4. Changes sought

4.1 Should the WCC approve *Our Natural Capital: Wellington's Draft Biodiversity Strategy and Action Plan 2014*, GWRC requests that:

1. The partnership between GWRC and WCC be recognised under Goal 1.1, which encompasses active management of sites, instead of Goal 1.2 (species protection). This change to the Strategy would better reflect the collaboration between the agencies in areas such as KNE sites.

2. The Response section (p.46) that describes how biodiversity will be protected under the Strategy be reworded to more accurately reflect GWRC's contribution, funding the delivery of possum control at one KNE site in Wellington City.

3. The definition of Key Native Ecosystem provided in the glossary of the Strategy (p.72) be aligned with how GWRC describes the work of this programme. We recommend that the text is replaced with the following:

    i. Key Native Ecosystem (KNE) site: An area that is actively managed by GWRC to protect and enhance indigenous biodiversity values. Sites in the KNE programme represent the best remaining examples of ecosystem types in the Wellington region.

4. The Regional Pest Management Plan (RPMP) be consistently referred to as such (not as the Regional Pest Management Strategy, which will soon be replaced). This could be changed on pages 46 and 70, and potentially in other areas of the document.

5. Further recommendations

5.1 GWRC would also like to make further recommendations for changes to the Strategy that could be considered:

1. The objectives and initiatives aimed at influencing statutory processes could be aligned with regional policy direction as set out in the RPS. We have appended all relevant RPS policies in Appendix 1.

2. We suggest that either:

   i. the ecological significance criteria appended to the Strategy (pp.74-5) are aligned with regional policy, allowing WCC to apply these directly to work under RMA processes such as district plan changes, or

   ii. that clarification is provided in the Strategy as to the purpose of these criteria and the likely extent of their application.

3. We suggest adding guidelines on aquatic ecosystem degradation to the Protect section (pp. 50-1) and on restoration of waterways to the Restore section (pp.55-6).

4. GWRC considers that WCC should further encourage riparian areas by providing for them in the Wellington City District Plan. The Strategy outlines that "a sufficient riparian zone is commonly considered to be at least 10m wide (with a width of 15-20m being preferable)". GWRC encourages WCC to provide for at least a 10m wide riparian setback along all rivers and streams as a requirement in the Wellington City District Plan.

5. GWRC suggests Action (b) under Objective 2.3.3 is amended to provide for its access and maintenance requirements for flood protection operations:

   (b) Consult other organisations to ensure current species restoration programmes are being followed and access and maintenance requirements are being met when planting plans are developed.

6. The description of activities related to the use of vertebrate toxic agents (p.48) could also include reference to localised ground-poisoning operations that target rabbits.

7. Section 13.1.3.a lists some pest animal species (including eastern rosella) for which there is no recognised control method (p.46). In light of this, we suggest reconsidering their inclusion.

8. Section 13.1.3.a also discusses integrated pest control and the effect of control on the populations of non-target species (p.47-8). The example given here could be changed as it may overstate the effectiveness of mustelids in controlling rat numbers.

9. Action 1.3.1.b states that WCC will "adapt the Department of Conservation guidelines for ethical and humane practices for animal pest control for use by the Council" (p.22). WCC could instead review the National Pest Control Agency's (NPCA) guidelines for this purpose, as these are the industry standard and are better suited to pest animal management on non-Crown land.

10. The commitment to using biological controls (Environmental pest guideline 10, p.49) could be extended to include new biological

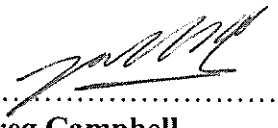
control agents as they become available for targeting other pest species.

11. Fallow deer (Dama dama) could be added to the list of pest animals in Appendix 4 (p.79).

6. Further involvement

GWRC recommends that the points as outlined above be considered. We would also welcome the opportunity to clarify and further discuss the matters raised.

GWRC does not wish to be heard in support of its submission.



.....

Greg Campbell
Chief Executive

Address for service:

Ali Caddy
Biodiversity Adviser, Biodiversity Department
Greater Wellington Regional Council
PO Box 11646
Manners Street
Wellington 6142

T 04 830 4083
F 04 385 6960

Appendix 1 – Relevant excerpts from the Regional Policy Statement[2]

Policy 23: Identifying indigenous ecosystems and habitats with significant indigenous biodiversity values – district and regional plans
District and regional plans shall identify and evaluate indigenous ecosystems and habitats with significant indigenous biodiversity values; these ecosystems and habitats will be considered significant if they meet one or more of the following criteria:

(a) Representativeness: the ecosystems or habitats that are typical and characteristic examples of the full range of the original or current natural diversity of ecosystem and habitat types in a district or in the region, and:

(i) are no longer commonplace (less than about 30% remaining); or

(ii) are poorly represented in existing protected areas (less than about 20% legally protected).

(b) Rarity: the ecosystem or habitat has biological or physical features that are scarce or threatened in a local, regional or national context. This can include individual species, rare and distinctive biological communities and physical features that are unusual or rare.

(c) Diversity: the ecosystem or habitat has a natural diversity of ecological units, ecosystems, species and physical features within an area.

(d) Ecological context of an area: the ecosystem or habitat:

(i) enhances connectivity or otherwise buffers representative, rare or diverse indigenous ecosystems and habitats; or

(ii) provides seasonal or core habitat for protected or threatened indigenous species.

(e) Tangata whenua values: the ecosystem or habitat contains characteristics of special spiritual, historical or cultural significance to tangata whenua, identified in accordance with tikanga Māori.

Policy 24: Protecting indigenous ecosystems and habitats with significant indigenous biodiversity values – district and regional plans
District and regional plans shall include policies, rules and methods to protect indigenous ecosystems and habitats with significant indigenous biodiversity values from inappropriate subdivision, use and development.

Method 21: Information to assist with the identification of indigenous ecosystems and habitats with significant indigenous biodiversity values

Prepare and disseminate information to assist with the interpretation of criteria set out in policies 23 and 24, which require the identification and protection of indigenous ecosystems and habitats with significant indigenous biodiversity values.

Implementation: Wellington Regional Council and city and district councils*

*lead authority responsible for implementation

2 http://www.gw.govt.nz/rps/

Submitter Details

First Name: **Marc**
Last Name: **Slade**
Organisation: **Polhill Restoration Project**
Street: **34 Ashton Fitchett Drive**
Suburb: **Brooklyn**
City: **Wellington**
Country:
PostCode: **6021**
Daytime Phone: **04 970 1091**
Mobile: **02102781556**
eMail: **marcslade@gmail.com**

Trade competition and adverse effects:
○ I could ○ I could not
gain an advantage in trade competition through this submission
○ I am ○ I am not
directly affected by an effect of the subject matter of the submission that :
a. adversely affects the environment, and
b. does not relate to the trade competition or the effects of trade competitions.

Wishes to be heard:
◉ Yes
○ I do NOT wish to speak in support of my submission and ask that the following submission be fully considered.

Preferred hearing location:
○ Oral Hearings - Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

Hearing Needs:

Correspondence to:
◉ Submitter
○ Agent
○ Both

Submission

1. Overall, do you support or oppose the general direction of Our Natural Capital?

○ Strongly oppose ○ Oppose ○ Neither support nor oppose ○ Support ◉ Strongly support

Why do you say this?

---

2. Do you support the Guiding Principles, Goals and Outcomes?

○ Strongly oppose ○ Oppose ○ Neither support nor oppose ○ Support ◉ Strongly support

Why do you say this?

3. Do you think we have identified the biggest issues facing indigenous biodiversity in Wellington?

(•) Yes ( ) No

Your comments

4. Do you think we have identified the right priorities in order to achieve our desired outcomes for biodiversity in Wellington?

(•) Yes ( ) No

Your comments

5. Do you think we have identified the right organisations to partner with to achieve our objectives?

(•) Yes ( ) No

Your comments

6. Do you think we have the right indicators and targets to measure our performance by?

(•) Yes ( ) No

Your comments

7. Do you agree with our direction for the tiered support for community groups?

(•) Yes ( ) No

Your comments
I think that plant allocations should be based on the ecological significance and size of the area to be planted as well as the group's capacity to plant. Groups carrying out higher levels of biodiversity management including monitoring and pest control need additional technical support and funding, than smaller care groups focused on planting reserves etc.

8. Is there anything you feel has not been adequately covered by the draft plan?

○ Yes ◉ No

Your comments

9. Do you have additional comments? (please attach additional pages via the 'Supporting Information' tab)

◉ Yes ○ No

Your comments

I strongly support the increase in spending on pest animal and plant control in Wellington City especially in areas with high biodiversity values such as Polhill (due to the presence of rare and threatened bird species; tieke, toutouwai, kakariki, whitehead, and am concerned at the loss of funding from GWRC for protection in urban reserves around Zealandia. I would encourage the council to increase spending and the technical support offered to community groups willing and able to carry out pest control. At present there is insufficient technical advice and funding to support groups. I would strongly advocate for the creation of one or two dedicate 'biodiversity rangers' to complement the existing Park Ranger service. I would also advocate additional support for community groups to carry out monitoring of both pests and native species, as this is necessary but technically difficult for volunteer groups to do well. I would also support greater provision of technical training on biodiversity management skills to support groups, including use of GIS and GPS, monitoring techniques etc. This could be carried out by WCC in partnership with GWRC and DOC.

Attached Documents

File
Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

Submitter Details

First Name: **Russel**
Last Name: **Garlick**
Organisation: **Wellington Mountain Bike Club**
On behalf of: **Wellington Mountain Bike Club Incorporated.**
Street: **43 Argentine Avenue**
Suburb: **Miramar**
City: **Wellington**
Country: **New Zealand**
PostCode: **6022**
Mobile: **0275371377**
eMail: **russel.garlick@gmail.com**

Trade competition and adverse effects:
○ I could ○ I could not
gain an advantage in trade competition through this submission
○ I am ○ I am not
directly affected by an effect of the subject matter of the submission that :
a. adversely affects the environment, and
b. does not relate to the trade competition or the effects of trade competitions.

Wishes to be heard:
◉ Yes
○ I do NOT wish to speak in support of my submission and ask that the following submission be fully considered.

Preferred hearing location:
○ Oral Hearings - Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

Hearing Needs:

Correspondence to:
◉ Submitter
○ Agent
○ Both

Submission

1. Overall, do you support or oppose the general direction of Our Natural Capital?

○ Strongly oppose ○ Oppose ○ Neither support nor oppose ◉ Support ○ Strongly support

Why do you say this?
Our club supports the general direction of the plan. Mountain bikers spend a lot of time in the town belt and bush surrounding Wellington. We do so because we enjoy the thrill of riding the tracks, but also because we enjoy being out in the environment. Our club is responsible for the bulk of volunteer led trail development and maintenance outside of Makara Peak. As part of these works, we plant several thousand plants each year. This is something we commit to because we value the environment that we recreate in.

2. Do you support the Guiding Principles, Goals and Outcomes?

○ Strongly oppose ○ Oppose ○ Neither support nor oppose ◉ Support ○ Strongly support

Why do you say this?
We are especially happy to see the 'We will acknowledge our city context' as a guiding principle. Whilst as a club, we do want to see the biodiversity preserved, we think it is very important to recognise that Wellington is no longer a pristine, untouched natural environment. When it comes to trail development, yes there will be short term impacts to the biodiveristy but we believe that it leads to enhanced biodiversity outcomes. We are glad to see that the plan recognises that track development is necessary to provide a way into the bush so that people can interact and appreciate the environment. We would expect that the plan takes a long term view of such works, yes short term interruption, but the opening up of the canopy, especially in areas where there is a mono culture in the regrowth (e.g. primarily Mahoe) these works provide the opportunity for species to be reintroduced as part of remedial planting. It is our strong belief that tracks open up the environment to people to appreciate it more. Any impact of a trail build is short term, and the opportunities for improving the biodiversity values is enhanced by the access the tracks provide. We like the focus on research in this plan. We would welcome the opportunity to be involved in potential studies on how trail building impacts the regenerating forest in the Wellington region. From this we would welcome the chance to work together with council to establish new best practice approaches. 'We will work collaboratively' Our club is well known for building tracks, but what is probably less well known is the amount of planting we do. We do recognise that our strength is in building the tracks, and that we can supply significant man power for planting, but our knowledge on what to plant and where, and what to protect is relatively poor. We do have some members with strong knowledge, but not enough. We would support any plan that seeks to help educate, inform and assist us with track design and planting decisions so that we can meet both our desired track design goals, and the goals of this biodiversity plan. Currently we get great support in terms of plants, but we would welcome more support in terms of where those plants should be planted, how to plant and care post planting. We support the 'Goals to connect people to biodiversity'. We think our volunteer led trail building and planting work parties provide a great way for people to connect with the local environment. And of course, the end result, the trails unlock the environment and provide access to recreate in the reserves.

3. Do you think we have identified the biggest issues facing indigenous biodiversity in Wellington?

◉ Yes ○ No

Your comments

4. Do you think we have identified the right priorities in order to achieve our desired outcomes for biodiversity in Wellington?

◉ Yes ○ No

Your comments

5. Do you think we have identified the right organisations to partner with to achieve our objectives?

Yes No

Your comments

6. Do you think we have the right indicators and targets to measure our performance by?

Yes No

Your comments

7. Do you agree with our direction for the tiered support for community groups?

Yes No

Your comments
This seems to be a practical response. Ideally we would like to see the council support all those who are willing to help, but we accept that there are going to be budget and resource constraints. Given the scope of our works, we expect that our group would be in the top tier. We accept that with our trail building activities, there is scope for serious impact on the biodiversity values and goals. However, we are seeing demand for trails go up as more and more people get into mountain biking, mountain running and general walking. New trails are going to be required, and volunteer led build and development is going to be required to meet these needs. As highlighted earlier, we have some club members who have knowledge, but we need assistance to elevate the knowledge of all our trail builders. This is something that we expect the council to lead and assist us with. In short, we would like recognition of our biodiversity work we currently do in parallel with the trail building, but we need help, time and resources from council to improve our collective outcomes.

8. Is there anything you feel has not been adequately covered by the draft plan?

Yes No

Your comments
Our club's concerns are all in the implementation and details. The high level goals are fine, our concern is about the on the ground implementation. The maps provided in the plan do not provide enough detail. They are at too large a scale to accurately determine where the 'Ecologically significant sites' are and how they may impact our club's activities. We would like to see either some more detailed maps, or have access to an online GIS system that allows us to zoom in to greater detail. As we address in the additional comments section, there are areas that we need specifics on before we can comment on the plan.

9. Do you have additional comments? (please attach additional pages via the 'Supporting Information' tab)

Yes No

Your comments

Re Section 1.1.1 d Master Plan for Te Kopahau Reserve Our membership will be very interested in this, and one of our projects, the Brooklyn Trail Builders, will be placing their own submission that addresses this in more detail. Suffice to say our club has long standing ties to this area and see it as one of the zones that could be opened up for some sustainable trail development that would give greater access to enjoy this environment. We look forward to collaborating with the council on these plans. Section 1.4.4a Track Development Our club maintains a vast number of tracks on council land. The Brooklyn Trail Builders, Mt Vic Trails, Miramar Track Project, Portal Trail Builders, and 98DH Trail crew are all projects of our club. In doing so, we provide a resource for our club members, and other mountain bikers to use, along with a vast array of other trail users. All these trail crews are carry out some level of native planting as part of their works. Currently the Open Spaces Access Plan (tracks plan) sets criteria for track works including new tracks. This does not include a biodiversity element. This is only considered under Track use. How will the draft Biodiversity Plan align with the existing Open Spaces Access Plan? We are therefore very interested in any new track development standards that are to be developed, and would expect, because our track record, and current standing, to be very much involved in the consultation and development of these standards. It is our expectation that they are evidence and research based, and include practical, quantitative measures reflect on the biodiversity values of new trail development. We are deeply concerned about what these new criteria may mean for not only our new track development but also our trail maintenance work. Work that is currently carried out by an army of volunteers at very low over head to the council. We would also like to see how the plan and criteria would apply to different styles of track. Beginner, largely machine built tracks, have a significant initial impact, but help drive many of the goals the council seeks. Advanced and expert tracks, that require little benching work, and mainly cutting to create a goat track line have a much lower impact. Currently Wellington has a shortage of these advanced and expert tracks. We'd like to see that there are opportunities in areas, potentially sensitive areas, to build expert level tracks, with lower impact, where a beginner/intermediate trail may not be appropriate. We understand the concept of fragmentation, but we would like to see a quantitative analysis of this when it is applied to single track development. 3.1.2 a Ensure access to 10 min walk, add in 'or ride' We would like to see 'or ride' added to this goal. It is great to see cycling added in section d, however, we are seeing an explosion in participation of our sport. Wellington is quite simply the best city to work, live and ride in. No other large urban centre has the proximity of tracks that Wellington has. This is a huge asset for this city, and one we would like to see is acknowledged just as much as the Harbour, Te Papa, Civic Square and other such amenities. We would also like to see 'access' defined as 'variety of access'. The track network needs trails both at the easy and expert end of the spectrum. Whilst we agree with officers that the middle ground is well catered for, the edges of the spectrum, we we are seeing the most growth in our sport, are not well catered for.

Attached Documents

File
Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

Submitter Details

First Name: **Murray**
Last Name: **Hosking**
Organisation: **Friends of Taputeranga Marine Reserve Trust**
Street: **C/- ,20 Witako Street**
Suburb: **Epuni**
City: **Lower Hutt**
Country: **NZ**
PostCode: **5011**
Daytime Phone: **0272314361**
Mobile: **0272314361**
eMail: **mrhosking@xtra.co.nz**

Trade competition and adverse effects:
○ I could ○ I could not
gain an advantage in trade competition through this submission
○ I am ○ I am not
directly affected by an effect of the subject matter of the submission that :
a. adversely affects the environment, and
b. does not relate to the trade competition or the effects of trade competitions.

Wishes to be heard:
◉ Yes
○ I do NOT wish to speak in support of my submission and ask that the following submission be fully considered.

Preferred hearing location:
○ Oral Hearings - Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

Hearing Needs:

Correspondence to:
◉ Submitter
○ Agent
○ Both

Submission

1. Overall, do you support or oppose the general direction of Our Natural Capital?

○ Strongly oppose ○ Oppose ○ Neither support nor oppose ○ Support ○ Strongly support

Why do you say this?

---

2. Do you support the Guiding Principles, Goals and Outcomes?

○ Strongly oppose ○ Oppose ○ Neither support nor oppose ○ Support ○ Strongly support

Why do you say this?

3. Do you think we have identified the biggest issues facing indigenous biodiversity in Wellington?

Yes No

Your comments

4. Do you think we have identified the right priorities in order to achieve our desired outcomes for biodiversity in Wellington?

Yes No

Your comments

5. Do you think we have identified the right organisations to partner with to achieve our objectives?

Yes No

Your comments

6. Do you think we have the right indicators and targets to measure our performance by?

Yes No

Your comments

7. Do you agree with our direction for the tiered support for community groups?

Yes No

Your comments

8. Is there anything you feel has not been adequately covered by the draft plan?

Yes No

Your comments

9. Do you have additional comments? (please attach additional pages via the 'Supporting Information' tab)

Yes No

Your comments

Attached Documents

File
Submission WCC Biodiversity Plan
Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

www.taputeranga.org.nz

Friends of Taputeranga Marine Reserve Trust

Draft Biodiversity Action Plan – Comments

General comments

- The document appears to say the function to maintain biodiversity is its highest responsibility – but that is incorrect – RMA s6 requires all persons exercising powers and functions to recognize and protect – council has those functions.
- We have some strong questions about how the non-biodiversity oriented functions of Council will be cognisant of this document and how will Council's actions be aligned with this document? It needs to be integrated with the other Council documents, embedded possibly, and actively implemented throughout Council. Our experience is that the Council often operates in a silo-ed fashion, with functional sections sometimes not well integrated with the wider priorities of the Council and the community. One option would be to add to all projects a checklist requiring acknowledgement that the biodiversity plan has been considered and implemented (and how it has been implemented). It should also be interconnected with the district plan.
- The document would benefit if a definition of biodiversity was stated at the start of the document, and it should encompass the marine environment. It would also benefit from a clear focus on identified priorities as well as identifying who "owns" the actions.
- The draft plan has too much emphasis on "Protect" at the expense of "Restore". The strategy should identify the reasons for any biodiversity decline in the urban, adjacent rural, fresh water parts of the council, as well as the contribution it can make to address those matters. It should spell out how it might manage the impact on the marine environment and offer significant and practical support to others that work on the ground as well as for their advocacy associated with protecting indigenous biodiversity.
- The list of biodiversity factors important to Wellington should acknowledge the economic value of biodiversity, including the business arising from recreation and the use of green space and waters, including tourism and other visitors to Wellington's Zealandia, Wilton Bush, Taputeranga Marine Reserve, Matiu Somes, etc.
- There is no mention up front of the Taputeranga Marine Reserve even though it is heavily used (including the land part) and WCC is heavily involved with parks, reserves (to the MHWS line) roading etc. It is a core biodiversity asset for the city. Surely the city should embrace this unique reserve – as the only truly accessible marine reserve on the doorstep and bus routes of a Capital city! It is manages and used from the city and it deserves to be recognised and fully integrated with the city's priorities.

- The vision includes a broad leadership role for WCC, but the actions appear to be too narrowly focused on either WCC land or dealing with private land through the DP. There is huge potential for making non-WCC public lands (e.g. transport corridors run by other agencies) and private lands that the landowner has no use for (all those little bits of land around factories for example) into quality open space or habitat.

Specific points

- The WCC Strategy should place more emphasis on continued provision of support. On-going pest control is important. Also a short term and ongoing action around what direct support will be made available to community groups that are improving habitats in freshwater, marine, and land based environments would be useful.
- In most of the action plan there is nothing that specifically addresses the Blue Belt, but could include underwater gardening for educational purposes, continuing the work at the wharves to restore inner harbour ecosystems and better supporting harbour clean ups.
- The plan should specifically develop existing and new parks/open spaces to support local biodiversity and to provide linkages through strategic ecological corridors, land and sea.
- Research should be carried out on locally endemic tree, shrub and grass species, including coastal species, for suitability as specimen plantings and a program be implemented to produce mature specimens for future projects, as well as a development of native species "planting guides" for volunteer groups.
- There is a lack of regulation around removal of habitat. The strategy should aim to improve that gap. There has been significant habitat removal as a result of infill. Planting is valuable but the strategy should ensure we also keep large trees in the city itself, not just on council land.
- While it is important to protect the remaining remnants of original biodiversity, there are two problems with that approach. Firstly, the methodologies normally used will ignore remnants of soil biota and other organisms that are no longer associated with recognisable vascular plant remnants. But they are of high value. For example there is a tiny population of ground weta in a roadside bank in Clifton Terrace, and giant earthworms in the land beside the motorway below Clifton Terrace. Both areas have been pretty much destroyed, but those species have survived.

  The second problem is that it ignores the value of spaces that are readily restored and protected. For example busy road/rail corridors are great places to put biodiversity that is sensitive to snails, rats and other predators/grazers that don't like crossing roads. Those spaces are also vital for the biophilia component. It is along footpaths, at bus stops and train stations, and similar places that people spend most time in the outdoors. Not in parks. Similarly, the Council should look for esplanade median strips and roundabout plantings for endangered coastal shrubs and grasses.

Specific comments by sections:

Summary - There is a one liner that recognises that biodiversity is not a respecter of Council boundaries. In the document throughout there is a strong emphasis on terrestrial biodiversity and only patchy 'added in' acknowledgement of sea coast and sea. The Blue Belt concept comes quite

out of the 'blue' as a significant add on later in the document and is welcome, but there should be some greater lead in to recognising that the marine nearshore environment and associated biodiversity is every bit as important as a component of the wider environment of Wellington that goes to people's well-being, health and economic advantage. There needs to be more action planning for this and other marine environment priorities.

2.1 There is an acknowledgement of 'coast' in the final word, but not the Harbour waters nor South Coast seas. Yet, the land/sea interface is not a barrier to biodiversity. Sea birds in particular commonly feed at sea and nest/forage on the land, becoming both a natural feature and a problem in some cases. The shags that nest at Zealandia are a key feature of that tourist facility and conservation success, but of course they feed at sea. The esplanades and marine parades feature signs exhorting motorists to look out for blue penguins crossing at dusk back to nests on 'impossible' hillsides. Work done at Matiu Somes to enhance habitats for sea birds including penguins has implications far afield as these birds travel long distances daily to feed and return to nests – to the eastern side of the Harbour, to the west and to the coast off Bering Head and the South Coast.

There is also the important link between fresh water species such as eels and whitebait which also spend part of their lifecycle in the sea.

As already stated, in this document, up front, there needs to be a definition of biodiversity that covers both terrestrial and inshore marine, probably in 2.2 which only skirts on the issue.

2.3 No mention here of the Taputeranga Marine Reserve. Yes, it is DOC's area to manage with the assistance of the conservation community, but the reserve and the South Coast is a place of recreation, enjoyment, study, inspiration, reflection and well-being to hundreds of thousands of Wellingtonians and visitors from the region and further afield every year. The Island Bay Snorkel Trail alone is used by at least 1000 visitors in the first three months of each year. The WCC reserves, parks, pathways and roading people are heavily involved in South Coast work, and there are very strong interfaces issues for stormwater and waste water disposal every year. **As the reserve recovers there will be increasing tourism around the reserve and its activities – it is already one of Air New Zealand sponsored Coastal Gems.**

Not the least, the south coast waters, whether marine reserve or outside provide the livelihood for a more or less sustainable fishing fleet out of Island Bay and the Harbour, as well as a number of dive shops with clientele for snorkel, scuba, fishing and camera work, providing equipment, instructions and certification. They strongly support the regions tourism with equipment hire and instruction, as well as tours to features like the F69 wreck. Once again these reflect on the artificiality of land/sea administrative boundaries which reflect into planning.

The list of biodiversity factors important to Wellington should acknowledge the economic value of biodiversity, including the business arising from recreation and the use of green space and waters, including tourism and other visitors to Wellington's Zealandia, Wilton Bush, Taputeranga Marine Reserve, Matiu Somes, etc. I am sure his can be done in a way that does not bring a squeal of protest from a neighbouring city or regional administration.

3. I note the Maori significance of biodiversity acknowledges Tangaroa. We have always found that Maori do not make any distinction in their view of whenua between that covered by air and that covered by salt water.

4.

We suggest wording: "……a network of green *and blue* space"

As well, climate change strategies must recognise the land/sea interface and the changing seascapes and weather patterns, as well as the cloaking and smothering value in energy absorption of healthy kelp and seaweed beds around the reefs.

5. Past.

How quaint to be quoting the value of damsel and dragonflies, but not a single species of fish that were the mainstays of protein for the early settlers, tangata whenua, who occupied the coasts in some considerable numbers. How about eels, koura, grouper, cod, rock lobster (crayfish), paua and kina.

Present

The sentence on Taputeranga Marine Reserve clearly looks like a token add on. Good to see it there, but surely you could be a little more descriptive of the keystone species that are flourishing. Where are the marine significant biodiversity sites –Harbour and South Coast? There is so much that WCC should be doing more to foster recovery and renewal in those vital places. As the receiving waters from waste and stormwater systems, these are key places for the well-being of the people.

7 Guiding Principles – Okay with these.

8. Okay

9.2 Blue Belt – Okay, but still largely has a terrestrial orientation. More emphasis should be placed on whole ecosystems restoration as envisaged by Stephen Journee.

Action Plans

1.4.3 Okay? But in the rest of the action plan there is nothing that specifically addresses the Blue Belt! Underwater gardening? Continuing the work at the wharves to restore inner harbour ecosystems?

Section 12 and onwards should either be an appendix, or better sit in front of the Vision statement. It is a good description of much upon which the action plans will operate. It is well written but appears as a disconnected add on. There seems to be little connection between this and the draft policy up front.

In summary, only brief passing lip service has been paid to the marine environments of Wellington, probably because of the sheer artificiality of city boundaries. Do not wait for super city integration that may never arrive. Integrate planning now and ensure that the sustainability of biodiversity is consistent with the Resource Management Act and embedded across the work of all of the branches of the Council.

5/3/15

Our Natural Capital, Parks, Sport and Recreation
Wellington City Council
P.O.Box 2199
Wellington 6140

Comments on the WCC Draft Biodiversity Strategy and Action Plan

We'd like to congratulate the Council staff on a very comprehensive strategy, and in essence only have minor comments as follows:

Goal 1.1 - Priority biodiversity sites on public and private land are protected
Objective 1.2.2 – *Ensure that animal predator control is sufficient to allow for the survival of key species.*

- We recommend that monitoring outcomes is an integral component of this and warrants specific mention, especially to identify protocols appropriate to urban as well and forested areas.

Goal 1.2 – Rare, threatened or locally significant species are protected
Objective 1.2.2.c - *Establish a methodology to decide which species within Wellington warrant additional protection if discovered through monitoring programme.*

- We think that development of " criteria and protocols" are needed to provide a framework for decisions and then actions which are likely to vary from site to site or species to species depending on local risk.

Goal 1.3 – Pest species are controlled to sufficient levels to protect our biodiversity, and eradicated if possible
Objective 1.3.1 – *Control pest animals and plants that threaten sites of ecological significance*

- We would like to see the objective expanded to include "Control and support control activities… " and a separate action added to make explicit that there will be support for other organisations (eg Zealandia) that undertake work that meets this objective. Assuming Zealandia is a site of ecological significance then we would recommend specifically supporting plans to remove the brown trout and redfin perch from the sanctuary.
  1.3.1. a – We would like to see fish and bats mentioned in the list of key species

1.3.3. b - *Implement animal pest control in the areas of rural land to the south-west of Zealandia*

- Clarification is needed. We believe that the Halo project is necessary to protect the biodiversity values of Zealandia, as some species (eg bellbirds) have struggled to get successfully established in the sanctuary due to dispersal beyond the safety of the perimeter fence. In addition, creating a safe buffer will reduce the risk of reinvasion of pest plants and animals. This will also protect biodiversity outcomes arising from dispersal of re-introduced species beyond the sanctuary. Accordingly, the area under integrated pest control should specifically highlight the halo area including rural, reserve and urban land around the sanctuary. We don't think this is adequately addressed under this goal.

Goal 2.2 - *Aquatic ecosystem health across the city is improved*

- We feel that restoration effort within Zealandia ie the head catchment of the Kaiwharawhara should receive mention and support, if not adequately covered in 1.3.1 as above. This includes the eradication of trout and perch species and restoration of processes which will enable migration to and from the lakes.

Goal 2.3 – Restoration programmes are in place for rare, threatened or locally significant species
Objective 2.3.1.b – *Install suitable nesting sites for cavity nesting species in reserves where these species are known to be present*

- We suggest that vulnerable cavity nesting species should only be encouraged to nest in reserves (by using nest boxes) where key pests have been reduced and maintained at appropriate levels. These levels may vary from species to species and should be developed in consultation with e.g. Department of Conservation staff; results of pest control and breeding success should be regularly reviewed to evaluate if targets are being met or need adjustment. The same caution needs to be extended to the suggestion of live nest cam opportunities mentioned in 3.1.1.b because activities around nests can increase vulnerability. The emphasis that we recommend is captured in Section 13.2.5 Guidelines, Habitat restoration #20 where the installation of nestboxes is explicitly linked to the active management of predator numbers.

Objective 2.3.3 - *Work in partnership with other organisations to develop restoration programmes*

- Include provision for supporting /enhancing existing restoration programmes

Goal 2.3 – Ecological networks developed across the landscape
Objective 2.4.1.a - *Identify key species for which connections would be beneficial and can be achieved*

- Need to also identify key pest plant and animal species that could benefit from the planned connections and ensure that potential negative impacts can be minimised or mitigated before new connections established.

Goal 3.2 – People understand the importance and value of biodiversity to their wellbeing

Objective 3.2.2 – *use technology to connect people with biodiversity and ensure that people have access to current information on biodiversity*

- We support this objective but recommend that these actions are integrated with databases and resources already available so a key outcome would be to provide links to the different resources rather than eg. developing a species identification guide for lizards (which has already been done); aiming to have all information on biodiversity and research on the Council website would need careful management to minimise IP issues and also keep up to date.

Goal 4.1 – Wellington City has increased understanding and knowledge of biodiversity
Objective 4.1.1.d - *Conduct a bat survey to establish whether populations are present in Wellington*

- We draw attention to current surveys being undertaken by GW and bat surveys that have been undertaken in Zealandia

Objective 4.1.1.e – *Follow up surveys for Ngahere geckos, barking geckos, spotted skinks, Kupe skinks, and ornate skinks using more intensive methods in surveyed parks and reserves with good habitat*

- We would like to see mention of/support given to a survey of southern areas in Zealandia for goldstripe and barking geckos, and to lizard transfers. We suggest that it would be useful to establish a monitoring programme for species found outside the sanctuary to determine population trends, and aligning the programme with monitoring done inside the sanctuary would provide a useful comparison as well as support for continuation of the sanctuary programme.

Section 12.4 – Freshwater Streams

- We suggest that the successful removal of brown trout from the headwaters of the Kaiwharawhara Stream and the significant response of banded kokopu and koura has significantly improved the value of the stream and upper reservoir for native fish and freshwater invertebrates; it provides an opportunity for more active freshwater restoration work through transfers that may not be feasible elsewhere.

Wetlands

- We feel there should be a mention of the reservoir lakes and created wetland at the head of the Kaiwharawhara catchment which provide a locally rare habitat for wetland species.

Section 13.1.3 (c) Aquatic ecosystem degradation

- We suggest that there also needs to be reference to the effect of introduced fish on cyanobacterial blooms in the lower Karori reservoir which not only affects the lake ecosystem but has downstream ramifications. Supporting efforts to reduce the severity and frequency of these blooms by removal of introduced fish, particularly perch will be beneficial.

Section 13.2.4 – Beyond planting Habitat restoration
Another role that these older trees play is providing the right niche for cavity nesting species, which includes kaka, kakariki, saddleback and falcon

- Falcon is not a cavity nesting species

Section 13.2.5 Guidelines
Habitat restoration – 20-– see comments associated with 2.3.1b

Section 13.3.6 – Working with partners towards a shared vision for Wellington's biodiversity; Council Controlled Organisations – Zealandia and Wellington Zoo

- Zealandia is not a CCO, and for the sake of the definitions offered sits more correctly within "Local community-based conservation and restoration groups…"

Section 13.4.4 – Priority research areas

Restoration - *"There are a number of cavity-nesting species in Wellington such as kaka, kakariki, saddleback, north island robin, bellbird, morepork, and kingfisher…"*

- North Island robin and bellbird are not regarded as cavity nesting species although they do use cavities occasionally.

Yours sincerely

Raewyn Empson
Manager Conservation, Research, Learning and Experience
raewyn.empson@visitzealandia.com

Submitter Details

First Name: **Des**
Last Name: **Smith**
Organisation: **Bell's track working group**
On behalf of: **volunteers**
Street: **24 Fox Street**
Suburb: **Ngaio**
City: **Wellington**
Country:
PostCode: **6035**
Daytime Phone: **(04) 4796310**
Mobile: **+6444796310**
eMail: **desjohn@xtra.co.nz**

Trade competition and adverse effects:
○ I could ○ I could not
gain an advantage in trade competition through this submission
○ I am ○ I am not
directly affected by an effect of the subject matter of the submission that :
a. adversely affects the environment, and
b. does not relate to the trade competition or the effects of trade competitions.

Wishes to be heard:
○ Yes
◉ I do NOT wish to speak in support of my submission and ask that the following submission be fully considered.

Preferred hearing location:
○ Oral Hearings - Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

Hearing Needs:

Correspondence to:
◉ Submitter
○ Agent
○ Both

Submission

1. Overall, do you support or oppose the general direction of Our Natural Capital?

○ Strongly oppose ○ Oppose ○ Neither support nor oppose ○ Support ◉ Strongly support

Why do you say this?
Having organized a group in Ngaio for the past 7 years in reforestation and guide at Zelandia foe the past 13 years am aware how much havoc has been wrought on the environment and delighted to be part of ameliorating this.

---

2. Do you support the Guiding Principles, Goals and Outcomes?

○ Strongly oppose ○ Oppose ○ Neither support nor oppose ○ Support ◉ Strongly support

Why do you say this?
as above

3. Do you think we have identified the biggest issues facing indigenous biodiversity in Wellington?

◉ Yes ○ No

Your comments

4. Do you think we have identified the right priorities in order to achieve our desired outcomes for biodiversity in Wellington?

◉ Yes ○ No

Your comments

5. Do you think we have identified the right organisations to partner with to achieve our objectives?

◉ Yes ○ No

Your comments

6. Do you think we have the right indicators and targets to measure our performance by?

◉ Yes ○ No

Your comments

7. Do you agree with our direction for the tiered support for community groups?

◉ Yes ○ No

Your comments

8. Is there anything you feel has not been adequately covered by the draft plan?

○ Yes ◉ No

Your comments

9. Do you have additional comments? (please attach additional pages via the 'Supporting Information' tab)

◉ Yes ○ No

Your comments
On behalf of the Bell's Track working group would like to endorse the Wellington draft and Biodiversity Strategy and action plan 2014.At a meeting last Tuesday myself and other volunteers were very impressed with the details to help Wellington be a natural capital. Some ideas for consideration is that our work is involved in improving part of the Te Araroa walkway. Eventually our groups work would extend from Mount Kaukau to the Trelissick Park group to ensure the entry to Wellington via the Te Araroa Walkway reflects the Nature City. Another area we have been maintaining is around the Awarua Street Station and the entrance to Cummings Park via Awarua Street. What we would like to see is the Johnsonville line become a a tourist attraction. residents along the line could be encouraged to as we have done at Awarua Street station to maintain the area and plant native plants. Maybe twice a year the railways could close the line to trains once in summer for residents to do weeding and pick up rubbish. Maybe a fun day with BBQ's etc at the stations. The again in winter to do the tree planting. We suggest tourists would be able to buy a day rail pass with a map showing walkways, Parka, Cafes, shopping and the history of the area. As the Wellington peninsular becomes predator free and the indigenous forest returns we visualize Zealandia playing a major role in education for the local environment and beyond. part of respecting the flora and fauna also should include the maori culture ensuring the pronunciation is correct by people dealing with the public. HAERE RA, Des

Attached Documents

File
Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

Submitter Details

First Name: **Geoffrey**
Last Name: **de Lisle**
Organisation: **Birds New Zealand (Wellington Branch of the Ornithological Society of NZ)**
On behalf of: **Wellington Branch of Birds New Zealand (Ornithological Society of New Zealand) G.W. de Lisle, Regional Representative**
Street: **244 Blue Mountains Rd**
Suburb: **RD1**
City: **Upper Hutt**
Country: **New Zealand**
PostCode: **5371**
Daytime Phone: **045270929**
eMail: **miromiro@xtra.co.nz**

Trade competition and adverse effects:
○ I could ○ I could not
gain an advantage in trade competition through this submission
○ I am ○ I am not
directly affected by an effect of the subject matter of the submission that :
a. adversely affects the environment, and
b. does not relate to the trade competition or the effects of trade competitions.

Wishes to be heard:
○ Yes
◉ I do NOT wish to speak in support of my submission and ask that the following submission be fully considered.

Preferred hearing location:
○ Oral Hearings - Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

Hearing Needs:

Correspondence to:
◉ Submitter
○ Agent
○ Both

Submission

1. Overall, do you support or oppose the general direction of Our Natural Capital?

○ Strongly oppose ○ Oppose ○ Neither support nor oppose ○ Support ◉ Strongly support

Why do you say this?

---

2. Do you support the Guiding Principles, Goals and Outcomes?

Strongly oppose Oppose Neither support nor oppose Support Strongly support

Why do you say this?

3. Do you think we have identified the biggest issues facing indigenous biodiversity in Wellington?

Yes No

Your comments

4. Do you think we have identified the right priorities in order to achieve our desired outcomes for biodiversity in Wellington?

Yes No

Your comments

5. Do you think we have identified the right organisations to partner with to achieve our objectives?

Yes No

Your comments

6. Do you think we have the right indicators and targets to measure our performance by?

Yes No

Your comments

7. Do you agree with our direction for the tiered support for community groups?

Yes No

Your comments

8. Is there anything you feel has not been adequately covered by the draft plan?

Yes No

Your comments
There are two related issues which require greater attention. (1) The funding of Biodiversity activities. The level of funding will be a major determinant of the success of the Biodiversity plan. (2) Management of the Biodiversity plan. Efficient management of Biodiversity activities is essential to ensure maximum progress is made in addressing the goals of the plan and ensuring the best utilisation of what will be limited resources. A related issue is the management of community groups to ensure their continued participation in contributing to the biodiversity of Wellington City as well as ensuring their activities are compatible with the Biodiversity Plan.

9. Do you have additional comments? (please attach additional pages via the 'Supporting Information' tab)

(•) Yes ( ) No

Your comments
There is an on going need to ensure that the Wellington City Council Biodiversity activities are co-ordinated with their regional neighbours. This has been identified in the draft plan but its importance needs to be emphasised.

Attached Documents

File
BIRDS New Zealand Wellington City Council
Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

BIRDS New Zealand (Ornithological Society of New Zealand)

In 2015 Birds New Zealand (Ornithological Society of New Zealand) celebrates its 75th Anniversary. This is a national organisation with over1000 members of which more than 100 belong to the Wellington branch. The Wellington Branch of Birds New Zealand actively participates in national and local studies on birds. A number of these studies complement the aims laid down in the draft of the Wellington City Council Biodiversity strategy and Plan. Some of these studies have been going for many years and provide longitudinal data of trends in bird populations in Wellington. For example, four detailed surveys of the birds of Wellington Harbour have been carried out since 1975. Since 1975 there have been major changes in the bird life of the harbour and reflect improvements in the discharge of sewage and other wastes in the Wellington Region. Ongoing surveys have been carried out in Zealandia with the first survey carried out prior to the establishment of the fence and the eradication of predators.

The Wellington Branch of Birds New Zealand has significant skills and experience in ornithology that could contribute to the maintaining and enhancing the Biodiversity of Wellington City. Consequently, we would like to be considered as a community group that can contribute in the field of ornithology to the Biodiversity initiatives being pursued by the Wellington City Council.

The aims of Birds New Zealand are listed below.

To create a nation-wide study group with individual members or groups working on different aspects of ornithology as suits their interests or circumstances and all contributing to the sum of ornithological knowledge. This aim cannot be achieved in a day or a decade but each year brings a variety of new accomplishments and insights into the biology of birds.

The aims and objective of the Society are to:

1. **encourage, organise and promote** the study of birds and their habitat use particularly within the New Zealand region.
2. foster and **support the wider knowledge** and enjoyment of birds generally.
3. **promote the recording** and wide circulation of the results of bird studies and observations.
4. **produce a journal** and any other publication containing matters of ornithological interest.
5. effect **co-operation and exchange of information** with other organisations having similar aims and objects.
6. assist the **conservation and management of birds** by providing information, from which sound management decisions can be derived.
7. maintain a **library of ornithological literature** for the use of members and to promote a wider knowledge of birds.

8. promote the **archiving** of observations, studies and records of birds particularly in the New Zealand region.
9. carry out any other activity which is capable of being conveniently carried out in connection with the above objects, or which directly or indirectly advances those objects or any of them

PO Box 10-412

Wellington 6143

New Zealand

Wellington Botanical Society

Charities Commission Registration
CC10518

4 March 2015

SUBMISSION ON *OUR NATURAL CAPITAL*

INTRODUCTION AND KEY POINTS

1. The Society welcomes the opportunity to comment on *Our Natural Capital*. Our submission includes many recommendations. Some relate to the Society's advocacy objective which is to protect land and waters in their natural state. Others may help improve the clarity of the strategy document or its subsequent implementation.

2. Section 13, which explains the reasoning behind each of the four themes, helped us understand the goals, objectives and action statements for each of the four themes in the Action Plan (Section 10).

3. We were pleased to learn that Council has identified and mapped 517 ecologically significant sites across the city.

4. We were concerned about the limited attention given to plants. As three examples:

    - only four plant species are mentioned in the "past" section of the overview of Wellington's biodiversity in Section 5, and all monocotyledons

    - the most detailed information about plants comes in section 12 which is after the vision, principles, goals, and action plan

    - the nationally and regionally threatened plant species still growing in the city's open spaces are not identified/listed.

Theme 1: Protection

5. Within the protection theme, we see the priority actions as:

    - reviewing the Pest Management Strategy and Implementation Plan (The fragmented treatment of pests and pest management in *Our Natural Capital* makes it difficult to know what the strategy is)

    - making an early start on the review of Chapter 18 of the District Plan (Conservation sites) so that key provisions are in place in time to influence implementation of Council's Urban Growth Plan.

Theme 2: Restoration

6. We welcome the commitment about ecological leadership on page 63 which says that "The Council will take a greater leadership role in determining ecological outcomes and

restoration priorities for the city, and will develop plant lists for specific zones or sites based on these priorities. The plants we provide for restoration purposes in those zones will be based on those lists". The "zone" information on KCDC's website may provide a useful model for this initiative. It identifies several zones based on soil and climatic factors.

7. We were pleased to see more importance attached to "restoring missing species", i.e. increasing the structural integrity and species diversity of damaged, regenerating and restoration forests. Many of the plantings in the city's parks and reserves over the last decade have achieved site coverage with a limited range of shrubs and small trees. How best to continue to restore these sites, including the role of enrichment plantings, needs additional research and planning.

8. In our submission on the Draft Suburban Reserves Management Plan, we proposed that Council develop MOUs with each community group involved in planting projects. Further discussion during the development of the current submission revealed a level of unease about MOUs. Our view now is that an informal, educative and responsive approach to working with community groups will be more effective than the formalised directive approach inherent in a system of MOUs. In particular, we recommend that you adjust the proposed resourcing allocations across the hierarchical support system for community groups so that experienced Council staff can engage face to face with third tier groups, particularly in early stages of their projects, or when they are starting to plan for enrichment plantings. If Council does want to give further consideration to the MOU approach (because planting is a managed activity), we can provide with an updated list of contents for MOUs.

9. We have recommended expanding action 2.1.2 to include a review of eco-sourcing practices in different contexts. We anticipate that this may result in either some amendments to the current 2-page guidelines or a new package of policy and educative materials for different audiences.

Theme 3: Connection

10. Our major recommendation under this theme is that Council establish a teaching garden to help volunteers and Council contractors distinguish between pairs of plants that are similar in appearance, but one is indigenous and the other is a pest plant, (e.g. pampas / toetoe, Old Man's Beard / *Clematis paniculata* (Puawhananga). This may reduce losses of natives during scrub clearance, weeding, track development and management of road-side vegetation. A second stage could see the development of a public educational resource where residents could learn to distinguish between pairs of similar native plants, e.g. black maire / white maire, and wheki / whekï-ponga.

Theme 4: Research

11. Applying the term "research" to this theme is somewhat misleading given the diversity of information needs and actions incorporated in the theme. The theme would benefit from more work to improve its focus and internal alignment.

12. We see one of the top research priorities as increasing the depth of the information in the data base about the values of the 517 sites of ecological significance, starting with sites that need better statutory protection under the District Plan, or a different mix of management interventions. The public also need to have access to maps and information identifying the sites that do not meet the criteria for ecological significance in Appendix 1.

13. In the short to medium term, we think better sharing of information with interest groups and the general public will be more influential in achieving *Our Natural Capital* objectives than "conducting intensive and targeted research in partnership with relevant organisations".

Submission details

COVER PHOTO AND TEXT

14. We endorse the choice of a photo of seals for the front cover. Seals are a reminder that Wellington has marine as well as terrestrial biodiversity. We noted that there was little about the city's marine plant life in the strategy.

TITLE

15. The proposed title, *Our Natural Capital*, is clever given that Wellington is NZ's capital city, but may also mislead as its contents cover only a small part of what most audiences would expect to find in a document about natural capital. Use of the sub-title is essential.

SECTION 1: SUMMARY

16. A succinct summary is vital in an 80-page document. The draft summary is not a summary. There is no mention of the vision, the four themes, or the tiered approach to supporting community groups. We strongly recommend re-writing the summary using the four 'themes' as the organising framework.

SECTION 2: INTRODUCTION

17. This may be the best place to explain that the plan is aspirational, and while some funding for some actions is assured, funding for others is dependent on decisions Councillors will make in future planning processes, statutory and internal. The Biodiversity Action Plan 2007 raised expectations that were not met.

SECTION 4: POLICY FRAMEWORK

18. We recommend showing the Town Belt Management Plan 2013, and the Botanic Gardens Management Plan 2014 in the diagram on page 11 as both have biodiversity objectives, policies and implementation plans.

19. We recommend describing and explaining in more detail the respective responsibilities of Council and GWRC for marine, freshwater and terrestrial biodiversity of Council under the Regional Policy Statement. Under Policy 61, for example, GWRC appears to have no responsibilities for terrestrial biodiversity in Wellington City.

SECTIONS 5 AND 12: WELLINGTON'S BIODIVERSITY OVERVIEW AND WELLINGTON'S BIODIVERSITY

20. Section 5 gives an "overview" of Wellington's biodiversity under the headings past, present and future. In the 'past' section, it mentions only four species of plants, all of which are monocotyledons (flax, rush, raupo and cabbage tree). Many different kinds of animals are described, and in much more detail, e.g., birds, reptiles, amphibians, fish (marine and freshwater), marine mammals and insects.

21. We recommend re-writing the overview to include more of the diversity of Wellington's indigenous plants, e.g. some conifers, (e.g. rimu, totara), some dicotyledons, (e.g. mamaku, manuka and greenhood orchids), non-vascular plants, (e.g. mosses, lichen, and liverworts) fungi and algae.

22. There is some information about Wellington's plants in section 12 under habitat sub-headings. We wondered why this was placed after sections 6-11 which contain the Vision, Guiding Principles, Goals and Outcomes, a couple of concept plans, and the Action Plan.

23. We strongly recommend combining sections 5 and 12, and placing the combined section as section 5. Each of the habitat sections should incorporate the past and the present, some information about well-known species (both plants and animals), some information about rare or threatened species, and a summary of ecosystem types.

24. The appendices contains species lists for native birds, lizards and freshwater fish, but no information about indigenous plants, not even those that are nationally or regionally threatened. Information later in this submission may help rectify this omission.

25. The future: We are not sure what you are trying to communicate in this section. One possible interpretation is that the 517 significant ecological sites belong to the first category (ecologically significant sites), and that other sites/areas throughout the city with lower biodiversity values are assigned to one of the other three categories. Nor could we work out the relationship between these categories and the actions in the Action Plan.

26. An alternative treatment for the 'future' section would be to translate the intent of *Our Natural Capital* into comparative sketches of the state of our biodiversity now and in 2040, for example:

    - an ecologically significant site with more complex layering and diversity of species
    - an ecologically significant site with a buffer zone, stepping stones to an isolated remnant, and a corridor link to a recently established community planting
    - a well-vegetated catchment with a day-lighted steam, fewer barriers to fish passage, and an artificial wetland created to capture and store storm water
    - a shrubland without gorse and Darwin's barberry.

SECTION 6: VISION

27. We compared the vision in the Biodiversity Action Plan 2007 with the draft vision in Our Natural Capital.

VISION IN 2007 STRATEGY	DRAFT VISION 2014 STRATEGY
Wellington is a city that protects and restores biodiversity and proudly showcases its natural areas. It is a city renowned for its kaitiakitanga, its environmental guardianship.	Wellington is a "living city", one that protects and restores indigenous biodiversity and celebrates nature. The people in our city are renowned for their kaitiakitanga.

28. After comparing them, we offer the following comments but no recommendation:

    - the speech marks around "living city" signal it has a special meaning, but that meaning is not mentioned or explained in *Our Natural Capital*
    - incorporating the word "indigenous" is an improvement
    - dropping the translation of "kaitiakitanga" is a retrograde step
    - 'nature' is not equivalent to 'natural areas'. The word "nature" is used in *Our Natural Capital*, particularly under the theme "Connect", but has not been explained. It could be interpreted as including the colourful wildflowers on the Town Belt, the pigeons in Te Aro Park, and a row of exotic street trees.

SECTION 7: GUIDING PRINCIPLES

29. We recommend adding "researchers" and GWRC to the list of parties with whom Council intends to work collaboratively.

SECTION 8: GOALS AND OUTCOMES

30. We recommend incorporating Section 8 into a revised Summary structured around the four 'Theme' headings. A separate section for goals and outcomes may not be necessary.

31. The research outcome statement includes Council's aspiration to be seen as "a leader in managing indigenous biodiversity in an urban context". We welcome the aspiration. Council may like to consider whether its leadership aspirations should also apply to any of the other three themes.

32. The outcome statement for protection includes "no further loss of species indigenous to Wellington". In 1998, DOC published a list of around 17 plant species with historic records in Wellington City that haven't been seen at the recorded site for decades and may have been permanently lost from the city.[1] As part of a nation-wide initiative between DOC and all regional Councils, DOC is currently working with GWRC to assess the regional conservation status of vascular plants in the region. This assessment may confirm the permanent loss of some of these species from Wellington and identify others that are threatened.

SECTION 9: BIODIVERSITY CONCEPT PLANS

33. This section illustrates two concept plans which "demonstrate the wider approach outlined in the guiding principles and what could be achieved". The first focuses on indigenous fauna, the second on the Blue Belt, i.e. coastal and marine. The concept plans have merit as an integrating, outcome-focused overview. Unfortunately the language introduces another level of complexity and confusion. The outcomes are called objectives and differ from the outcome statements in section 8 and from the objectives in the Action Plan.

34. We recommend further development of the concept plans with a view to producing a series of clear graphics for use in power point presentations and posters about Council's roles in protecting and restoring the city's indigenous biodiversity.

35. We welcome the intention to establish collections of coastal plants at sites around the harbour. We recommend adding this to the Action Plan.

SECTION 10: ACTION PLAN

Theme 1: Protect

36. We regard protection of the best of what remains of Wellington's indigenous biodiversity as the highest priority.

37. We welcome the outcome statement for protection in section 13.1.1 (page 45) which acknowledges previous losses of species indigenous to Wellington, previous reductions in the size of ecologically significant areas, and reductions in the size of the areas with the potential for future restoration. You could also mention the loss of whole ecosystems, e.g., the 86-hectare freshwater lagoon on the Miramar Peninsula. According to Wildlands (2009),

1. Sawyer, John. *Plants of National Conservation Concern in Wellington Conservancy*. Department of Conservation, Wellington Conservancy, 1998.

the eight remaining wetland sites within the Wellington City Council boundaries have a total area of just 16.9 ha of wetlands.

38. Section 13 establishes a sound foundation for the four protection goals in the Action Plan and the associated programme of 48 actions. We support the goals.

No.	Goal	Actions
1.1	Priority biodiversity sites on public and private land are protected	7
1.2	Rare, threatened or locally significant species are protected	6
1.3	Pest species are controlled to sufficient levels to protect our biodiversity, and eradicate if possible	11
1.4	The impact of urban growth and human activity on all ecosystems and remaining habitats is managed	24

Pest Control (Goal 1.3)

39. Council's reporting systems provide very little meaningful information about the results of its investment in pest control. The Annual Report 2013/14 reported that "We have enhanced our pest plant programme in 36 key native ecosystems. We continued controlling high priority weeds in the Town Belt". The numerical measure is a percentage of high value biodiversity covered by integrated animal pest control or weed control. The target of 60% of sites was not achieved (52%) but the report didn't show how many high value biodiversity sites were included in the target. None of the information reported sheds much light on goal 1.3. We recommend that more informative qualitative and quantitative information is included in future reports, especially trends related to goal 1.3.

40. We recommend including high-level financial information about pest control from the approved LTP 2015-2025 in the approved version of *Our Natural Capital*, for example:

    In 2013/14, Council spent net $1,058 million on operational pest management. Under the approved Long Term Plan 2015-25, the budgets for pest management (animals and plants) over the next five years are:

Year	14/15	*15/16*	*16/17*	*17/18*	*18/19*	*19/20*
Expenditure Biodiversity (pest management)						

Pest Management Strategy

41. Council's website says that *Our Natural Capital* updates and replaces both the 2007 Biodiversity Action Plan and the 2004 Pest Management Strategy. We had trouble reviewing the updated Pest Management Strategy because elements of it are scattered throughout *Our Natural Capital*.

- Goal 1.3 contains three objectives and 11 actions
- Appendix 4 (pp. 79-80) lists environmental pests (23 pest animals and 68 plants).
- There is some background information about environmental pests in Section 13.1.3 (a)
- Section 13.1.4 (pp. 50-51) contains 15 Guidelines for Council staff and contractors
- Section 13.4.5 (pp. 69-70) includes background information and guidelines for monitoring and reporting on pest control

- Appendix 2 (p76) shows the type of support with pest control that Council will give to community groups in each tier of its proposed tiered support system

42. We recommend that bringing the above components together in a standalone chapter, called Pest Management Strategy.

43. We strongly support increased funding for action 1.3.1(a) which we regard as vital to the protection and restoration of Wellington's indigenous biodiversity.

Goal 1.3	Pest species are controlled to sufficient levels to protect our biodiversity, and eradicated if possible			
Objective 1.3.1	Control pest animals and plants that threaten sites of ecological significance			
Action (a)	Develop a revised pest management implementation plan and review the pest management programme to determine whether the size, scope, scale, intensity and duration are likely to sustain viable populations of key species (including vegetation and processes, birds, lizards and invertebrates) within the Council's open space network and where possible on relevant private land	Funding	Priority	Timeframe
		Expand	1	Complete in 1-3 years

44. We recommend amending the wording of 1.3.1(c) to include the current number of hectares of ecologically significant public land currently under integrated pest control as well as the percentage targets. Percentages have little value or meaning without a baseline (X).

45. These changes also need to be incorporated into Council's performance management framework.

Action 1.3.1(c)	(Revised) Expand the number of hectares of ecologically significant public land under integrated pest control from X ha in 2014 to meet the agreed target of 70% by 2020, and 100% by 2025.	Funding	Priority	Timeframe
		Ex	1	Long

More about Weed Control

46. We wonder if the list of 70 species of pest plants in Appendix 4 is for the whole Greater Wellington Region. We recommend that you prepare some supplementary lists for Wellington City, showing, for example, which 5-10 species are "Wellington's Worst Ecological Pest Plants" and explaining how and where they impact on indigenous biodiversity. You could also identify the major freshwater pest plants in Wellington City's freshwater habitats.

47. We would include Darwin's Barberry and sycamore among Wellington's ten worst weeds. Society members first alerted Council to the threat of Darwin's Barberry (Db) in the 1930s.

48. Darwin's Barberry: (Allen & Lee 1992) reported that blackbirds, thrushes and silvereyes disperse most Darwin's barberry fruits in southern New Zealand. An unintended consequence of increasing bird numbers in the Halo is that birds will carry more Db seeds into Zealandia, Otari-Wilton's Bush, other open space and private gardens. Biological control offers a way of reducing Db's rate of spread, but will not reduce the existing infestations. Evidence presented to the Environmental Protection Authority includes that Db requires high rates of herbicide and penetrant to successfully poison with spray, and is difficult to target because it is commonly found amongst regenerating native. Cutting and stump treating is very labour intensive, with hard stems, sharp vegetation and the plant growing in dense thickets. It took ten man-days to cut and stump treat 800 sq m of barberry

mixed in with regenerating native. Less than 2 kg of vigilant gel was used in the two days, indicating the difficulty of the vegetation and the task.

49. Sycamore: A proverb says: "One year's seeding – seven year's weeding". More than seven year's weeding is likely to be required to deal with the city's sycamores. *Plant Me Instead* reports that each tree produces 10,000 seeds. We think this is an annual estimate.

50. Zealandia is showing the way, recently controlling about 8ha of sycamores to prevent reinvasion of Denton Park from sanctuary-managed land.

51. As part of Goal 3.3, we recommend Council seek more engagement from communities and individual property owners in a major attack on sycamores. Gardeners could be encouraged to get the seedlings out when small, i.e. before weed killer is required. Council could commit to assisting communities to remove large sycamores from road reserves provided the communities mapped the locations.

52. Such a campaign will have its detractors. Some people won't like seeing any tree removed, even if it is replaced by a young indigenous tree that provides food for birds. Some people value deciduous trees for their shade in summer and access to sun in winter. (NZ has few fully-deciduous trees). Some people want shade for their cars, but don't want native species that produce fruit which attract birds which then poop on cars. Some will argue that sycamores are a cheap way of increasing the absorption of carbon dioxide – they don't have to be planted. The planned carving of nesting holes in aging sycamores is also likely to be used as an argument to retain them.

53. We have comments on two other weed control action statements.

1.3.2 (b)	Carry out weed control based on priority sites in accordance with ecological significance criteria and priority threats.	The wording suggests Council is proposing to focus on site-led weed control. What about species-led control at sites that are not of ecological significance, e.g. road reserves? We **recommend** adding a separate action to guide decision-making about the control of priority ecological weeds in areas that are not ecologically significant sites.
1.3.2.(e)	Work closely with the NZTA and On Track to address environmental weed issues on transport corridors not owned by the Council.	We **recommend** raising the priority from (3) to (2) in recognition of the multiple benefits of weed control and planting on transport corridors, i.e. ecological corridors, reduced fire risk from long grass, less vandalism/tagging, higher quality connections with nature for commuters.

Goals 1.1 and 1.4: Impact of urban growth and human activity
Review of sections of District Plan

54. Managing the impact of urban growth requires renewed and urgent attention given that Council's *Urban Growth Plan* anticipates an additional 45,000 residents in the city within the next 30 years. If housing and infrastructure growth is ad hoc and business-friendly, the associated direct, indirect and cumulative impacts on biodiversity could cause serious damage to one of the key values that currently attracts students, businesses and tourists to Wellington, and retains residents.

55. Council's District Plan is the key statutory mechanism for managing impacts of urban growth on biodiversity. The review of the plan's Natural Environment Chapter, especially Chapter 18 (Conservation Sites), is long overdue. (It became operational in July 2000). The review is urgent so that additional protection is in place as Council starts working with more developers and utility providers to implement the Urban Growth Plan.

56. The potential for the Minister for the Environment (Hon Nick Smith) to weaken environmental protection in the RMA is no excuse for delaying the revision of Chapter 18. Opportunities for beneficial land swaps or other forms of offsets to protect ecologically significant sites should also be identified in the event that the Minister decides to approve the Proposed National Policy Statement on Biodiversity which went out for public consultation in early 2011.

57. We strongly recommend the addition of a short term action, priority 1 to Objective 1.4.2, to initiate and fund the review of Chapter 18, Chapter 16, and any other sections of the District Plan that would help establish a more resilient statutory framework for decision-making associated with the *Urban Growth Plan* and sub-divisions in other parts of the city.

58. Some delays to improving statutory protection for freshwater and marine biodiversity appear to be inevitable given the likely timescales for approval of the Natural Resources Plan for the Wellington Region (still draft) which is dependent on completing the whaitua processes for each of the city's catchments. Council and Wellington Water Services are working on Integrated Catchment Management Plans, but the cost of completing these plans, yet alone implementing the agreed improvements, mean that any progress towards better protection of freshwater and marine biodiversity is likely to be dependent on non-statutory actions.

59. The description of Wellington's freshwater habitats in section 12.4 identifies issues with rural streams on private land. Council's intention to allocate 20% of the 45,000 plants available through its annual planting programme to riparian planting may help resolve these issues.

Mountain-biking and track development

60. We were pleased to see that some parts of the Council are aware of the damage being caused to biodiversity by some mountain-bike developments. We strongly endorse action 1.4.4 (a) (criteria for track development).

61. Even where the initial developments may have been well-planned to minimise fragmentation and destruction of vegetation, the behaviour of some mountain-bikers can cause serious damage, e.g. by creating short cuts straight downhill across zig-zags, presumably to add excitement. The current guideline in Chapter 13 is a start, but doesn't go far enough. It only says:

> *Soil disturbance within ecologically significant sites should be minimised. Any further ground disturbance ground disturbance, including track development, within these sites will undergo very careful evaluation as to whether it should proceed.*

62. We have three recommendations for reducing the damage that mountain biking developments can do to indigenous biodiversity and habitats.

- We r**ecommend** closer supervision of track development, whether the work is being done by staff, contractors or community groups. The independent site supervision standards for resource consents involving earthworks by private developers may set a suitable standard. Where conditions are not met, further work should be stopped until the infringements are remedied or mitigated.

- We **recommend** that plantings associated with track developments should go through the same approval and educative processes as plantings by restoration groups

- We **recommend** compiling a file of photos of such damage for use within Council, with the mountain-bike sector, and on Council's pages in the DomPost.

Theme 2 Restoration

63. The explanatory information in chapter 13 provides a reasonable summary of the complex and diverse issues to be addressed in planning to reverse the loss and decline of the city's biodiversity and establish self-sustaining ecosystems.

64. We endorse the observations about restoring missing species on page 53, i.e.:

    - many regenerating forests and restored planting areas lack structural complexity; they have one tier (instead of five), and are missing the forest floor, understorey, sub-canopy and emergent layers

    - plant types within the layers need to include not just trees and shrubs, but grasses, ferns, fungi, climbers and epiphytes

    - there is little evidence for missing species returning to these areas naturally.

65. We commend the intent to increase the structural integrity and species diversity of damaged, regenerating and restoration forests, and the associated guideline (no. 11):

    Large-scale targeted "enrichment" plantings will occur across the city to reintroduce missing species and create a seed source for the city.

66. We recommend expanding the text about restoring missing species to explain more about the planned approach to restoring threatened species (see action 2.3.2). Possible species include *Muehlenbeckia astonii*, *Muehlenbeckia ephedroides*, *Pimelia aridula*, and *Euphorbia glauca*.

67. We welcome the commitment in the paragraph about ecological leadership in Chapter 13 (page 63), i.e. Council "will take a greater leadership role in determining ecological outcomes and restoration priorities for the city, and will develop plant lists for specific zones or sites based on these priorities. The plants we provide for restoration purposes in those zones will be based on those lists". The approach KCDC used to establish planting zones may be helpful.

68. As part of developing the lists, we recommend identifying the species that used to grow at specific sites or in zones. Possible sources of this information include species lists prepared at various times since settlement, and information from historic pollen counts, diaries and paintings.

69. Other factors that need to be considered in compiling the lists include:

    - different project goals, e.g. to improve water quality, to create better habitat for birds

    - the availability of suitable quantities of plants which can be dependent on access to suitable seed sources

    - production time lines (for plants from seeds or cuttings)

    - site conditions, including availability of mulch, access to water during droughts

    - whether temporary plantings may be necessary to provide shelter to increase survival rates for less-robust species in the first few years

    - what will grow under pines and macrocarpas

- the various stages in restoration e.g. species for initial site coverage, species for enrichment plantings (layers, diversification, timing)

- climate change – Botanic Gardens of Wellington Management Plan (p.49) proposes to select tall tree species on their ability to survive a 3-5 degree upward temperature shift.

70. We didn't understand the sentence in section 13.2.2 which says "Aside from active planting, Wellington is fortunate in its level of natural adventive recolonisation by native species". We think this refers to native plant species that will germinate and grow under pines, macrocarpas, sycamores, gorse, and eucalypts. If so, we suggest deleting the word 'adventive" from the sentence.

Guidelines (section 13.2.5).

71. We recommend adding a guideline on plant care to maximise survival rates. This guideline could, for example, indicate if it is OK to place a low priority on annual weeds because they will eventually be overtopped by trees and shrubs.

72. The connectivity guidelines currently focus on birds. We recommend noting that connectivity may also be beneficial for plant populations which have been fragmented by land uses, e.g. improved dispersal of pollen and seeds which may increase genetic resilience in plant populations.

73. We support the following goal in 2.3, "Restoration programmes are in place for rare, threatened or locally significant species", and the associated objective: "Re-establish populations of threatened plants in Wellington".

74. The following information about plants of conservation concern within Council's boundaries may help you identify which species to work on. The list is not complete.

From *Threatened Plant of NZ* (de Lange et al)

- Nationally endangered: *Muehlenbeckia astonii* (shrubby tororaro)
- Nationally vulnerable *Anogramma leptophylla* (annual fern)

Plants with current records at the time of publication of *Plants of National Conservation Concern in Wellington Conservancy* (DOC, 1998?) were *Pimelia aridula, Mazus novae-zeelandiae* and *Muehlenbeckia astonii.*

Plants with historic records in Wellington City that had not been seen at the recorded site for decades and have probably been permanently lost from those sites are listed below. There are 17 on the list. Notes about each plant illustrate the diversity of the threats that may have led to these losses. Other notes provide information about cultivation.

Anogramma leptophylla
Atriplex billardierei agg
Atriplex cinerea
Crassula peduncularis
Euphorbia glauca
Geranium retrorsum (rabbits and hares dig up turnip-like root stock)
Korthalsella salicornioides
Lepidium flexicaule
Lepidium oleraceum
Leptinella diocica
Muehlenbeckia ephedroides
Myosotis australis – (quarrying at Owhiro Bay)
Myosurus minimus subsp. *novae-zealandiae*

Pimelia aridula
Pimelia tomentosa – successional processes leading to overtopping
Pterostylis puberula – Geoff Park suggested different ground surfaces result from gorse replacing manuka after fire disturbance
Tupeia antarctica – fragmentation of population and species being dioecious.

Note: DOC has a species recovery plan for *Muehlenbeckia astonii* and the *Lepidiums*.

75. We recommend adopting a case-by-case approach to identifying the most appropriate sources of plant material for propagation of each species. It will not always be possible to obtain the material for some of them "locally" because they are either absent or very rare in Wellington City.

Restoration planning programme

76. Action 2.1.1 promises "at least" 45,000 native eco-sourced plants annually. We suspect this is the number for Council plantings, and that the number of plants available for community groups has been omitted by accident.

Council's management of plantings by community groups

77. As noted in paragraph 8, our submission on the Draft Suburban Reserves Management Plant in late 2014 proposed a system of MOUs between Council and each group undertaking planting projects. That proposal was developed in response to reports about a small number of inappropriate planting in Centennial Reserve.

78. Further discussions this month compared the relative merits of a formal system of MOUs and an informal, educative approach, preferably face-to-face. The softer approach was seen as being more effective in explaining concepts such as ecosourcing, particularly in the early stages of a group's activities. Some groups may not want to know; they will just want to finish with the paper work so that Council will give them some plants and they can get on with the planting. Others will be interested in hearing why Council won't let them plant pohutukawa, kauri, karo and karaka anywhere in the city, and other species in particular reserves, e.g. *Rhabdothamnous solandri* and fierce lancewood *(Pseudopanax ferox*) in Centennial Park.

79. Other concerns about the MOU system included the costs associated with its development and administration, particularly if the number of groups wanting approval from Council for planting activities continues to grow. The potential for a negative reaction from new and existing groups was also recognised. This could lead to an increase in unauthorised plantings.

Learning from Council's restoration initiatives

80. Restoration takes time. Successes and set-backs along the way provide opportunities for learning. Capturing and sharing that information will increase the capability of Wellington's "restoration" sector.

81. We recommend Council commission an independent and on-going review of some of its own restoration initiatives, possibly through its partnership with Victoria University of Wellington. The various revegetation and restoration projects on Te Ahumairangi, including the follow-up to the recent clear-felling of macrocarpas and pines, would make a worthwhile study.

Ecosourcing and ecosourcing guidelines

82. In October 2014, following several informal discussions about ecosourcing, Wellington Botanical Society arranged a panel discussion to provide members with an opportunity to hear different perspectives. Two papers resulting from that meeting are included with this submission as background for Councillors. Paula Warren's paper was published in the 2014 edition of the Wellington Botanical Society Bulletin, (see Appendix 1. Chris Horne's paper is attached as Appendix 2.

83. Two of the issues emerging from the evening were:

- how should "local" be interpreted,e.g. when deciding where to collect seed of different species for different purposes
- the importance of creating genetically diverse populations that will be more resilient in changing environmental conditions.

The next two paragraphs contain extracts from recent articles and papers about aspects of ecosourcing, again as background information. The first comes from an article in the New Zealand Plant Conservation Network about the use of genetic information in an initiative to create genetically diverse kakabeak populations in the wild. *Although grown widely in gardens, domestic kakabeak have limited genetic variation and therefore little genetic value. Until recently, only about 110 naturally-seeded kakabeak were known to exist in the wild but, earlier this year, a DOC-led field trip to Ruakituri, a part of inland Hawke's Bay where only six wild plants had previously been known to exist, yielded 18 more.*

Tests on these most recent discoveries have resulted in the most complete genetic picture of the nearly extinct New Zealand native that anyone has ever had. "We now have DNA data from pretty much every accessible wild kakabeak known to us," Dr Houliston said. "This allows us to make sensible, science-based decisions about what mix of plants from FLRT's seed stock should be used in restoration plantings."

FLRT's forest manager, Pete Shaw, said the trick would be to strengthen the genetic pool of each distinct group by introducing young plants with a different genetic composition. "The genetic diversity of any plant population is a good indicator of that population's strength," Shaw said. "
(Trilipedia November 2014). Newsletter of the New Zealand Plant Conservation Network

84. The second extract is from *Assessing the benefits and risks of translocations in changing environments: a genetic perspective".* It identifies two factors about gene pools that need to be considered when planning restoration projects.

*A '**local is best**' sourcing practice misses two important points that may impact restoration or reintroduction success in the face of future climatic changes (Sgrò et al. 2011). The first is that there is a risk of encouraging the establishment of populations that do not harbour sufficient genetic variation and evolutionary potential resulting in the selection of inbred or genetically depauperate seed sources (Broadhurst et al. 2008). The second issue is that environmental conditions driving local adaptation can change very rapidly such that the conditions, for example, under which a 100-year-old tree established are likely to be quite different to those existing today. Source material from more distant (geographically and ecologically) populations may often harbour adaptations that more closely match the environment of the focal restoration site today and into the future.*

Evolution Applications. 2011 Nov; 4(6): 709–725. The authors are Andrew R Weeks, Carla M Sgro, Andrew G Young, Richard Frankham, Nicki J Mitchell, Kim A Miller, Margaret Byrne, David J Coates, Mark D B Eldridge, Paul Sunnucks, Martin F Breed, Elizabeth A James, and Ary A Hoffmann.

85. Although Council's current eco-sourcing guidelines are brief (See Appendix 5), they are more comprehensive than the guidance provided on many other websites. Correctly applied, they are likely to be fit for purpose in many situations for some time.

86. Some aspects of the guidelines, however, may benefit from a review, not in isolation, but as part of a wider discussion about eco-sourcing practices in different contexts (e.g. by species, purpose of planting, scale of planting, habitat, etc). We envisage case studies, reports, workshops, and focus groups. The results of focus groups conducted to test understanding of, eco-sourcing, levels of commitment to different eco-sourcing principles, and the effectiveness of the current eco-sourcing guidelines with different audiences may be particularly informative. Potential participants could come from all tiers of the community restoration groups, community nurseries, commercial nurseries, roading authorities, seed collectors, home-gardeners and sector stakeholders such as botanists, Wellington Botanical Society, and Forest and Bird. The final result in Wellington City may be a new package of educative and policy communications for different audiences. By conducting this review, Council will also be able to make an informed contribution about eco-sourcing in urban environments to the Department of Conservation and other biodiversity agencies in NZ and internationally.

87. We therefore recommended expanding action 2.1.2 to include a review of eco-sourcing practices in different contexts.

Applying research findings

88. The following summary from a recent research report may help with the planning of Action 2.1.3 (b), i.e., to trial ways of restoring native forest under a canopy of exotic conifers. Forbes et al assessed the relative performance of rimu, kahikatea and totara planted into a degraded Ponderosa plantation in the central North Island. They hypothesised that the degraded pine plantation overstorey could provide suitable conditions for the development of a podocarp-dominated forest structure within ca. 50 years of underplanting, and that podocarp growth would differ depending on the species suitability to the site. Rimu significantly outperformed both Totara and Kahikatea in height and diameter growth. Rimu was now the structurally dominant tree where it occurred rather than pine. Per annum scaled carbon storage within Rimu stands was significantly greater than the Totara, Kahikatea or Pine stands. All podocarp species had attained a greater stand density compared to the pine overstorey. Possible reasons for the differing podocarp growth performance include different light requirements, response to soil nutrients, elevational distributions and frost susceptibility. There were significant differences in understorey species richness among the different stands of podocarp species. Underplanting accelerated successional development by incorporating late-successional indigenous canopy dominants within the forest succession and overcame limitations imposed on forest succession at the site from its isolation from indigenous forest tree seed sources. [2]

Theme 3 Connect

89. We welcome Council's intention to educate the public about Council's use of indigenous vegetation to increase awareness of local plants. (See Action 3.2.1 (a)). Information can be delivered in many ways, including in-situ, ex-situ and online. We recommend expanding this educational role to include Council's role in maintaining healthy populations of local

[2] Forbes, Adam S., Norton David A, Carswell, Fiona E. *Underplanting degraded exotic Pinus with indigenous conifers assists forest restoration.* Ecological Management & Restoration. 2014 Ecological Society of Australia and Wiley Publishing Asia Pty Ltd

species. As an example, interpretative material about nikau could be placed near the model nikau in the Civic Square.

> *These artworks celebrate Nikau palms, the southern-most palm in the world. Living nikau survive at only x sites in the city. Kereru will be distributing nikau seeds to new sites. Seeds that land in sites with dense shade and moist soil have the best chance of survival, if rats don't eat them. Nikau are slow-growing, and we may have to wait 40-50 years to see a respectable trunk.*

90. In-situ interpretation, especially signs in parks and reserves, can be very effective. We support the new proposed action (3.2.1(c), but suggest changing its timing from medium to ongoing so that interpretation signs can be included in the short-term projects such as the implementation of the management plan for Mt Victoria. On-site interpretation could explain Council's intentions for the re-vegetation of the northern end of Te Ahumairangi.

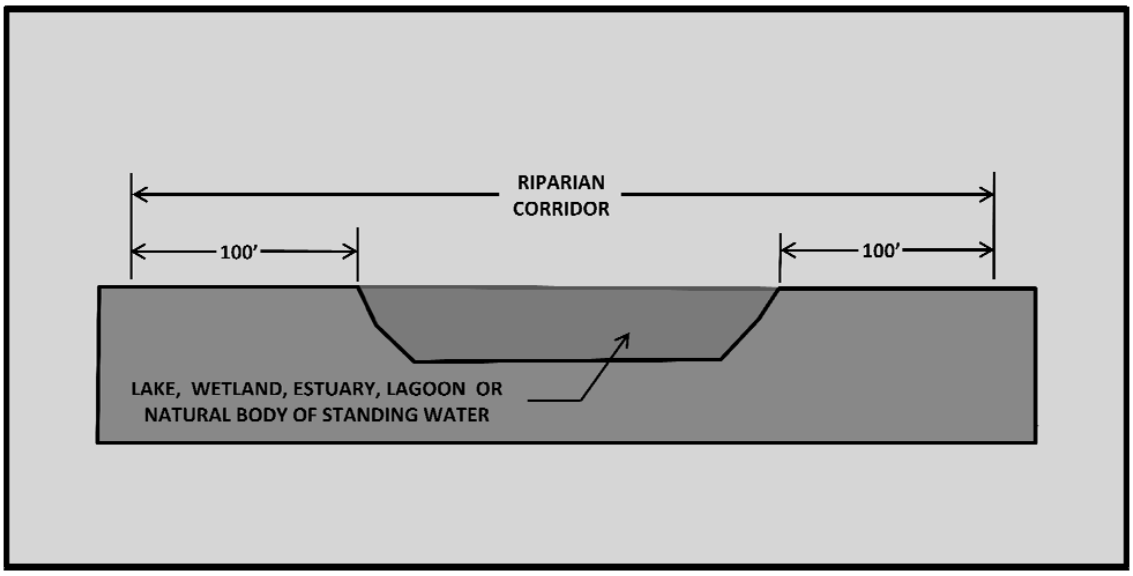
91. A teaching garden: We recommend Council establish a teaching garden where the public, members of volunteers groups involved in track work, members of restoration groups, and Council staff and contractors can learn to distinguish natives from similar pest plants, and to identify more natives. Our goal is to reduce the unintentional loss of native plants by well-meaning people. We think the potential benefits outweigh the risks, e.g. remove seed heads of pest species before seeds disperse. We think learning is more likely to be effective if people can see the real plants than from photos or sketches in books or on the web. Examples of pairs of plants include: toetoe /pampas; *Clematis forsteri* / Old Man's Beard; young *Lycopodium volubile* /*Selaginella*; and native grasses, reeds and sedges from similar weed species, e.g. *Cyperus ustulatus* / *Cyperus eragrostis*.

92. The garden could be extended at a later time to include a section where visitors could see pairs of native Wellington plants side by side with signs explaining how to tell them apart in the field, e.g. black maire / white maire; kanuka /manuka; red matipo / kohuhu; hound's tongue fern / scented fern.

93. As part of the 'Connect' theme, we recommend Council consider whether sufficient attention has been given to the people who live and work in Wellington's rural and semi-rural environments. A proportion of the 517 ecologically significant sites are likely to be located on private land in rural areas. Some of the landowners will already be taking active steps to protect indigenous biodiversity on their land, e.g., by fencing off streams and bush remnants, creating buffer zones to increase the resilience of remnants, controlling pests, and planting stream banks. These landowners may be influential in persuading nearby landowners to do likewise, with appropriate support from officers about access to subsidies for fencing, and access to eco-sourced plants.

94. Guideline 13.2.5 (no 7) shows that Council has attached a high priority to riparian plantings by proposing that no less than 20% of the total Council planning per annum (of 45,000 plants) will be allocated to riparian planning with a focus on areas requiring shading or stream bank stabilisation. Definitions for riparian areas can vary. For example, a definition of riparian areas might be based on geographic region (arid or humid climates) or on distance from a stream channel rather than on site characteristics. The County of Santa Cruz (2012) Riparian Corridor and Wetlands Protection ordinance prohibits development within riparian corridors defined as 'Lands extending 100 feet (30.48m) (measured horizontally) from the high watermark of a lake, wetland, estuary, lagoon or natural body of standing water'.

95. We recommend that, as part of the whaitua processes, Council propose a draft rule for defining riparian areas in different contexts, e.g. that riparian plantings should cover 30m on each side of streams and wetlands, and around coast.



Theme 4: Research

96. This theme needs more work to give it a tighter focus and strengthen the alignment between the various components. The term "research" is somewhat misleading given the diversity of information needs and actions incorporated under this theme. We recommend making a distinction between monitoring (usually long-term and focused on either outcomes or operational programmes), and short-term investigations designed to fill information gaps or resolve particular problems. A further distinction is needed between information gaps that can be resolved by a Council officer with a few hours to search the web, and 'scientific' research of an academic or contractual standard. This differentiation is attempted in 13.4.3 and is partially incorporated in the guidelines, but hasn't been carried through into Chapter 10.

97. We have suggested a change to the Research outcome statement: Section 13.4.1.

Draft	Our suggestion	Why
We are leaders in managing indigenous biodiversity in an urban context. We actively seek and share knowledge, support research and use the information we gain to continually improve our management of a natural resources.	Council's management of indigenous biodiversity in its urban context has improved as a result of actively seeking, sharing and applying knowledge".	The leadership outcome should apply across all four themes, not just research. 'Natural resources' takes the scope of theme 4 well beyond biodiversity to include, for example, soils, air, and water.

Research goals, objectives and actions

No.	Goal	Actions
4.1	Wellington City Council has increased understanding and knowledge of biodiversity	10
4.2	Environmental monitoring is consistent across the city, region and country and informs our biodiversity management.	6
4.3	We actively seek and share knowledge about Wellington's biodiversity	13
4.4	We have built our capacity to protect and restore Wellington's	5

	biodiversity	

98. We offer alternative wording for the goals in this theme.

No.	Goal	Actions
	An enhanced monitoring and evaluation programme provides Council with better knowledge and understanding about the results of its biodiversity programmes.	
	External and internal users report favourably on Council's systems for actively seeking and sharing information about Wellington's biodiversity, and on the quality of the information available through those systems.	

Increased understanding and knowledge of Wellington's biodiversity

99. We recommend adding another action to objective 4.1.1, which states: "Continue to enhance knowledge and understanding of the biodiversity values of Wellington's ecologically significant sites, and any threats to those values". Improving the quality and quantity of the information WCC holds about the biodiversity of the 517 ecologically significant sites will support the protection theme. As an example, the ecological importance of the wetland seepages on Old Karori Road did not become apparent until their survival was threatened by proposed developments on the adjacent site. We now know the seepages are home to special bryophytes, snails, and glowworms.

100. Disseminating information about the ecologically significant sites will help expand awareness of the diversity within those sites.

Sample record:
Unique ID: 58. Site name: Kaukau Johnsonville Park Khandallah Park
Dominant habitat: Forest/Shrubland
Justification for Ranking: At Risk LENZ, Rock tors and cliffs, protected land, includes Primary Forest Remnant, podocarps, threatened species, riparian
Priority action: Management, adjoining land
Action comments: On-going barberry and other weed control; advocate for legal and physical protection for areas outside WCC ownership.

Environmental monitoring

101. We support the intention to increase funding for Action 4.2.2 (a), i.e., to set up a consistent terrestrial outcomes monitoring framework and annual programme (incorporating existing monitoring work) in a collaborative approach with other key organisations. This action will include monitoring of vegetation, birds and lizards.

102. Action 4.2.2(b) is a new action that will establish a programme of biosecurity output monitoring to evaluate effectiveness of pest control programme. Our expectation is that the programme will include weeds, and that it will be integrated with action 4.2.4 (b), the current mapping of the spread of environmental weed species.

103. As an addition to the actions in 4.2, we recommend Council engage in any initiatives associated with the passing and implementation of the Environmental Reporting Bill 2014. This may help Council enhance its own systems and develop a reputation as a leader in environmental monitoring.

Seeking and sharing knowledge about Wellington's biodiversity

104. We think better sharing of information with interest groups and the general public will be more influential in achieving *Our Natural Capital* objectives in the short to medium term than "conducting intensive and targeted research in partnership with relevant organisations".

105. We recommend early action on setting up effective systems for sharing 'research' information. We see Council's website, *Branch Out*, Council's page in the DomPost and articles for suburban newspapers as obvious channels.

106. We don't support Action 4.3.3 (a) as currently worded. It proposes capturing "all biodiversity information (e.g. location and species data) related to the Council in one location". We don't know what problem this action is trying to solve. Nor is it clear whether the proposed solution is a combined data base or something else. Several agencies within and beyond Wellington hold location information on plant locations, including the three major herbaria and Greater Wellington. Wellington Botanical Garden and Otari-Wilton's Bush have accessions data bases. Integrating existing data bases can be costly. We recommend developing clear problem and opportunity statements as a first step towards finding a cost-effective solution. The data base, (if that's what the common location is), also needs to record how the locations have been validated, e.g., herbarium vouchers, photos on Nature Space.

Section 13.4 Context for Research Goals, Objectives and Actions

107. We have several issues with six pages this section. Despite its length, it does not provide a particularly clear rationale for the goals, objectives and actions in Section 10.4. Several of the guidelines are worded as actions when the introduction to Section 13 says the guidelines are meant to be explaining how the actions will be achieved. Some of the guidelines in 13.4.7 look like additional actions that will require resourcing. We recommend shortening 13.4 by transferring details of priority research areas (13.4.4) to the end of the relevant theme (i.e. protection, restoration etc). This may also make it easier for readers to understand the operational relevance of the research to Wellington.

108. Section 13.4.4 includes lists of "key questions" (research needs?). Of the current questions, we would support:

- What natural succession is happening in urban forests? (limit to Wellington's urban forests)
- What are the microhabitat requirements for the missing plant species we aim to reintroduce?
- What native plants will work best as green infrastructure in urban design? This includes green roofs, water-sensitive urban design, and street trees.

109. Other suggestions:

- Guideline 14 says that Council intends to "initiate and promote crowdsourcing and citizen science approaches to collect large amounts of geographically based information". The diagram on page 66 shows that scientists will analyse the data and report results, but the source of the scientists, and the funding for their services is unclear. We recommend that Council contribute financially to the data analysis and reporting where the findings are likely to be of value to Wellington.

- Guideline 17 says that "intensive and targeted research" will be conducted in partnership with relevant institutions. It's not clear if research in this category will be funded from a core biodiversity budget or as an Annual Plan proposal. We recommend clarifying funding arrangements for major research projects.

Capability and capacity

110. We strongly support Goal 4.4, building Council's capacity to protect and restore Wellington's biodiversity. The preparation of this strategy demonstrates the team's understanding of the complexity of protecting and restoring biodiversity in an urban environment. We recommend Council continue to invest in building the capability of the team members and other staff with roles in implementing *Our Natural Capital*.

SECTION 11: MEASURING COUNCIL'S PERFORMANCE

111. We recommend that Council pursue its involvement in the City Biodiversity Index. Benefits include better quantitative information about the state of the city's biodiversity at 5-yearly intervals, and professional contact with international experts in biodiversity management in urban environments. We recommend preparing detailed methodological notes that relate to the Wellington context before starting to collect data. For example, for indicator 4, how will the survey sites be selected; will the same sites be used each five years; and what species in each taxonomic group will be monitored

112. We recommend changing the measure for pest control in the Long Term Plan 2015-25, annual reports, and Council's regular (quarterly) performance reporting to 'Increase in the number of hectares of ecologically significant public land under integrated pest control *based on X ha in 2014*.' Also show the increase as a percentage to show progress towards the agreed target of 70% by 2020, and 100% by 2025.

113. We recommend continuing the collection of hours worked by 'recognised environmental volunteer groups and Botanic Garden volunteers'. The number of hours rose from 25,000 in 2009/10 to 34,611 in 2013/14. This measure can be used as an indirect measure of progress towards the vision i.e. "the people are renowned for their kaitiakitanga". We suggest explaining the data collection methodology in a future issue of *Branch Out*.

114. We question the value of the current reports on bird counts without any interpretation of the wide variability in the raw data.

SECTION 13: CONTEXT FOR GOALS, OBJECTIONS AND ACTIONS

115. We recommend starting the climate change section with possible implications for biodiversity that are not as well-known as storm surges and sea level rise. Possible examples include plants that flower too early may 'miss' their pollinators, gender balance in tuatara, and changes associated with diseases that threaten plants and birds.

116. *Adapting to a changing climate* is the Department of Conservation's proposed framework for the conservation of terrestrial native biodiversity in New Zealand.[3] The framework comprises five four strategies and 14 actions. We recommend that Council include more of these ideas into *Our Natural Capital,* and the update of Council's *Climate Change Action Plan 2013.*

SECTION 14: GLOSSARY

[3] Christie, J.E. Adapting to a changing climate. Department of Conservation, May 2014.

117. We recommend including definitions of the following terms in the Glossary because they are used in *Our Natural Capital*: green infrastructure, Blue Network, Integrated pest management, nature, novel ecosystem, succession.

118. We recommend removing words from the glossary as they are not used in *Our Natural Capital*, e.g. benthic, feral species and ecological region.

SECTION 16: BIBLIOGRAPHY

119. We recommend adding a bibliography of key references, not just those referred to in footnotes, but other references that have implications for understanding and implementing the strategy. We suggest seeking out any recent NZ references that will help people understand and implement the strategy. Summaries, evaluations and reviews of terrestrial and/or riparian restoration projects in urban areas would seem to be particularly relevant. As one example, the following paper deserves a wider audience.

- Blaschke, P. *Vegetation in Owhiro Stream catchment, Wellington South Coast.* Wellington Botanical Society Bulletin, November, 2012.

HEARINGS

We would like to speak to Councillors at the oral hearings.

ATTACHMENTS TO SUBMISSION

1. Warren, Paula. *Eco-sourcing*.Wellington Botanical Soceity Bulletin 55. November 2014.

2. Horne, Chris. *Eco-sourcing of plants. What, why where and how*. October, 2014, updated 1 March 2015.

Contact details

Bev Abbott
Submissions Coordinator, Wellington Botanical Society
40 Pembroke Rd, Northland, Wellington 6012
bevabbott@xtra.co.nz
Phone 04 475 8468 (H).

Attachment 1: Wellington Botanical Society Submission on *Our Natural Capital*

Eco-sourcing

Paula Warren[1]
1. DOC, PO Box 10420, Wellington 6143. Email: pwarren@doc.govt.nz

Eco-sourcing is one of those topics that generates heat but not (so far) a clear light to guide community groups. Wellington Botanical Society set up a debate for its meeting on 21 July 2014, with myself, Chris Horne, Stephen Hartley and Leon Perrie providing material to start the discussion. This paper reflects my views at the end of the debate.

The debate highlighted that there are in fact two closely related issues – when to intervene in natural processes, and what the role of eco-sourcing is in any interventions?

Should we intervene or leave it to nature?
At one end of the spectrum would be the view that the best approach is to let nature do whatever nature chooses to do – humans cannot make better decisions, and nature does not need help. The other end of the spectrum would be to always plant, as that will always deliver faster and better outcomes. None of the participants in the debate seemed to be at either extreme, but there was clearly no consensus on what is the best place to land along the spectrum.

As a policy analyst I always try to start with the question "what are you trying to do?"

I've recently set up a charitable trust to use vegetation management to improve transport corridors in order to generate a wide range of desirable outcomes – cut the costs of management for the transport agency, reduce illegal rail crossings, reduce dumping and litter, stop tagging, reduce crime, create new populations of rare plants, provide amenity values, make public transport and walking more attractive, provide habitat for lizards and invertebrates, reduce bird kill, improve stream health, reduce weed propagules, and restore existing natural remnants or rare plant populations.

Nature isn't going to deliver most of those objectives. Nature is not going to conveniently put a native vine next to a bridge pier that has tagging, and even if it does, the vine will need help to climb the structure to hide the tags.

But even where we really are doing ecological restoration, I would argue that natural isn't always the best, and often won't produce a natural outcome.

Firstly, even if the "right" seeds turn up, they won't always establish. Stephen Hartley presented an Australian study that showed that even after 45 years, an area in exotic grass was still in exotic grass, and none of the locally present eucalypts had colonized.

Chris Horne argued in the debate for patience. But in many cases we can't afford to wait. If the price of waiting is loss of animal species or inability to establish locally extinct species,

stream banks slumping and downstream estuaries filling in, high fire risk, or any of the other possible outcomes of slow regeneration, I believe intervention is essential.

Waiting may also be just too expensive. Robyn Smith pointed out in the debate that weed control contractors cost $600 per day. Does it make sense to do weed control for 80 years at that price, rather than get in and plant?

And will the result of waiting be a more natural system anyway? Are there significant propagule flows from undesirable sources (e.g. gardens)? Would reliance on local propagule sources result in genetic bottlenecks? Are there species that will be missing, because there is no propagule source or because the changes to the site mean they won't establish on their own?

Do we really trust birds more than people, just because they are "nature"? Starlings in Wellington deliver plenty of weed seeds to the areas in which they roost. So natural regeneration may not result in "eco-sourcing".

Does eco-sourcing matter

Eco-sourcing relies on the hypothesis that there is a "natural" assemblage of species and science can work out what is "native" to a particular location. The meeting discussed the fine details of that concept (do we welcome some eucalypts because they were present in New Zealand a few million years ago?), but there seemed to be a broad consensus that there is a "natural" species composition that we should be aiming to retain or restore.

A few key principles seemed to get full agreement, one being that if you can, you should. If there is no cost to eco-sourcing, eco-sourcing should be the automatic choice, for two key reasons: the risk of altering natural genetic patterns is avoided, and there is a greater chance that the material will be suited to the conditions of the site. Stephen presented some research evidence for improved fitness with eco-sourced material.

Where there is a cost or barrier to ecosourcing (e.g., higher cost of plants, difficulty getting material, delays in planting programmes while the right stock is grown, risk of poor genetic fitness, the species is locally extinct), I would argue that the decision on whether eco-sourcing matters comes down to three questions. Is eco-sourcing directly relevant to your objectives (e.g., to create a scientifically accurate outcome)? Could you be creating a future weed or genetic contamination problem by doing something else? Could you repair the damage if your plantings turned out to be a mistake?

What constitutes eco-sourcing

If the answer is that eco-sourcing is desirable, there is one further issue to be resolved - what constitutes eco-sourcing? Not a simple question to answer, and (as far as I can determine) it hasn't been answered in the literature. But we know some key things to consider in trying to achieve that misty goal.

Closer is better. Go for the remnant next door, not the one in the next catchment.

Similar habitat is better. Similar altitude, soil type, hydrology, exposure to wind, exposure to salt.

In terms of how far might be too far, the likely natural gene exchange distances are, in my view, highly relevant. Something dispersed by a kereru will have a larger population/metapopulation area than something pollinated and dispersed by lizards. Focusing on natural dispersal ranges is, in my view, likely to be more useful than trying to use simple concepts like ecological districts, although real genetic data would be even better.

At the same time, it is important to avoid creating genetic bottlenecks. In the debate the idea of taking propagules from the nearest 100 plants was floated. That might be a useful approach, but I believe the number needs more thought. 250 individuals is the number used to identify species that are critically endangered. While that also relates to risk of stochastic loss, it might be a better number to use to ensure a wide gene pool.

An alternative might be to use the nearest populations that collectively have at least 250 individuals, and then collect from as many individuals within those populations as possible.

Some proposed principles

At the end of the debate I had concluded that we need some simple guidance for community groups, covering both the "when to intervene" and the "what plants to use" arguments. I would offer the following.

1. Work out what you are trying to achieve, and be explicit about that when explaining your project to other people. If you aren't doing true ecological restoration, don't call it that – call it stream bank stabilization, or water quality improvement revegetation work, or lizard habitat creation, or whatever best describes the core goal.
2. Minimise your interventions. That will reduce costs and reduce risks of mistakes. In terms of revegetation, use the following hierarchy:
    a. Blocking new threats (e.g., legal protection, fencing and quarantine).
    b. Changing the nature of the site so natural regeneration is enhanced (e.g. turfing or spraying grass)
    c. Assisting natural regeneration (e.g., weeding, controlling herbivores)
    d. Adding missing dispersal agents (e.g., introducing kereru) or replacing them (e.g., lobbing seed bombs).
    e. Planting
3. Ensure your intervention is the best way to achieve the intended result and avoid creating new impacts.
4. If bringing in seed or plants, use site-appropriate, regional natives. Get your material from the closest possible source(s), but if possible ensure that you are collecting from a large number of individuals. A good rule of thumb would be:
    a. Use sites that are within the likely natural gene dispersal catchment of your planting site for that species, unless that will mean less than 100 individuals will be available. If there are less than 100 individuals, think about the relative merits of risking genetic bottlenecks or risking genetic contamination.

   b. Within those sites collect from as many individuals as you can.
5. If that isn't possible, or doesn't fit with your objectives, choose species that best meet your objectives, that aren't weedy, and that can be identified by other people as human interventions. That might mean using exotic species, or species that are from another part of New Zealand. In particular
   a. avoid using seed or plants of local natives that have come from unknown or distant sites;
   b. avoid using species that will hybridise with local natives; and
   c. avoid species that will invade natural ecosystems and out-compete local natives.
6. If the horse has already bolted (i.e., the locally native plants turning up as a result of natural dispersal are already a genetic mix), you can be a bit more relaxed about using those species. But try not to make the problem worse. Use the local mix rather than introducing new material from outside the local area to add to that mix. If you can, select those which are most likely to match what was the local population.

Conclusion

It is important to get out there and do work, even if you don't get it right. On Tiritiri Matangi Island in the Hauraki Gulf, some of the plantings proved to be far from optimal. But they still delivered better ecological outcomes than doing nothing, and thinning of dense pohutukawa greatly improved the outcomes from the affected areas.

But it is also important to ensure that mistakes can be recognised and fixed. Science isn't finished – our understanding will hopefully improve over time, and our capacity to do restoration will also grow.

In historic structure conservation, repairs are generally designed so that they are visibly repairs, not original structure, and can be easily removed later if the repair was considered to be an error. Materials that will cause further damage to the remaining original structure are avoided. The aim of repairs is to stablilise the structure and retain what is left of its intrinsic values. I think that approach is equally applicable to a lot of vegetation/soil management, with the obvious difference that ecosystems can repair themselves, while historic structures have only a downward trajectory available.

Attachment 2: Wellington Botanical Society Submission on *Our Natural Capital*

Paper by Chris Horne.

ECO-SOURCING OF PLANTS

WHAT, WHY, WHERE and HOW

In my opinion eco-sourcing is what Nature does, when it is given the opportunity provided by intensive and sustained control of pest animals, pest plants and other ecological weeds. Natural ecological restoration is genetically sound, and requires considerable patience.

My opinion is based on the following observations:

- 1957 / 58 & 1958 / 59: I was employed on the Forest Research Institute's Ecological Forest Survey in Te Urewera, Ahimanawa, Kaweka, Kaimanawa and Ruahine ranges. I saw forests severely degraded by the whole range of pest animals. Ground-cover, and shrub tiers, were dominated by unpalatable species.
- 1961 / 62: I was employed on the Forest & Range Experiment Station's High Country Survey in the Cragieburn Range, Eyre Mountains and Takitimu Mountains. The plant communities within the bush line, and on the tops, were in a similarly degraded state. Chamois and thar added to the suite of pest animals affecting North Island forests.
- Early 1980s: When tramping the tops of the Tararua Range, I noted abundant flowering of alpine species, presumably aided by NZ Forest Service deer-culling, and helicopter hunting.
- 1990s onwards: The numbers of seed-carrying birds, e.g., tūī and kererū, began increasing in the city, as a result of Greater Wellington Regional Council's (GWRC) possum / rodent / mustelid control in the city's reserves.
- 2001-04: I was contracted to do possum-control work for GWRC, filling c. 275 bait stations (Karori Park / Karori West, Johnston Hill Reserve / Karori Cemetery, Otari-Wilton's Bush, Outer Green Belt / Crofton Downs / Huntleigh Pk, Orleans-Makererua Reserve, Johnsonville Park). I noted that seedlings of species palatable to possums, and to seed-eating rodents, began appearing after about 18-months' work.
- 2007: I was contracted by GWRC, with Barbara Mitcalfe, to do a botanical survey in Albemarle Road 'Reserve', Northland. We found one nīkau seedling; later Richard Morgan found another. Presumably the seeds had been brought by birds from Otari, or Johnston Hill Reserve, or North Makara Valley.
- 1980 – present: When I bought 28 Kaihuia St, Northland in 1980, where I now live, there were lawns at the back and front of the house, and on the Wellington City Council (WCC) berm. In 1981 I received from WCC about fifteen native plants to plant on the berm. Other native plants, mostly self-sown, have since shaded out all three lawns. Natural arrivals via the wind or birds include: rewarewa, patē, hangehange, five-finger, *Coprosma grandifolia*, *Parsonsia heterophylla*, *Rubus cissoides* (diameter at base c. 10 cm). The most recent arrivals are tawa seedlings, one on the WCC berm, and one at the front of my sectioon – kererū in action! To increase the chances of seeds germinating, I control pest animals on the property with traps.
- 2014: On the Society's field trip in January 2014 in Te Urewera and Whirinaki forests, we saw evidence of the regeneration of indigenous species, including

some highly palatable species, despite the absence of intensive control of pest animals such as in Wellington's reserves.

I believe that eco-sourcing should be left to Nature: the wind, birds, and in the case of some plant species, gravity or water. The only ecologically and genetically-sound exceptions to this are:

- when there is a need to protect an indigenous ecosystem against the "edge-effect", plantings around its perimeter of seedlings grown from seeds collected from naturally occurring plants within it.
- when there is a need to plant on grass sward, or on land with, e.g., gorse or blackberry, the plants used have been grown on from seed collected from naturally occurring plants immediately adjacent to the site.

In any other circumstances, when people plant what they think are 'eco-sourced' plants, the results are likely to be 'botanic gardens', 'designer ecosystems' of little or no scientific value.

Dr Geoff Park's 1999 paper, *An Inventory of the Surviving Traces of the Primary Forest of Wellington City*, prepared for WCC, recorded 401 sites in the city with what he defined as "primary-forest remnants". These were stands of vegetation in which "… canopy tree species characteristic of the district's primary forests' canopy tree species are naturally occurring." I believe that these remnants, " … fairly evenly spread across the City's land area," provide a range of seed sources suited for the natural, genetically- and ecologically-sound restoration of the city's regenerating and mature native forests, shrublands, adventive scrublands and even plantations. To achieve this, WCC and GWRC must continue, undiminished, throughout the city and its hinterland, the intensive control of pest animals, and WCC must intensify its control of pest plants and other ecological weeds.

The term "eco-sourcing" has a 'feel-good' sound to it, but when it involves bringing to an indigenous ecosystem, plant material from beyond it, it is genetically and ecologically unsound, because the genetic makeup of a species varies from one location to another. It is putting the pleasure of planting, ahead of the ecologically sound management of our precious indigenous ecosystems. It ignores natural patterns of plant distribution and genetic composition. I believe that this practice is turning indigenous ecosystems around the city into 'botanic gardens', because people are choosing what species to plant, choosing where to source them from, and then choosing where to plant them. These 'botanic gardens' will have little worth for future genetic and ecological studies, because their composition has been dictated by people, not by Nature. Examples include:

- scores of northern rātā from Project Crimson, on Te Ahumairangi Hill, Wadestown, planted at c. 2-m centres.
- 180 northern rātā from Project Crimson, and whau, in Polhill Reserve, Aro Valley. Another 180 northern rātā are to be planted near the Aro St bus terminus.
- nīkau, pukatea, miro, kohekohe, *Coprosma linariifolia*, *Pseudopanax ferox* and *Rhabdothamnus solandri* in Centennial Reserve, Miramar North.
- *Ackama rosifolia*, *Olearia albida*, *Meryta sinclarii* and pōhutukawa in Rangitatau Reserve, Strathmore.
- *Meryta sinclarii* in Oku St Reserve, Island Bay.
- *Pittosporum crassifolium* / karo in Buckley Rd Reserve, Southgate, and Te Raekaihau Reserve, Melrose.
- *Plagianthus regius* and an Australian *Elaeocarpus* planted in Kelburn School gully.

Planting workbees attract more volunteers than weeding workbees, or servicing traps and bait stations. Otari-Wilton's Bush Trust weeding workbees have had to be called "plant-care workbees", to make them sound more attractive.

When Northland's Albemarle Road 'Reserve' StreamCare Group's GWRC liaison officer heard that the group had decided not to plant the eight podocarp seedlings delivered to the site, unrequested, she said that of all the StreamCare groups she was working with, the group was the most advanced in its ecological thinking. Previously, the group had discussed the surprise donation of the podocarps, and noted that there were no records of podocarps ever growing in the small catchment. The group came to accept that in time podocarp seeds would be delivered by birds from Otari-Wilton's Bush or Johnston Hill Reserve, just as two nīkau seeds had arrived, and germinated. (See 2007, page 1).

In the early 1990s it was estimated that there were about twenty tūī and two kererū in the city. There are now hundreds of tūī, and there is a recent report of a flock of twelve kererū seen over Te Ahumairangi Hill. If pest-animal control efforts are maintained, and intensified, the burgeoning numbers of these seed-distributors, plus the ever-reliable wind, will ensure that, over time, seed from Wellington's 401 remnants of primary forest will be distributed far and wide – into other forest remnants, regenerating forests and shrublands, gorse, broom and Darwin's barberry scrublands, and even into plantations on the Town Belt.

Answers to questions raised on 13.7.2014 by Carol West:

- Fitness of locally sourced plants for local conditions; Please refer to my fourth paragraph.
- Genetic variation, and why it does or doesn't matter: It differs within each species according to location.
- What are the impacts of bringing native plants from outside a region into a region: Genetic pollution.
- Has the horse bolted with plant movements throughout NZ by people: Perhaps, but let's not compound past errors.
- What are the "rules" on eco-sourcing: Nothing definitive. Keeping records is essential for protecting what remains of Wellington's indigenous biodiversity.

Chris Horne **21 July 2014, updated 1 March 2015**

MT COOK MOBILISED
Box 9724 Wtn 6141
mtcookmobilised@gmail.com

Wellington's Draft Biodiversity Strategy & Action Plan *5 March 2015*

Thank you for the opportunity to comment on Wellington's Draft Biodiversity Strategy and Action Plan. On the whole Mt Cook Mobilised was impressed by the tenor of the Action Plan and the range of initiatives under consideration. Papawai Reserve Group is a one of the initiatives of Mt Cook Mobilised, which operates under the umbrella of the Newtown Residents' Association.

For the last six years, the Papawai Reserve Group in Mt Cook, has been planting and weeding a once derelict area on the suburban fringe of the Town Belt, which we call Papawai Reserve. Today Papawai Reserve is an urban oasis, enjoyed by many on the walk from the city to the southern suburbs, and celebrated by the Mt Cook community at our annual Spring Flings.

Papawai Reserve includes an area of unculverted stream which is a tributary of Waitangi Stream, and which we call Papawai Stream. Papawai Stream is home to native fish (banded kokopu and koura). The Papawai Reserve Group has taken an active interest in the welfare of the native fish, including agitating for a fish passage (fish ladder) for the climbing fish, and taking part in fish stocktakes. The lower Prince of Wales Park has had flooding issues in the past which have been resolved over several years of working with the Council. Our community takes a very active interest in this area, engaging with both the Wellington City Council and the Greater Wellington City Council.

Under our Memorandum of Understanding with WCC, it was agreed that Papawai Reserve will not be weed-sprayed. We would like Wellington City Council to be more sparing in their use of herbicides (particularly Roundup), pesticides and fungicides. We believe that the Council should put the biological eco-system ahead of convenience, and should set an example for Wellington. We would also like Council to consider running workshops about the dangers of using sprays, and highlighting the alternative methods.

Comments on the Biodiversity Action Plan

Section 7 Guiding Principles – We will work collaboratively [page 17]

- GWRC should be included in the list of agencies

Section 7 Guiding Principles – We will recognise the significance of people's connection with nature; in the last sentence "We recognise that these experiences actively contribute to people's sense of health and wellbeing." [page 17]

- We would like to recognise that "wellbeing" refers to both physical and mental wellbeing

Section 8 Goals and Outcomes–Goals to restore biodiversity; "aquatic ecosystem health" [page 18]

- We would like to include an explicit reference "including streams and native fish"

10 Action Plan – **Goal 1.4** The impact of urban growth and human activity on all ecosystems and remaining habitat is managed, **1.4.3** Reduce impacts of urban development and land-use on aquatic ecosystems, **b.** "Work with GWRC and within the Council to ensure no new barriers to fish passage are created through works in streams" [page 23]

- We would like to append "or underground stormwater" to sentence **(b)**

10 Action Plan – **Goal 3.1** Biodiversity is a common experience for all Wellingtonians, **3.1.1** Ensure all Wellingtonians encounter nature on a daily basis, **a.** "Promote and increase use of native plantings in Council amenity planting, road planting etc" [page 27]

- We full support (**a**).

  For public amenity planting, as a general rule we would like to see priority given to plants native to the local area, then native to New Zealand, then exotic plants. We recognise that there is benefit in planting a variety of species.

  Where there are plantings near large public buildings, e.g. the St James on Courtenay Place, we would like to see native plants showcased, where practical.

  We note that when the Drummond Street steps were designed, Mt Cook Mobilised suggested that kowhai trees would look magnificent and add to the green corridor for native birds. Flowering cherries were planted. We were told that kowhai flowers would be too slippery underfoot.

10 Action Plan – **Goal 3.3** More people are connected to nature, so take action to protect and restore biodiversity, **3.3.7** Encourage and support individuals and households to take action to support biodiversity, **a.** "Continue to support annual initiatives with partner organisations that encourage people to remove weeds from their gardens and plant native plants instead" [page 29]

- We would like to see some additional wording added to **(a)**, shown in italics here: "Continue to support annual initiatives with partner organisations that encourage people*, local businesses and government properties* to remove weeds from their gardens, *without the use of weed spray,* and plant native plants instead"

11. Measuring Wellington City Council's Performance [page 34-36]

- These are all quantitative measures, i.e. counting things. We would like to see some qualitative measures included, e.g. have people experienced the anticipated benefits of a closer relationship with the city's biodiversity?

12 Wellington's Biodiversity – 12.4 Freshwater; Streams, paragraph 2 begins "Urban streams include Owhiro Stream, Kaiwharawhara, Ngauranga and the Porirua Stream system…" [page 40]

- We would like to see "and smaller local streams, some of which are home to native fish..." included here.

  Papawai Stream is an example of a local stream, and we believe there are others in the city. Local streams with native fish living in them are not common and they should be acknowledged as a special part of the City's biodiversity.

13.1 Protect - 13.1.3 What do we need to protect biodiversity from?
13.1.3 (a) Environmental pests; Integrated pest control; the section on Methods used begins "Agrichemicals are the main method used for controlling pest plants." [page 48]

- Our preference is to limit the use of agrichemicals, particularly neonicotinoids, which have been linked to the collapse of the bee colony, and which are spread throughout the food chain. Neonicotinoids are a relatively new class of insecticide that affect the central nervous system of insects, resulting in paralysis and death.

13.1 Protect - 13.1.3 What do we need to protect biodiversity from?
13.1.3 (d) Climate change; Pressure and state, in the middle of paragraph 2 it states "The capacity of stormwater systems will be exceeded more frequently due to heavy rainfall events leading to surface flooding and increased number of sewer overflows." [page 50]

- We suggest the inclusion of "More water permeable media will be used for surface drainage, and the water table retention systems will be investigated"

  An example of water permeable surface drainage would be crushed lime or gravel paths in preference to concrete, or planted roadside areas instead of grass. This would help water return to the water table, rather than making its way through the stormwater system to the sea.

  We would like to see the District Plan tied to the Biodiversity Action Plan, so that residents are encouraged to make changes to their properties in support of the Biodiversity Action Plan, for example, replacing concrete driveways with water permeable surfaces, e.g. gravel driveways.

13.2.4 Beyond planting – Restoring our waterways, the first paragraph states "Wellington and most of our original streams are piped. Planting streamside (riparian) zones around streams is also important for water quality as it slows runoff and filters sediment before it reaches the stream. Sites for riparian restoration are prioritised around sediment source significance and the impact on the stream and harbour depositional environments." [page 55]

- We fully support this approach to prioritising riparian restoration

Submission to *Our Natural Capital – Wellington Draft Biodiversity Strategy and Action Plan*

Submission is from
Brooklyn Trail Builders

Submission prepared on behalf of Brooklyn Trail Builders (BTB) by:

Garth Baker, 54 Highbury Rd,
Wellington 6012
Ph: 027 357 7901
Email: garthbaker@xtra.co.nz

With input from other BTB members

Yes – we do want to make an oral submission to city councillors. Ring Garth Baker on 027 357 7901 to arrange time.

One of the 1000 nikau BTB are planting in Polhill

Introducing the Brooklyn Trail Builders

Brooklyn Trail Builders (BTB) are a group of volunteers building and maintaining multiuse tracks on council-managed land between Aro Valley and the South Coast. This includes the Polhill and Waimapihi Reserves, and George Denton Park.

The 20 kilometres of multiuse tracks we have built and maintained over the last seven years are recognised as being among the best in the country[1].

Late last year Wellington cyclists voted BTB the *Best Anything You Like 'Bike' for Wellington*[2].

BTB tracks link Aro Valley, Brooklyn and Highbury with the south-western hills (around the wind turbine and Hawkins Hill radar) and through to the south coast. Along with cyclists, they are used by runners, walkers and nature-watchers. The tracks also provide vital commuter links and are used for recreation events.

In 2014 Wellington cyclists voted BTB the Best Anything You Like 'Bike' for Wellington (Cycle Aware Wellington and CAN - Cycling Advocates Network annual awards)

We actively promote biodiversity in this area and in the last four years have planted 5,000 native trees alongside our tracks[3]. One particular project aims to reintroduce 1,000 eco-sourced nikau palms to this area[4].

The area in which we work is particularly relevant to *Our Natural Capital* as it includes a range of natural environments and is popular for different kinds of recreation. The Polhill reserve is where the edge of the city is closest to the city centre.

BTB works under the auspices of the Wellington Mountain Bike Club (WMTBC). WMTBC has a Memorandum of Understanding with WCC for the development and maintenance of trails and ecological restoration in our area, and at other sites across Wellington.

BTB is one of the leaders of community involvement in the green hills of Wellington and we believe our work over the last seven years aligns well with the guiding principles, goals and outcomes of WCC and *Our Natural Capital*. WE provide examples below.

[1] Personal comment form Jonathan Kennett, author of numerous mountain bike ride books and advisor to The NZ Cycle Trial.
[2] Annual awards offered by Cycle Aware Wellington and CAN -Cycling Advocates Network.
[3] Trees provided by the WCC, Forest and Bird and Project Crimson. We work closely with the WCC Restoration Technical Advisor on plant selection and placement
[4] One of our members has WCC permission to gather seedlings from an original nikau on Johnsons Hill. We grow them on and plant them in valleys along our tracks.

Overall support for *Our Natural Capital*

BTB supports the general direction of *Our Natural Capital*, along with its principles, goals and outcomes.

Our focus is on ensuring that Wellingtonians have access to natural spaces.

Our submission seeks to clarify some implications of *Our Natural Capital*, and offers suggestions on managing Wellington's natural areas for the enjoyment of all.

Discussions of specific aspects of *Our Natural Capital:*

Guiding principle: We will recognise the significance of people's connection with nature and **Goals to connect people to biodiversity**

We support this principle but are aware that "accessibility" is a vital link between Wellingtonians and natural spaces. People need to be able to get to, and into, natural spaces, to have a connection.

Our Natural Capital is reliant on an infra-structure of safe, well-made and welcoming tracks for Wellingtonians to connect with nature.

Working on tracks, or using them as a cyclist, walker or runner, give Wellingtonians real opportunities to connect with nature

We believe that this accessibility could be made more explicit in *Our Natural Capital* by extending the wording of this guiding principle to read: "We will promote and enhance people's awareness of and connection to nature, *and facilitate access to it*".

The goals to connect people to biodiversity could also be more explicit about *Our Natural Capital's* role in providing access, with the inclusion of a goal such as: *People are easily able to access natural spaces.*

Policy framework of Our Natural Capital

One reason that tracks have been developed in the Polhill area is to provide commuter routes away from roads. Commuting cyclists, runners and walkers regularly use our tracks. This has obvious environmental (and health) benefits. We believe *Our Natural Capital* would be strengthened if it acknowledged that it fits alongside WCC's promotion of sustainable transport options.

WCC is currently developing a tourist promotion of Wellington as a mountain biking destination[5]. The city's natural environment, along with the easy access provided by tracks is a vital component of this. This initiative is another part of *Our Natural Capital's* policy framework that could usefully be acknowledged.

Tracks get Wellingtonians into places they wouldn't otherwise be able visit. New Clinical track. This area is planted with trees from the original forest

Goal 1.1: Priority biodiversity sites on public and private land are protected

Objective 1.1.1 Protect all areas of ecological significance on Council-owned land through active management

BTB supports the protection of prime ecological sites. We expect that these sites would be identified using established procedures and with public consultation. This would enable a suitable management plan to be developed for the area which would identify permissible activities and access.

Objective 1.1.1 d. Ensure that a master plan for Te Kopahau Reserve protects existing ecological values by limiting new development.

Te Kopahau Reserve links with tracks we have developed south from Brooklyn, and includes several mountain biking routes, such as the Red Rocks and Tip Tracks.

Though this area is between two well-used recreation areas (around the wind turbine, and the South Coast) it lacks suitable tracks to encourage greater use. Given the number of Wellingtonians who visit nearby areas, Te Kopahau Reserve offers a real opportunity for more people to connect with nature.

We question the assumption that existing ecological values can only be protected by limiting new development. Te Kopahau Reserve seems to be the only area where *Our Natural Capital* proposes to take this action. The document provides no evidence that

[5] http://www.stuff.co.nz/dominion-post/news/wellington/9990806/City-could-become-mecca-for-mountainbikers-say-trio

the values in the reserve are so significant or fragile that they require this level of special protection.

We would expect *Our Natural Capital* to propose a framework to consider management development, rather than detailing the management of a single area.

Rather than a blanket ban on development we recommend that WCC consults widely and that any master plan for a particular areas, including Te Kopahau, considers all of the WCC's goals and policies, and reflects *Our Natural Capital's* goal of connecting people with nature.

Goal 1.4: The impact of urban growth and human activity on all ecosystems is managed

Objective 1.4.4 a Develop criteria for track development

We appreciate that we have a responsibility to design, build and maintain tracks in a manner that enhances, rather than degrades, the environment. We take our direction from the International Mountain Bike Association (IMBA) in the USA who research and promote *Sustainable Trail Building*. This includes:

- Building tracks to defined grades to reduce erosion.
- Sloping the track outwards to remove water.
- Integrating the track with trees and other natural features.
- Armouring the track surface with natural stone.
- Building narrow tracks and other techniques to reduce impact.

BTB recommends that the IMBA's book *Trail Solutions* is used to design a criteria checklist for track development in Wellington that covers design, pre build/planning, construction, follow up maintenance and environmental restoration and planting. This would ensure that the criteria and their implementation are based on sound science.

Well designed and built tracks will provide long-term and welcoming access to Wellingtonians

We also seek clarification on who will be responsible for developing the criteria and monitoring their implementation. We expect that Wellington trail builders would be fully involved. Given that the track development aligns with a number of WCC goals, a correspondingly wide range of interests should be represented in their future development and management.

Goal 3.1.1 and 3.1.2, Ensure Wellingtonians encounter nature on a daily basis and as part of recreation activities

Objective 3.1.2 Ensure Wellingtonians connect with nature as part of recreation activities

The tracks that the BTB have built provide easy public access into otherwise inaccessible areas of regenerating vegetation. These tracks have also enabled easy access for effective pest control, weed control, and planting and monitoring within these and nearby areas.

Wellingtonians connecting with nature and contributing by making tracks

The tracks provide a significant number of Wellingtonians with recreation in natural settings. The 'Transient' track that climbs from Aro St to Brooklyn has over 84,000 uses in the last calendar year, with a summer peak of 12,000 uses a month[6].

The track network has been designed to link the places that users want to go, and to enable a circular journey. The tracks themselves have been well-designed and built to ensure a suitable surface and gradient, and to manage water flow off the track. BTB believes the design of the network and the high build-quality of the tracks is one of the main reasons for their popularity.

Trackside planting—replacing gorse with more biodiversity. Clinical track, winter 2014

The native planting alongside tracks improves the quality and diversity of nature that Wellingtonians can enjoy.

Our work demonstrates our strong support for *3.1.2 a*. However, we note that the *quality* of access to a natural space is crucial to enabling a wide range of Wellingtonians to use these areas.

Riding bikes is a popular – and desirable – recreational activity for many Wellingtonians. We believe that *3.1.2 a* would better recognise this by including a ten-minute cycle ride alongside walking. This ensures a much greater number of Wellingtonians are within a 10-minute journey of nature spaces.

[6] Information from WCC, information from the number of 'passes' of their track counters

Goal 3.3: More people are connected to nature, so take action to protect and restore biodiversity

Objective 3.3.2 Celebrate and promote action to protect and restore biodiversity

Along with mountain bikers who regularly volunteer to build tracks or plant trees, BTB has made extensive use of volunteer corporate groups. In the 2013-14 financial year volunteers provided over 2,000 hours of labour to build our latest track, which gives Wellingtonians access to a natural space that was previously inaccessible[7].

Brooklyn Primary School students enjoying clearing gorse for planting, June 2013

We manage annual tree-planting with Brooklyn School Students in the Polhill Reserve. In 2014 we also worked with WCC parks staff and other groups[8] to manage an event to plant native trees as part of the WCC's development of Polhill Park at the top of Aro St. Over 50 mountain bikers participated, many explaining they wanted to give something back and to be able to identify their contribution later.

This shows how different organisations who are not exclusively focused on environmental regeneration can provide real opportunities for Wellingtonians to take real action and celebrate our natural spaces.

Objective 3.3.2 would be strengthened by encouraging more and more diverse organisations to take biodiversity action. It should also publicise these activities.

Wellingtonians enjoying nature and contributing by making tracks

The well-publicised sighting of the first pair of saddlebacks nesting outside Zealandia occurred alongside BTB's Clinical track[9]. As well as demonstrating that tracks do not disturb bird-nesting, this emphasises that tracks provide vital opportunities for Wellingtonians to celebrate our biodiversity.

[7] The 2 kilometre 'Clinical' track that climbs from Holloway Rd to George Denton Park I Highbury.
[8] The Aro Valley Regeneration Group and Kai O Te Aro community garden
[9] http://www.stuff.co.nz/environment/10665721/Saddleback-find-a-100-year-record

Brooklyn Trail Builders
Andrew Jackson
Chris Mueller
Craig Starnes
Garth Baker
Kevin O'Donnell

Mountainbikers turned up in droves to help plant Polhill Park— they want to contribute. June 2014

BTB volunteer helping plant Polhill Park, June 2014

Submitter Details

First Name: **Alex**
Last Name: **James**
Street: **11 Surrey Crescent**
Suburb: **Hokowhitu**
City: **Palmerston North**
Country: **New Zealand**
PostCode: **4410**
Daytime Phone: **027 326 6785**
Mobile: **027 326 6785**
eMail: **deleatidium@gmail.com**

Trade competition and adverse effects:
○ I could ○ I could not
gain an advantage in trade competition through this submission
○ I am ○ I am not
directly affected by an effect of the subject matter of the submission that :
a. adversely affects the environment, and
b. does not relate to the trade competition or the effects of trade competitions.

Wishes to be heard:
○ Yes
◉ I do NOT wish to speak in support of my submission and ask that the following submission be fully considered.

Preferred hearing location:
○ Oral Hearings - Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

Hearing Needs:

Correspondence to:
◉ Submitter
○ Agent
○ Both

Submission

1. Overall, do you support or oppose the general direction of Our Natural Capital?

○ Strongly oppose ○ Oppose ○ Neither support nor oppose ○ Support ◉ Strongly support

Why do you say this?
I strongly support the general direction of Our Natural Capital as WCC has clearly defined the issues, provided a set of well-defined goals, and perhaps most importantly detailed how they propose to measure their progress over time. I do have some concerns about how progress will be measured in freshwater environments and this will be detailed subsequently

---

2. Do you support the Guiding Principles, Goals and Outcomes?

○ Strongly oppose ○ Oppose ○ Neither support nor oppose ○ Support ◉ Strongly support

Why do you say this?
A sound set of 'Guiding Principles' has been provided. It is especially important the WCC 'will acknowledge our city context' as the area has been permanently and irreversibly altered by urbanisation and changes in land use, which will always place limits on what any restoration efforts can achieve (i.e., it is unlikely kakapo will ever be wandering the streets). Also important is WCC's commitment to 'actively engage with research'. The only way to ensure our biodiversity improvement efforts are working is through sensible monitoring linked to targeted research. The 'Goals and Outcomes' provided are realistic. It is especially encouraging seeing there is goal stating, 'Aquatic ecosystem health across the city is maintained and/or improved'. Many local government bodies do not place a lot of importance on the condition of their rivers and streams so it is great to see a specific goal aimed at such environments in the WCC area. With respect to aquatic ecosystems, I have some concern how they are integrated into the significant goal of 'Priority biodiversity sites on public and private land are protected'. I will elaborate on this in question 9 below.

---

3. Do you think we have identified the biggest issues facing indigenous biodiversity in Wellington?

◉ Yes ○ No

Your comments
The big issues (environmental pests, habitat loss and fragmentation, aquatic ecosystem degradation, and climate change) facing indigenous biodiversity in Wellington are the same as those facing biodiversity nationwide and in some respects, worldwide. It is great to see aquatic ecosystem degradation has been specifically identified as one of the biggest issues.

---

4. Do you think we have identified the right priorities in order to achieve our desired outcomes for biodiversity in Wellington?

◉ Yes ○ No

Your comments
It is encouraging to see a comprehensive list of prioritised actions to 'reduce the impacts of urban development and land-use on aquatic ecosystems' and 'continue stream restoration programmes in accordance with community and catchment priorities'. In particular I was pleased to see some major new initiatives targeted at aquatic ecosystems; the identification and remediation of fish barriers and the development of a stream monitoring programme, which includes macroinvertebrates. It will be important to ensure remediation of fish barriers uses techniques suitable to the fish species present and the design of the stream monitoring programme will allow useful information to be collected.

---

5. Do you think we have identified the right organisations to partner with to achieve our objectives?

◉ Yes ○ No

Your comments
Collaboration with GWRC, Wellington Water, DOC, Zealandia, Victoria University, and specialist consultancies will be crucial to achieving WCC's biodiversity objectives.

6. Do you think we have the right indicators and targets to measure our performance by?

○ Yes ◉ No

Your comments
Section 11 of the draft Biodiversity Strategy indicates that the WCC's performance will be measured using the City Biodiversity Index, which includes 13 indicators. I am concerned that the only indicator directly related to aquatic ecology and biodiversity is the inclusion of freshwater fish as one of five key taxonomic groups selected as 'core indicators' against which to measure the change in number of native species. Additionally, it is possible that due to New Zealand's limited freshwater fish fauna the number of fish species present in the WCC area over time is unlikely to change to any great degree. Also, it is unclear how other monitoring actions included under 'Goal 4.2: Environmental monitoring is consistent across the city, region, and country and informs our biodiversity management' are integrated into measuring performance (e.g., the stream monitoring programme).

7. Do you agree with our direction for the tiered support for community groups?

◉ Yes ○ No

Your comments
It is clear the WCC has put some significant thought into the various types of community group that exist and are committed to supporting even the smallest of these. The provision of eco-sourced native plants is a component of support for all tiers of group. I would suggest WCC ensures all groups have a suitable location to plant all plants delivered. With some 20% of all new planting to be done in riparian areas, I would also suggest input from Wellington Water to ensure plantings are not done in locations where they may increase the flood hazard. It would be unfortunate if community group plantings had to be removed at a later date for such reasons.

8. Is there anything you feel has not been adequately covered by the draft plan?

◉ Yes ○ No

Your comments
A method/process for determining the ecological value of constructed/highly-modified ecosystems has not been included. A case in point is the extensive piped sections of some stream catchments. It is known some fish species manage to migrate through these pipes to unpiped reaches upstream. However, the actual habitat value of these piped sections is unknown. Have they developed to be simplified pseudo-cave environments that have their own invertebrate and fish communities? Another, similarly overlooked constructed environment are the ponds and wetlands that are increasingly being created to treat stormwater runoff. There are studies that show such environments in urban areas can have similar biodiversity values and natural wetlands in urban areas (e.g., Hassall & Anderson (2015) Stormwater ponds can contain comparable biodiversity to unmanaged wetlands in urban areas. Hydrobiologia 745: 137-149.). While I am unsure of how many such stormwater treatment wetlands/ponds are currently in the WCC area, it is likely they will

become more common elements of new subdivisions.

9. Do you have additional comments? (please attach additional pages via the 'Supporting Information' tab)

(•) Yes ( ) No

Your comments
With respect to aquatic ecosystems, I have some concern how they are integrated into the significant goal of 'Priority biodiversity sites on public and private land are protected'. The criteria provided in appendix 1 for determining ecological significance is very much geared towards terrestrial sites and in particular indigenous vegetation. I am unsure if WCC has identified any aquatic sites of ecological significance (I could not see any on Map 1 of the draft biodiversity strategy). The determination of such sites can be more difficult than for terrestrial sites for a number of reasons: 1. What is a 'site' when it comes to a stream or river? The dimensions/boundaries are not as easily defined as they are for an indigenous vegetation remnant. 2. What measures are appropriate for determining ecological significance in a stream or river 'site'? Typically fish and macroinvertebrates are used, however the use of macroinvertebrates requires identification generally to species level which is beyond that undertaken by most surveys and monitoring programs. With fish, what constitutes high ecological significance is debatable. Does the presence of a single longfin eel ('At risk: declining' conservation status) at a 'site' mean it is of high value or should it be based more on the fish assemblage present? 3. Do more holistic measures such as Stream Ecological Valuation (SEV) have a role to play in determining ecological significance? While the protection of such aquatic sites on public land shouldn't be too difficult, legal and property right issues could potentially arise when trying to do so on private land. Thus specialist knowledge is required to first come up with suitable criteria for determining the ecological significance of aquatic ecosystem (namely streams and river) 'sites', and then determine where such sites are located in the WCC area. It is proposed to 'Carry out a monitoring programme for Wellington's streams using the Macroinvertebrate Community Index (MCI)'. While I support this initiative, it is important to note that there are numerous other indices and techniques for summarising invertebrate data and determining impacts and trends over time rather than just the MCI. I suggest this action is changed to 'Design and implement a benthic macroinvertebrate biomonitoring programme for Wellington's streams' In subsection 12.4 of the draft Biodiversity Strategy, under the threatened species heading the statement regarding the threat status of three fish is incorrect. Giant kokopu and long finned eel are classified as 'At risk: declining', while short jawed kokopu are 'Threatened: nationally endangered'. While it sounds pedantic, giant kokopu and long finned eels can not technically be called threatened based on the criteria used in the latest conservation status update: Goodman, J.M.; Dunn, N.R.; Ravenscroft, P.J.; Allibone, R.M.; Boubee, J.A.T.; David, B.O.; Griffiths, M.; Ling, N.; Hitchmough, R.A.; Rolfe, J.R. 2014: New Zealand Threat Classification Series 7. Department of Conservation, Wellington. 12 p.

Attached Documents

File
Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

Submitter Details

First Name: **Craig**
Last Name: **Starnes**
Organisation: **Individual**
Street: **19 Forsyth Grove**
Suburb: **Brooklyn**
City: **Wellington**
Country:
PostCode: **6021**
Daytime Phone: **049142432**
Mobile: **0292782736**
eMail: **craig.starnes@msd.govt.nz**

Trade competition and adverse effects:
○ I could ○ I could not
gain an advantage in trade competition through this submission
○ I am ○ I am not
directly affected by an effect of the subject matter of the submission that :
a. adversely affects the environment, and
b. does not relate to the trade competition or the effects of trade competitions.

Wishes to be heard:
◉ Yes
○ I do NOT wish to speak in support of my submission and ask that the following submission be fully considered.

Preferred hearing location:
○ Oral Hearings - Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

Hearing Needs:

Correspondence to:
◉ Submitter
○ Agent
○ Both

Submission

1. Overall, do you support or oppose the general direction of Our Natural Capital?

○ Strongly oppose ○ Oppose ○ Neither support nor oppose ○ Support ◉ Strongly support

Why do you say this?
The green spaces are a huge asset to Wgtn on a number of fronts. Improving the biodiversity for all users is particularly important.

---

2. Do you support the Guiding Principles, Goals and Outcomes?

○ Strongly oppose ○ Oppose ○ Neither support nor oppose ◉ Support ○ Strongly support

Why do you say this?
The majority of the guiding principles, goals and outcomes are very good but I think the 'balance' in the Strategy document between biodiversity and access to the natural environment is not quite right. The guiding principles and outcomes do not specifically address access at the highest level, although access is mentioned in the Connect Goals. My preference is to see 'access' specifically stated in the guiding principles, eg 'We will recognise the significance of people's connection with nature and provide access to the natural environment' (connection is all about getting in amongst it and not viewing it from afar or having it locked up, eg Polhill had very few users until the new track network was created) and in the outcomes, eg 'Wellingtonians are connected to nature. They are .... to them. They are kaitiaki of the natural environment and take action to support its protection and restoration and ability to access and participate in the environment'. This also feeds into other WCC outcomes (refer 4. Policy Framework) for tourism, health benefits of exercise, Wellington more liveable, etc. Regarding Te Kopahau which is specifically mentioned; this area has been heavily modified over time (quarry and farm land) and, at best, can currently be considered a good home to pests and introduced plants but with some areas of regenerating bush. Access is limited to what is a very large tract of land and the existing access is generally steep 4WD tracks that are difficult to use and are not sustainable in places. There is a fantastic opportunity to develop the area to improve recreation and biodiversity - hence the masterplanning is an excellent idea. The area is effectively a 'blank canvas' with respect to track development (other than steep 4WD tracks) so planning is critical to get the desired long term outcome, eg there is no easy (Grade 3) track up from the south coast to provide a contiguous easy 2 way multi user connection between the city and the south coast as well as side tracks to the lookout bunkers above devils gate.

---

3. Do you think we have identified the biggest issues facing indigenous biodiversity in Wellington?

○ Yes ◉ No

Your comments
I suspect that within WCC there are different views on what should be happening, eg mixed messages between the ecology and parks staff about what can and cant happen. Resourcing is always an issue but the trend is an improving one.

---

4. Do you think we have identified the right priorities in order to achieve our desired outcomes for biodiversity in Wellington?

◉ Yes ○ No

Your comments
But noting that the biodiversity outcomes also need to to work in with the other WCC objectives, eg tourism, healthy living, etc

---

5. Do you think we have identified the right organisations to partner with to achieve our objectives?

◉ Yes ○ No

Your comments

6. Do you think we have the right indicators and targets to measure our performance by?

○ Yes ○ No

Your comments

7. Do you agree with our direction for the tiered support for community groups?

◉ Yes ○ No

Your comments

8. Is there anything you feel has not been adequately covered by the draft plan?

○ Yes ◉ No

Your comments
Once again - its access to the natural environment. The multi user tracks need to be well planned to ensure they remain a long term asset - gradient, variety, flow, visit points of interest are all key (there are examples in Wgtn of poorly designed and built tracks). Its the balance between biodiversity and access with a very long term veiw (hundreds of years) that can really leverage off Wgtns natural assets.

9. Do you have additional comments? (please attach additional pages via the 'Supporting Information' tab)

○ Yes ○ No

Your comments

Attached Documents

File
Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

Submitter Details

First Name: **Denis**
Last Name: **Asher**
Organisation: **Aro Valley Restoration Project/Tanera Gully Restoration Project**
On behalf of: **Members and supporters of the above.**
Street: **63**
Suburb: **Norway St**
City: **Wellington**
Country: **New Zealand**
PostCode: **6012**
Daytime Phone: **+64223536078**
Mobile: **+64223536078**
eMail: **denis.asher3@yahoo.co.nz**

Trade competition and adverse effects:
○ I could ○ I could not
gain an advantage in trade competition through this submission
○ I am ○ I am not
directly affected by an effect of the subject matter of the submission that :
a. adversely affects the environment, and
b. does not relate to the trade competition or the effects of trade competitions.

Wishes to be heard:
◉ Yes
○ I do NOT wish to speak in support of my submission and ask that the following submission be fully considered.

Preferred hearing location:
○ Oral Hearings - Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

Hearing Needs:

Correspondence to:
◉ Submitter
○ Agent
○ Both

Submission

1. Overall, do you support or oppose the general direction of Our Natural Capital?

○ Strongly oppose ○ Oppose ○ Neither support nor oppose ○ Support ◉ Strongly support

Why do you say this?
Because of the resulting positive economic, quality of life and biodiversity outcomes.

---

2. Do you support the Guiding Principles, Goals and Outcomes?

○ Strongly oppose ○ Oppose ○ Neither support nor oppose ○ Support ◉ Strongly support

Why do you say this?
Experience clearly demonstrates without a significant community input Council goals and strategy will struggle. Effective partnership has been demonstrated internationally, nationally and regionally as fundamental to successful regeneration projects. 'Buy-in' by residents will result in less weeds, less rubbish, greater biodiversity. Council resources, particularly its experienced and skilled staff have a vital role to play in providing advice and guidance for significant numbers of volunteers ready and willing to commit their time and effort to 'restoring' and enhancing Wellington's already significant natural values.

---

3. Do you think we have identified the biggest issues facing indigenous biodiversity in Wellington?

◉ Yes ○ No

Your comments
More yes than no. It's a huge task, through complex micro and macro levels. Pest control and, desirably complete removal, are tasks demanding significant resource and community (and political) focus. WWC's draft objectives are an important step in the right direction.

---

4. Do you think we have identified the right priorities in order to achieve our desired outcomes for biodiversity in Wellington?

◉ Yes ○ No

Your comments
Largely. Effective community participation will exponentially impact the benefit of existing and increased Council resources. A significant democratic initiative is unfolding via volunteer groups initiating restoration projects. Their efforts need proper focus and effective resourcing and co-ordination.

---

5. Do you think we have identified the right organisations to partner with to achieve our objectives?

◉ Yes ○ No

Your comments
See the box above. In the Aro Valley alone dozens of residents have responded enthusiastically to restoration proposals and initiatives. It is a significant grass roots response: it would be political willfulness to ignore the significance of the numbers involved, and the value of their objectives. There is a major multiplier to hand: volunteer groups = improved and increased biodiversity values = improved recreational spaces = an improved quality of life for Wellington residents and visitors = more visitors and increased tourist spend = more jobs for locals = a strengthened domestic economy= more support for volunteer groups, and so on.

---

6. Do you think we have the right indicators and targets to measure our performance by?

◉ Yes ○ No

Your comments
A simple count is: how much of our pre-European biodiversity have we restored? How much is succumbing to pest plants and predators?

7. Do you agree with our direction for the tiered support for community groups?

◉ Yes ○ No

Your comments
Broadly but I welcome the opportunity to address this question further in oral submissions.

8. Is there anything you feel has not been adequately covered by the draft plan?

○ Yes ◉ No

Your comments
No, but I welcome the opportunity to address this question further in oral submissions.

9. Do you have additional comments? (please attach additional pages via the 'Supporting Information' tab)

○ Yes ◉ No

Your comments
No, but I welcome the opportunity to address this question further in oral submissions.

Attached Documents

File
Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

Submitter Details

First Name: **Nicole**
Last Name: **Miller**
Organisation: **Wellington Underwater Club**
On behalf of: **I provide this submission in my role as secretary of the Wellington Underwater Club (WUC) on behalfe of the WUC committee. For communitcations regarding this submission please contact WUC by email to**
Street: **7 Hinau Rd**
Suburb: **Haitaitai**
City: **Wellington**
Country: **New Zealand**
PostCode: **6021**
Daytime Phone: **0210549865**
Mobile: **0210549865**
eMail: **proventure.nz@gmail.com**

Trade competition and adverse effects:
○ I could ○ I could not
gain an advantage in trade competition through this submission
○ I am ○ I am not
directly affected by an effect of the subject matter of the submission that :
a. adversely affects the environment, and
b. does not relate to the trade competition or the effects of trade competitions.

Wishes to be heard:
◉ Yes
○ I do NOT wish to speak in support of my submission and ask that the following submission be fully considered.

Preferred hearing location:
○ Oral Hearings - Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

Hearing Needs:

Correspondence to:
◉ Submitter
○ Agent
○ Both

Submission

1. Overall, do you support or oppose the general direction of Our Natural Capital?

○ Strongly oppose ○ Oppose ○ Neither support nor oppose ◉ Support ○ Strongly support

Why do you say this?
Refer to the attached supporting information

---

2. Do you support the Guiding Principles, Goals and Outcomes?

○ Strongly oppose ○ Oppose ○ Neither support nor oppose ◉ Support ○ Strongly support

Why do you say this?
Refer to the attached supporting information

3. Do you think we have identified the biggest issues facing indigenous biodiversity in Wellington?

○ Yes ◉ No

Your comments
Refer to the attached supporting information. More emphasis is required on the marine environment.

4. Do you think we have identified the right priorities in order to achieve our desired outcomes for biodiversity in Wellington?

○ Yes ◉ No

Your comments
A higher priority needs to be placed on the marine environment. Refer to attached document for comments.

5. Do you think we have identified the right organisations to partner with to achieve our objectives?

○ Yes ◉ No

Your comments
Refer to the attached supporting information.

6. Do you think we have the right indicators and targets to measure our performance by?

○ Yes ◉ No

Your comments
Refer to the attached supporting information.

7. Do you agree with our direction for the tiered support for community groups?

Yes No

Your comments
However refer to attached document.

8. Is there anything you feel has not been adequately covered by the draft plan?

Yes No

Your comments
The importance of the marine biodiversity and strategies and actions to address this. See attached document.

9. Do you have additional comments? (please attach additional pages via the 'Supporting Information' tab)

Yes No

Your comments
Please note that our submission is focussed on the natural environment, and in particular on the marine environment, which is our remit. WUC endorses the Draft Biodiversity Strategy and Action Plan in general with some specific comments outlined in the provided supporting information. Yes/No answers of question 3-8 do not adequately reflect our position on these issues. Please refer to the comments of the Wellington Undewater Club on the Biodiversity Strategy and Action Plan as per attached document.

Attached Documents

File
Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

To the Wellington City Council

Submission on Draft Biodiversity Strategy and Action Plan

Deadline 5pm on Friday 6 March 2015.

The Wellington Underwater Club is one of the oldest scuba-diving clubs in New Zealand and represents members of many generations.

Please note that our submission is focussed on the natural environment, and in particular on the marine environment, which is our remit. WUC endorses the Draft Biodiversity Strategy and Action Plan in general with some specific comments outlined below. We would like to present an oral submission when suitable.

- We recommend to include a definition of the term biodiversity in the document. The marine environment should specifically be included in the definition.
- The Biodiversity Plan would benefit from a clear outline of priorities and focus on these priorities. To support implementation and monitoring of progress we suggest to clearly state who will be responsible for progressing specific priorities and actions.
- Strategies and activities across Council's responsibilities need to align with the Biodiversity Plan. One example is the Council District Plan. Amendments could be made in a way that all projects require a formal consideration against the Biodiversity Plan and an outline on how the Biodiversity Plan is implemented.
- We understand that the Resource Management Act requires the Council to take responsibility in recognizing, protecting and maintaining biodiversity (as per section 6). The document should acknowledge this.
- The Biodiversity Plan should give emphasis to both restoration and protection. Strategies should be put in place by the Council identify reasons for biodiversity decline on land and in water (both fresh and sea water).
- It is important the Council identifies and reports on the impact of Council actions on biodiversity including assessments of possible alternative actions. This includes biodiversity services delivered by groups outside the Council and with Council support (e.g. volunteers, community groups and associations working 'in the field', in education and advocacy). The Underwater Club is particularly interested in how the Council will manage direct and indirect impacts on the marine environment and marine biodiversity.
- We would like to see Water Sensitive Urban Design to be prioritised in all Council and private redevelopments and asset renewals.
- Council strategies should include provisions for short term and ongoing support of biodiversity services delivered by the Council as well as through community groups (e.g. habitat improvement through pest control, planting, and education)

- A rich biodiversity directly and indirectly translates to economic value for the Wellington region. This includes revenue through attraction of tourists as well as attracting talent (creative and entrepreneurial) and providing residents with healthy and high quality living space (blue and green).
- We strongly advocate to recognize the importance of the marine near-shore environment for Wellington and the need to integrate strategies and actions into the Biodiversity Plan. Marine biodiversity (including South Coast, South Coast Sea and Harbour) should be of high priority.
- WUC is missing a reference to the Taputeranga Marine Reserve, which is highly frequented not only by our club members. The Taputeranga Marine Reserve is one of Wellington's main points of difference in biodiversity – nationally and internationally.
- We would like to see specific mention of the Blue Belt in the action plan. We propose that the plan acknowledge the work that is or has been done, such as marine education, the work at the wharves to restore inner harbour ecosystems, harbour clean ups.
- There is great potential for establishing quality open spaces and habitats. We would like to see a proactive and inclusive approach by WCC to develop open spaces under private ownership or run by other agencies (all those small parcels of land around factories or transport corridors for example) into spaces of rich biodiversity.
- We feel strongly about that the plan should refer to a systemic development of existing and new spaces on land and in water to support local biodiversity and to provide linkages through strategic ecological corridor.

Finally, we want to thank you for the opportunity to make a submission on the draft biodiversity strategy and action plan. We hope the points raised in our submission will be considered.

Kind regards,
Nicole Miller (Secretary)

For the Wellington Underwater Club
www.wuc.org.nz

Contact us email to wellington.underwater@gmail.com

From:	Peter Reimann
To:	BUS: Our Natural Capital
Subject:	Submission - Wellington"s Draft Biodiversity Strategy and Action Plan 2014
Date:	Friday, 6 March 2015 2:31:01 p.m.

Submitter name: Peter Reimann
Organisation: Trelissick Park Group
Organisation contact name: Peter Reimann
Address: c/- 51 Heke Street, Ngaio, Wellington 6035
Phone: 04 938 9602
Email: peter.reimann@paradise.net.nz
Date: 6 March 2015

The Trelissick Park Group would like to congratulate Wellington City Council on the work carried out in preparing this draft plan. We largely agree with its provisions, subject to the comments below.

General Comments

Budgets - We note from Section 10 Action Plan that "The actions outlined in this plan will be prioritised as part of Wellington City Council's planning and budgeting processes and itemised into work programmes". Our major concern, based on past experience, is that the funding that finally gets allocated in Council Long Term and Annual Plans and from other sources will not be nearly enough. The resulting prioritisation causes half-hearted/delayed implementation. Wellington is a unique and attractive city for its integration with biodiversity. We must preserve and enhance this.

'Teeth' – We look forward to Council Plans, Codes of Practice and consents having more 'teeth', eg mandatory neutral-effect stormwater run-off in developments. All Council activities need to require adherence to the provisions of the Biodiversity Plan.

Specific Comments

p. 13 under "Present" 4th para. - Perhaps kereru could get a mention also.
1.4.3 (g) (i) (n) and 3.1.1(g) – We would like to see WSUD as higher priority.
2.4.1, 2.4.2 – The railway corridor could also feature in ecological networks.
3.1.2(a) – Some Wadestown/Highland Park residents may not be able to access an area of natural space within 10 minutes. Implementing the access to Trelissick Park from Oban Street is essential.
3.1.2(f) – One possibility for forest bathing is at the "18-footer" in the Korimako Stream just upstream of the junction with the Kaiwharawhara. This was a popular pool in the early 1900s.
3.3.1(c) – Other dog problems – catching kaka fledglings and ducklings should be addressed.
3.3.7(a) – Removing weeds from gardens and planting natives instead should include species such as pampas, flowering cherry and sycamore, which easily spread into adjacent reserves.

12.4 and 13.1.3(c) Streams – A major issue for us is that all the stormwater from the huge 20 km2 catchment area goes into the Kaiwharawhara and Korimako Streams. Rainwater runoff from hard surfaces during storms causes the streams to rise quickly up to 2 metres, washing away stream banks. This causes bed deposition of debris/silt, affecting invertebrate and native fish life and destroys riparian planting.
13.1.3(a) Pest Plants (p. 45) – Another pathway for spread of infestation is from being washed down by streams, eg wandering willie *(Tradescantia fluminensis)* and Himalayan balsam *(Impatiens glandulifera).*
13.1.3(a) Environmental Pests Animals – Add dogs as per 3.3.1(c) above.
13.1.3(d) Climate change – Also should cover increase of drought conditions and response – eg selecting more drought tolerant species when planting, need to plant as early as possible in the year and strategies such as not watering to encourage deep rooting, also mulching after planting.
13.2.3 Restoring the integrity of areas – Add to 3rd paragraph about weeds after slips and infrastructure upgrades (roads, sewer, rail).
13.2.5 – see 13.1.3(d) above (climate change).
13.3.5 Making "pro nature" choices – Amplify "preventing pollution from entering drains" by referring to car, paint and cement washing in driveways or roadsides.
13.4.4 and 13.4.7 – Include research into climate change, including strategies to deal with storms, floods and drought.
14 – Include "vascular" in glossary.
Appendix 2 – Could not understand the use of *"Matai", "Kowhai" and "Nikau"* in the "level and type of support offered to groups".
Appendix 4 – Add rabbits and dogs (might need qualifying) to pest animals and Himalayan balsam *(Impatiens glandulifera)* to pest plants.

Amplification on Himalayan balsam, dogs, old man's beard and fish migration is given in the submission of Bill Hester, which we support.

Regards,
Peter Reimann
(Chairman,
Trelissick Park Group)

Submission
Wellington City Council Draft Biodiversity Plan

Catharine Underwood
22 Taft Street
Brooklyn
Wellington 6021
kt@danzat.co.nz
04 894 3717

I am a member of the Upstream Group which volunteers in Central Park. I am a long time volunteer at Zealandia. I wrote the draft Biodiversity Strategy for the 3 Wairarapa District Councils.

Thank you for the opportunity to comment on Wellington City Council's Biodiversity Action Plan. The Strategy reads well and looks to be a great continuation of the good work the council is already doing with regard to Wellington's biodiversity.

I am pleased to see a review of the Biodiversity Plan and an integration with the Pest management. Pest Management is an integral part of managing New Zealand's and Wellington Biodiversity and combining the plans makes good sense.

Out of interest, your photos shows a young child and a seal. The child doesn't look 10m or more away from the seal as recommended in the caption.

Comments on the Biodiversity Action Plan
Section 7 Guiding Principles
We will work collaboratively [page 17]
Greater Wellington should be included in the list of agencies (regardless of the outcome of the proposed local city amalgamation).

Section 8
Goals and Outcomes
Goals to restore biodiversity; "aquatic ecosystem health" [page 18]
It think it be more explicit "Including streams and native fish". Freshwater fish in New Zealand get a raw deal and more needs to be done to protect them and their environment. The more specific the biodiversity plan can be regards freshwater environments and inhabitants the better.

1.4.1"….. open spaces are recognised in the District Plan…"
The biodiversity plan should be an integral part of all WCC plans. It is the biodiversity of Wellington which supplies the ecosystem services on which people, communities, businesses and biodiversity rely on. Too often the council (it is not alone here) work in silos within itself. The Mayor herself mentioned this at the Upstream Artstrail launch on 5th March 2015. We should be recognising Wellington's biodiversity in every part of operations. Native plants should be given priority over exotic – especially in public places,

walkways, plazas, beaches and in particular where tourists go. Our biodiversity is special – let's celebrate it every day. It belongs here.

1.4.3 as per Mt Cook Mobilised submission
Reduce impacts of urban development and land use on aquatic ecosystems, ,
b. "Work with GWRC and within the Council to ensure no new barriers to fish passage are created through works in streams"
[page 23]
I agree with the Mt Cook Mobilised submission and would like to append "or underground storm water" to sentence (b)

1.4.3 (f). This to be amended to include eel habitats and eel egress – to accommodate the life cycle of the long finned eel.

3.3.7 Support Mt Cook Mobilised comments.
Encourage and support individuals and households to take action to support biodiversity, "Continue to support annual initiatives with partner organisations that encourage people to remove weeds from their gardens and plant native plants instead" [page 29]
I would like to see some additional wording added to (a),:
"Continue to support annual initiatives with partner organisations that encourage people, local businesses and government properties to remove weeds from their gardens, without the use of weed spray, and plant native plants instead"

12 Wellington's Biodiversity –12.4 Freshwater;
Streams, paragraph 2 begins "Urban streams include Owhiro Stream, Kaiwharawhara, Ngauranga and the Porirua Stream system..." [page 40]

I would like to see "and smaller local streams, some of which are home to native fish..." included here. For example, Papawai Stream, Moturoa Stream (Central Park) are examples of local streams, and I believe there are others in the city. Local streams with native fish living are rare and they should be acknowledged as a special part of the City's biodiversity.

13.1.3 What do we need to protect biodiversity from?
13.1.3 (d) Climate change; Pressure and state, in the middle of paragraph 2 it states "The capacity of storm water systems will be exceeded more frequently due to heavy rainfall events leading to surface flooding and increased number of sewer overflows." [page 50]

Some years ago Forest and Bird did an article on concrete driveways and the impact on storm water drains/streams/the sea in heavy rain. A move to more 'water permeable media will be used for surface drainage' to be included in the Biodiversity and District plans. An example of water permeable surface drainage would be crushed lime or gravel paths in preference to concrete, or planted roadside areas instead of grass. Even a strip down the middle of a driveway planted with native ground covers. This would help water return to the water table, rather than making its way through the storm water system to the sea.

13.2.4 Beyond planting
Restoring our waterways, the first paragraph states “Wellington and most of our original streams are piped. Planting streamside (riparian) zones around streams is also important for water quality as it slows runoff and filters sediment before it reaches the stream.
Sites for riparian restoration are prioritised around sediment source significance and the impact on the stream and harbour depositional environments.” [page 55]
I fully support this approach to prioritising riparian restoration. A ‘whole catchment management approach from source to sea’.

Extra Bit
I would like to see a move towards biodiversity sensitive street lighting. Light and dark are part of the environment the same way as wet and dry, sunny and damp. Different creatures like different conditions. Making sure the night is a dark as possible but safe for humans would be great. They do this very effectively in Tekapo to protect the night sky as a World Heritage Dark Area. Such street lighting would have dual function in Wellington - protecting the night sky (our geography makes it possible to see great stars while in the middle of a city) and assist biodiversity to maintain its natural behaviour. There is evidence from cities overseas that street lights are having an impact on birds and their behaviour.

This could be a great way to make Wellington an even better city. We are very lucky to live here – no other New Zealand city has what we have. We have a duty and obligation to prioritise the protection, enhancement, restoration, celebration and promotion of our indigenous biodiversity.

A good place to start would be new subdivisions as that is where the greatest immediate impact is on biodiversity. Would be a great way to lessen the human impact.

I support the draft plan and it is good to know that council staff are working hard, often up against difficult proposals, to do the best for Wellington’s biodiversity. Great stuff.

Submitter Details

First Name: **cheryl**
Last Name: **robilliard**
Organisation: **Newtown Residents' Association**
Street: **1 Nikau St**
Suburb: **Newtown**
City: **Wellington**
Country:
PostCode: **6021**
Daytime Phone: **04 383 8382**
Mobile: **027 2477 257**
eMail: **cheryl@paos.co.nz**

Trade competition and adverse effects:
○ I could ○ I could not
gain an advantage in trade competition through this submission
○ I am ○ I am not
directly affected by an effect of the subject matter of the submission that :
a. adversely affects the environment, and
b. does not relate to the trade competition or the effects of trade competitions.

Wishes to be heard:
◉ Yes
○ I do NOT wish to speak in support of my submission and ask that the following submission be fully considered.

Preferred hearing location:
○ Oral Hearings - Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

Hearing Needs:

Correspondence to:
◉ Submitter
○ Agent
○ Both

Submission

1. Overall, do you support or oppose the general direction of Our Natural Capital?

○ Strongly oppose ○ Oppose ○ Neither support nor oppose ○ Support ○ Strongly support

Why do you say this?

---

2. Do you support the Guiding Principles, Goals and Outcomes?

○ Strongly oppose ○ Oppose ○ Neither support nor oppose ○ Support ○ Strongly support

Why do you say this?

3. Do you think we have identified the biggest issues facing indigenous biodiversity in Wellington?

Yes No

Your comments

4. Do you think we have identified the right priorities in order to achieve our desired outcomes for biodiversity in Wellington?

Yes No

Your comments

5. Do you think we have identified the right organisations to partner with to achieve our objectives?

Yes No

Your comments

6. Do you think we have the right indicators and targets to measure our performance by?

Yes No

Your comments

7. Do you agree with our direction for the tiered support for community groups?

Yes No

Your comments

8. Is there anything you feel has not been adequately covered by the draft plan?

Yes No

Your comments

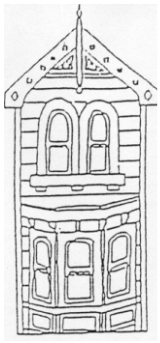
9. Do you have additional comments? (please attach additional pages via the 'Supporting Information' tab)

Yes No

Your comments

Attached Documents

File
NRA submission BSAP
Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan



Newtown Residents' Association

www.newtown.org.nz

PO Box 7316 Newtown Wellington 6242
newtownwellington@gmail.com

Submission on: Wellington's Draft Biodiversity Strategy and Action Plan, March 2015

Contact Details: C/- Cheryl Robilliard
1 Nikau St, Newtown, Wellington 6021
04 934 6853, Mobile 027 2477 257
cheryl@paos.co.nz

The Newtown Residents' Association would like to make an oral submission.

Newtown Residents' Association (the Association) has been an Incorporated Society since 1963 representing Newtown and neighbouring suburbs. We are an active group of local residents and business people and are concerned with maintaining and improving our suburbs.

Our Objectives

Our Rules (updated in 2010) include the promotion of public works and efficient administration of civic and municipal affairs to ensure the provision of health, recreation, education, environmental sustainability, community connectivity, and well-being of Newtown and its surroundings.

Submission

The association appreciates the opportunity to comment on the draft Biodiversity Strategy and Action Plan, and congratulates the Council on a comprehensive, well presented and readable document.

Comments

1. **9.2 Blue Belt**

   Public awareness of streams and their impact on the ecology and water quality of our harbour would increase if more streams were visible rather than piped out of sight. In our area Papawai Reserve Group has been planting and weeding along the unculverted section of Papawai Stream for several years. The group and its regular activities has engendered community interest, including from children, in the welfare of native fish in the stream.

   While we recognise the challenges in daylighting streams, we would like the Council to consider locations in our suburb and around Wellington where sections of streams could be brought to the surface, particularly where they flow through parks and reserves. In this way people would be able to more easily connect impacts of land use and activities on the ecology and water quality of our streams and harbour. This would also help to increase awareness of the impact of activities

on streams such as car washing and the use of paint and chemicals as described in 3.3.7 d. (page 29) of the draft document.

Therefore, we would like to see an objective added to 9.2 Blue Belt – "Sections of Wellington streams that are currently piped underground through reserves are daylighted (exposed) to increase awareness of stream ecology and water quality". We also suggest inserting a text box on the map on page 20 that reads "Daylight sections of urban streams"

2. **Action Plan – Goal 1.4 The impact of urban growth and human activity on all ecosystems and remaining habitat is managed**
   - **1.4.3 h.** We support the mapping of streams and suggest attractive and communicative maps are developed and publicised and a programme put in place to increase community awareness of streams and their locations, whether located on the surface or part of the infrastructure underground.

3. **11. Measuring Wellington City Council's Performance**

   All of the measures are quantitative. We would also like to see some qualitative measures. For example
   - **9. Amount of accessible green space** is measured by the area of parks and reserves with natural areas per 1000 persons. This calculation is only useful when other aspects are also measured – e.g. accessibility, distance from residential areas, quality of the green space, values and safety (particularly for women, the elderly and children).
   - **13 Outreach or public awareness events held in Wellington City per year** are measured by the total number of events per year. We believe that measuring events is not just about the number of events but also about equity, quality of the event and reaching diverse parts of the community.

4. **12.4 Freshwater**

   The second paragraph lists the larger urban streams only. We would like to see reference to smaller urban streams included here.

5. **13.1.3 (a) Environmental pests**

   The SPCA is located in our area and many SPCA employees and volunteers live in the suburbs we represent. We would therefore like to see an emphasis on humane approaches and methods to animal pest control. We would like to see the action to adapt Department of Conservation guidelines for ethical and humane practices for animal pest control for use by Council (1.3.1 b. page 22) be extended to cover animal pest control by the public and included in section 13.1.3. We would also like to see reference to humane approaches and methods added to the guidelines on environmental pests in section 13.1.4 (page 50-51).

Submission on

Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

This is a short submission on the January 2015 version of "Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan".

My Name: Robert Davies
Address: 16 Gloucester Street, Wilton, Wellington
Phone 4753346; email: robert@statsresearch.co.nz

I am making the submission as an individual and I do *not* want to make an oral submission.

Overall I am very happy with the strategy and plan. Here are some additional comments:

While I agree with the focus on our indigenous biodiversity I note that

- Changing climate and probably a warmer climate will mean that the natural flora & fauna will tend to change. In particular, we can expect a southward drift of species. This should not be resisted. New plantings should be of plants that can be expected to thrive under the warmer and possibly harsher conditions.
- Recognise species brought here from overseas are also part of our heritage. While we don't want to see them as dominant as they have been, they still have a place. I am thinking particularly of the conifers. I think it is fine to keep some stands of these. Provided they don't represent a hazard, they shouldn't be cleared them without good reason.

Cooperation with other organisations: I am surprised to see only brief mention about cooperation with the other cities in the Wellington region and nothing about what they are doing.

Cooperation with community groups: I would also like a note on cooperation with informal groups and individuals who are doing planting, clean-ups, etc. These people don't expect monetary support but sometimes a bit of informal encouragement, guidance and support wouldn't be amiss.

RMA and building/planning consents: Should there be a section on how the building/planning consents process could or should be changed to make the biodiversity plan relevant to them.

Small patches of bush: Wellington has lots of these, for example, the Gloucester Street bush or the bush behind Cardinal McKeefry School in Wilton. These are

implicitly covered but I think more could be said about the role they play or could play in the plan – in particular: are they important?

Grassy areas & carbon capture: We have a lot of grassy areas and grass verges where nobody walks. Is there an alternative planting that would be easy to maintain, be better aligned with the biodiversity policy and also absorb some carbon? This is probably a research topic.

Pest animals and plants (Appendix 4). Can we have an indication of priority, please?

Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

Submission to the Wellington City Council from the Environmental Reference Group

6 March 2015

The Environmental Reference Group (ERG) would like to make an oral submission. Please liaise through our Council liaison officer, Simon Wright.

The ERG would like to note that it has been consulted twice during the development of Our Natural Capital, and appreciates the opportunity to comment on earlier versions, as well as the effort the Council has put in to include the earlier comments we submitted. As such this submission is generally endorsing the document, with specific points raised below.

Comments

- How will the non biodiversity parts of the Council be cognoscente of this document and how will the Council's actions be aligned with this document? It needs to be integrated with the other Council documents, embedded possibly, and actively implemented throughout the Council. One option would be to add to all projects a checklist requiring acknowledgement that the biodiversity plan has been considered and implemented (and how it has been implemented). It should also be interconnected with the district plan.
- The document would benefit if a definition of biodiversity was stated at the start of the document, and it should encompass the marine environment. It would also benefit from a clear focus on identified priorities as well as identifying who "owns" the actions.
- The document appears to say the function to maintain biodiversity is its highest responsibility – but that is incorrect – RMA s6 requires all persons exercising powers and functions to recognize and protect – council has those functions.
- The draft Our Natural Capital strategy and plan has too much emphasis on "Protect" at the expense of "Restore". The strategy should identify the reasons for any biodiversity decline in the urban, adjacent rural, fresh water parts of the council, as well as the contribution it can make to address those matters, including how it might manage the impact on the marine environment and offer significant and practical support to others that work on the ground as well as for their advocacy associated with protecting indigenous biodiversity.
- The list of biodiversity factors important to Wellington should acknowledge the economic value of biodiversity, including the business arising from recreation and the use of green space and waters, including tourism and other visitors to Wellington's Zealandia, Wilton Bush, Taputeranga Marine Reserve, Matiu Somes, etc.
- There is no mention of Taputeranga Marine Reserve even though it is heavily used (including the land part) and WCC is heavily involved with parks, roading etc. It is a core biodiversity asset for the city.

- The vision includes a broad leadership role for the Council, but the actions appear to be too narrowly focused on either Council land or dealing with private land through the district plan. There is huge potential for making non-Council public lands (e.g. transport corridors run by other agencies) and private lands that the landowner have no use for (all those little bits of land around factories for example) into quality open space or habitat.
- The WCC Strategy should place more emphasis on continued provision of support. On-going pest control is important. Also a short term and ongoing action around what direct support will be made available to community groups that are improving habitats in freshwater, marine, and land based environments would be useful.
- In most of the action plan there is nothing that specifically addresses the Blue Belt, but could include underwater gardening for educational purposes, continuing the work at the wharves to restore inner harbour ecosystems, restarting harbour clean ups.
- Water Sensitive Urban Design needs to be prioritised in all redevelopment (both those of the Council and private sector) as well as asset renewals (facilitated by Wellington Water for the Council).
- The plan should specifically develop existing and new parks/open spaces to support local biodiversity and to provide linkages through strategic ecological corridors.
- Research should be carried out on locally endemic tree species for suitability as specimen planting and a program be implemented to produce mature specimens for future projects, as well as a development of native species “planting guides” for volunteer groups.
- There is a lack of regulation around the removal of habitat. The strategy should aim to improve this gap. There has been significant habitat removal as a result of infill. Planting is valuable but the strategy should ensure we also keep large trees in the city itself, and not just on Council land.
- While it is important to protect the remaining remnants of original biodiversity, there are two problems with this approach. Firstly, the methodologies normally used will ignore remnants of soil biota and other organisms that are no longer associated with recognisable vascular plant remnants but are of high value. For example, there is a tiny population of ground weta in a roadside bank in Clifton Terrace, and giant earthworms in the land beside the motorway below Clifton Terrace. Both areas have been pretty much destroyed, but those species have survived. The second problem is that it ignores the value of spaces that are readily restored and protected. For example busy road/rail corridors are great places to put biodiversity that is sensitive to snails, rats and other predators/grazers that don’t like busy transport corridors. Those spaces are also vital for the biophilia component. It is along footpaths, at bus stops and train stations, and similar places that people spend most time in the outdoors, not in parks.

Submitter Details

First Name: **Hadley**
Last Name: **Fierlinger**
Street: **114 Upland Rd**
Suburb: **Kelburn**
City: **Wellington**
Country: **New Zealand**
PostCode: **6012**
Daytime Phone: **021 258 4973**
Mobile: **021 258 4973**
eMail: **hadley@bigwerk.com**

Trade competition and adverse effects:
○ I could ○ I could not
gain an advantage in trade competition through this submission
○ I am ○ I am not
directly affected by an effect of the subject matter of the submission that :
a. adversely affects the environment, and
b. does not relate to the trade competition or the effects of trade competitions.

Wishes to be heard:
○ Yes
◉ I do NOT wish to speak in support of my submission and ask that the following submission be fully considered.

Preferred hearing location:
○ Oral Hearings - Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

Hearing Needs:

Correspondence to:
◉ Submitter
○ Agent
○ Both

Submission

1. Overall, do you support or oppose the general direction of Our Natural Capital?

○ Strongly oppose ○ Oppose ○ Neither support nor oppose ◉ Support ○ Strongly support

Why do you say this?
The focus is on healthy people and a healthy environment. Biodiversity that includes earth, soil, sky, air, water, animals and people.

---

2. Do you support the Guiding Principles, Goals and Outcomes?

Strongly oppose Oppose Neither support nor oppose Support Strongly support

Why do you say this?

3. Do you think we have identified the biggest issues facing indigenous biodiversity in Wellington?

Yes No

Your comments

4. Do you think we have identified the right priorities in order to achieve our desired outcomes for biodiversity in Wellington?

Yes No

Your comments

5. Do you think we have identified the right organisations to partner with to achieve our objectives?

Yes No

Your comments

6. Do you think we have the right indicators and targets to measure our performance by?

Yes No

Your comments

7. Do you agree with our direction for the tiered support for community groups?

Yes No

Your comments

8. Is there anything you feel has not been adequately covered by the draft plan?

Yes No

Your comments
The plan does not mention specifically which methods of weed control are to be used and the public has a right to know if the soil, water and air are being affected by the WCC pest control methods. There is growing research internationally that pesticides and herbicides such as Glyphosate and Roundup are limiting biodiversity by affecting the health of aquatic animals, birds, insects, animals and humans at a cellular level. The use of these chemicals in our environment has lasting implications on the future health of our city environment. Other non chemical options of weed control should be used if we are going to call ourselves a 'natural capital'. If we are going to encourage a return to biodiversity in our city, we can not continue to use these chemicals in our environment. Hundreds of other cities around the world have banned the use of these chemical pesticides and herbicides and I strongly believe WCC needs to do the same.

9. Do you have additional comments? (please attach additional pages via the 'Supporting Information' tab)

(•) Yes ( ) No

Your comments
please have a look at these supporting documents

Attached Documents

File
Neonic
pubmed_result
Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

The Impact of the Nation's Most Widely Used Insecticides on Birds

AMERICAN BIRD CONSERVANCY

The Impact of the Nation's Most Widely Used Insecticides on Birds

American Bird Conservancy, March 2013

Grasshopper Sparrow by Luke Seitz

Cover photos: Horned Lark and chicks by Middleton Evans;
Corn field, stock.xchng, sxc.hu;
Calico Pennant dragonfly by David Cappaert, Michigan State University, Bugwood.org

American Bird Conservancy would like to thank the Turner Foundation, Wallace Genetic Foundation, Jeff and Connie Woodman, Cornell Douglas Foundation and A.W. Berry Foundation for their ongoing support for American Bird Conservancy's Pesticides Program.

Written by Dr. Pierre Mineau and Cynthia Palmer

Designed by Stephanie von Blackwood

About the Authors

Dr. Pierre Mineau began his long and distinguished scientific career studying the effects of persistent organochlorine compounds, like DDT and PCBs, on fish-eating birds. He then became responsible for the Canadian assessment of new and existing pesticides to determine their adverse impacts on wildlife. In 1994 he transitioned from regulatory reviews to full-time research on the environmental impacts of pesticides, achieving the rank of Senior Research Scientist at Environment Canada. Working with international collaborators and graduate students, he works on assessing globally the environmental footprint of pesticides. He also studies how birds are exposed to pesticides and how bird populations respond to pesticide use and agricultural practices. His work includes defining the ecological values of birds in cropland as well as estimating the incidental take of birds from various other human activities. He has written more than 100 peer-reviewed publications and has authored some 200 presentations. He officially retired from public service in 2012 and now holds an Emeritus position with the Canadian government, serves as an adjunct research professor at Carleton University in Ottawa and at the University of Saskatchewan in Saskatoon, and consults privately.

Cynthia Palmer has worked in the environmental arena in the US and internationally - in the executive and legislative branches of government, in non-profit organizations, and in the news media. She has been involved in pesticide issues for many years. She co-authored a report on pest control for the Congressional Office of Technology Assessment, advocated for safer alternatives with the World Wildlife Fund, and helped place pesticide issues in the national spotlight as senior editor of the daily news service, Environmental Health News. Her other work has dealt with chemical contamination, agriculture and food safety issues, worker health and safety, air and water pollution, and climate and energy policy. Cynthia received her AB from Harvard College in 1988 majoring in environmental and public health policy, her JD from Harvard Law School in 1993 with an emphasis on environmental law, and her MPH from the Harvard School of Public Health in 1994 concentrating in environmental and occupational health.

Acknowledgments

We wish to thank John Struger, Christy Morrissey and their respective colleagues for access to unpublished residue information. Jim Devries and Peter Jenkins were relentless in their zeal to ferret out the latest publications. We are grateful to Francisco Sanchez-Bayo and Henk Tennekes for meeting and sharing their insights into the neonicotinoids and other systemic insecticides. A huge thank-you to Theo Colborn and Lynn Carroll at The Endocrine Disruption Exchange for offering their data and helping us sort through the implications. Robert Miller, Sharon McBride and others at EPA helped facilitate our access to EPA data. Scott Hoffman Black and Larissa Walker offered valuable guidance.

SYNOPSIS

First introduced in the 1990s in response to widespread pest resistance as well as health objections to older pesticides, the neonicotinoid insecticides quickly sailed to the top slot in global pesticide markets. Now the most widely-used insecticides in the world, it is difficult to find pest control commodities that do not contain one or several of the neonicotinoid insecticides. California alone has registered nearly 300 neonicotinoid products.

Neonicotinoids' toxicity to bees and other insects has brought them the most attention so far and has dominated recent concerns of regulatory institutions worldwide. In the United States, the Environmental Protection Agency's registration review of the neonicotinoids is focused on the threat to insect pollinators. The seriousness of this issue should not be underestimated, as one-third of the U.S. diet depends on these insect pollinators.

But much more is at stake. The environmental persistence of the neonicotinoids, their propensity for runoff and for groundwater infiltration, and their cumulative and largely irreversible mode of action in invertebrates raise environmental concerns that go well beyond bees.

This report reviews the effects on avian species and concludes that neonicotinoids are lethal to birds as well as to the aquatic systems on which they depend. A single corn kernel coated with a neonicotinoid can kill a songbird. Even a tiny grain of wheat or canola treated with the oldest neonicotinoid, imidacloprid, can poison a bird. As little as 1/10th of a corn seed per day during egg-laying season is all that is needed to affect reproduction with any of the neonicotinoids registered to date.

Birds depend heavily on the aquatic systems at the bottom of the food chain. But neonicotinoid contamination levels in surface and groundwater in the US and around the world are strikingly high, already beyond the threshold found to kill many aquatic invertebrates. EPA risk assessments have greatly underestimated this risk, using scientifically unsound, outdated methodology that has more to do with a game of chance than with a rigorous scientific process.

Major risk concerns raised by scientists both inside and outside the agency appear to have gone unheeded in agency registration decisions. The older insecticides that the neonicotinoids largely replaced – including organophosphates such as diazinon and chlorpyrifos, and carbamates such as carbofuran and methomyl – were highly damaging to people and wildlife. What is so disturbing is that in their rush to register

alternatives, regulators have approved more and more neonicotinoid products for an ever-growing number of uses without regard to the red flags raised by their experts concerning this persistent, cumulative, irreversibly-acting new class of pesticides.

Neonicotinoids are currently under registration review by EPA. The Agency's decision to approve, restrict, suspend, or cancel these powerful insecticides will have profound environmental and economic impact. We have a small window of opportunity in which to act; EPA's next review of this class of pesticides will not occur for at least 15 years, and the damage done in those intervening years will be irreversible.

The results of this study and others have led American Bird Conservancy and partners in the National Pesticide Reform Coalition to urge the EPA to take the following actions:

- Suspend all applications of neonicotinoids pending independent review of these products' effects on birds, terrestrial and aquatic invertebrates, and other wildlife.
- Expand its re-registration review of neonicotinoids beyond bees to include birds, aquatic invertebrates, and other wildlife.
- Ban the use of neonicotinoids as seed treatments.
- Require that registrants of acutely toxic pesticides develop the tools necessary to diagnose poisoned birds and other wildlife.

Sunflower field, stock.xchng, sxc.hu

EXECUTIVE SUMMARY

The neonicotinoids represent a relatively new group of insecticides. They were introduced in the early 1990s to counter widespread resistance in insect pests and increasing health and safety objections to the organophosphorous insecticides. Although of lower acute toxicity to vertebrates than the latter, the neonicotinoids' longer persistence, high water solubility, runoff and leaching potential as well as their very high toxicity to pollinators are placing them under increasing public and political scrutiny, especially now that they have become the most widely used pesticides in the world. Their toxicity to pollinators has brought them the most attention so far and has dominated the recent concerns of regulatory institutions worldwide.

The intent of this report is to review the risk that neonicotinoids pose to birds. Birds have borne more than their fair share of impacts from pesticides – from the early issues of eggshell thinning with DDT to the extensive mortality caused by the organophosphorous and carbamate insecticides that followed. Some researchers have suggested that birds may already be affected by neonicotinoids and that, at least in Europe, bird population declines can be blamed on these popular insecticides.

The main products reviewed here are acetamiprid, imidacloprid, thiacloprid, clothianidin and thiamethoxam. Minor compounds include dinotefuran, nitenpyram and nithiazine. For the sake of comparison, this report will discuss, where appropriate, a number of older insecticides that the neonicotinoids have replaced. This includes the organophosphorous insecticides diazinon, chlorpyrifos, malathion, terbufos and methamidophos, the carbamate insecticides carbofuran, methomyl, the pyrethroids tefluthrin and deltamethrin as well as the seed treatment insecticide carbathiin.

The report will emphasize US regulatory history although it will make reference to Canadian and EU regulatory reviews where relevant. For ease of consultation, summary points made here are detailed in the body of the report under the same section heading:

1. The history of neonicotinoid registrations highlights many of the critical failings of our current pesticide registration system. Regulatory agencies in both the US and Canada (and to some extent in Europe as well) exhibited a conflicted approach to the neonicotinoid class of compounds – on the one hand expressing serious concerns about the persistence, mobility and toxicity of the products – on the other hand, granting registrations in an ever-widening range of crops and non-agricultural use sites.

   There is evidence the neonicotinoids got a very 'soft ride' through registration. Based on the existing record, registration decisions concerning the neonicotinoid insecticides were overwhelmingly positive despite a consistent record of cautionary warnings from the scientists involved in the assessment process. Increased concerns in the scientific and popular literature over imidacloprid, clothianidin and other neonicotinoid insecticides did not deter pesticide manufacturers, who appeared to be in a race to register as many uses as possible. It looks as if the USEPA and other regulatory agencies consistently approved registrations despite their own scientists' repeated and ever-growing concerns. It is relevant to ask why we conduct scientific evaluations of products if those evaluations have little or no bearing on the registration decisions that are made, and when staff scientists warning of 'major risk concerns' appear to be ignored.

   Even though several early reviews of the first neonicotinoid, imidacloprid, correctly identified

issues of bird and mammal toxicity, persistence, runoff/leaching and aquatic toxicity, regulators failed to apply some of the lessons learned in the 1990s with imidacloprid to more recently developed compounds such as clothianidin and thiamethoxam. They also failed (and continue to fail) to consider the impact of combined neonicotinoid residues in the environment. Regulators have tended to place inordinate faith in precautionary labelling to mitigate very serious terrestrial and aquatic risks.

2. The acute toxicity of neonicotinoids to birds is lower than the acute toxicity of many of the insecticides they have replaced, notably the organophosphorous and carbamate insecticides. However, EPA and other regulatory agencies worldwide have underestimated the toxicity of these compounds to birds. This undervaluation is partly because the risk assessment methods fail to account sufficiently for interspecies variation in toxicity.

   Depending on the specific insecticide, we have found that EPA underestimates toxicity by 1.5 - 10 fold if the intent of the exercise is to protect most potentially exposed bird species, and not merely mallards and bobwhites, the two test species.

   In addition, there is some evidence that the neonicotinoid insecticides will debilitate birds at a much reduced fraction of a lethal dose compared to other pesticides and this debilitation will be longer-lasting. Small non-lethal doses are likely to cause partial paralysis and other sub-lethal effects in birds. These effects slip under the radar screen in regulatory assessments based entirely on lethal levels.

3. The chronic/reproductive toxicity of neonicotinoids to birds is high. This was recognised very early on in the regulatory reviews of the various active ingredients. Yet high reproductive toxicity in birds is typically ignored in the pesticide review process – whether for neonicotinoids or for other pesticides. Many pesticides fail the current reproduction screen, and many uncertainties exist surrounding the extrapolation of laboratory data to actual field conditions. These problems are not new but regulatory agencies have failed to address the situation. Because the neonicotinoids are systemic and persistent in soils, and because several are used as seed treatment chemicals, they are available to birds in a chronic fashion, making their potential to affect reproduction an even greater concern.

   The standard tests carried out by manufacturers place reproductive effects at dosing levels ranging from 2 to 13 mg/kg/day depending on the product. This level of exposure is easily achieved with seed treatment chemicals. However, very recent toxicological information from Japan suggests that testicular function in male birds as well as embryonic development in the offspring of exposed males is affected at levels much lower than indicated from these standard reproduction tests.

4. Of particular concern to birds are those compounds that are used as seed treatments, primarily imidacloprid, clothianidin, thiamethoxam and acetamiprid. Regardless of the exact label directions and requirements, seed-treatment chemicals are widely available to birds. Seeds are never fully covered with soil, making them easy to find by foraging birds. Spills are commonplace with current machinery. And many species have the ability to scrape and dig for planted seed. Seed treatments, by definition, will result in a high exposure situation for birds (as well as for small mammal species not discussed in this report). Both the EPA in the US and Pest

Management Regulatory Agency (PMRA) in Canada have failed at times to consider this high exposure potential in their assessments.

5. The amount of insecticide adhering to the average corn (maize) seed can result in acute intoxications in birds with all three registered products – imidacloprid, clothianidin and thiamethoxam. With imidacloprid, a single seed may prove lethal for an average-sized bird (e.g. blue jay-sized) likely to be picking up whole corn seed from seeded fields. A few seeds only are required in the case of clothianidin or thiamethoxam. Indeed, we believe that imidacloprid is too acutely toxic to be used as a seed treatment insecticide on any seed type based on our assessment of its use in cereals and oilseeds. Acute intoxications in wheat or canola are less likely with clothianidin or thiamethoxam because these neonicotinoids are less acutely toxic to birds. The birds would need to ingest a greater number of the treated seeds to receive a lethal dose.

   However, based on chronic/reproduction endpoints, all seed treatments are predicted to cause effects given the very small number of seeds (as low as 1/10 of a seed per day during egg laying season) needing to be ingested to push birds into a 'critical range' where reproductive effects are expected. The main uncertainty here is how long the seeds will be available to birds and how long dosing is necessary before the type of effects seen in the laboratory will be seen in the wild. There are huge uncertainties – for instance what types of effects might be seen in altricial species (those in which the newly-hatched young are born relatively helpless, such as most passerines, or perching birds) and how this differs from effects seen in precocial species (in which the newly hatched young are relatively mature, such as ducks and geese, grouse and pheasants).

   Based on our current understanding and risk assessment procedures in place, the neonicotinoids as a group have a high potential to affect avian reproduction. This is due in large part to the very high exposure potential that seed treatment chemicals represent and the persistent nature of the neonicotinoids.

   A publication currently in press advances the hypothesis that the neonicotinoids are a contributory factor to many wildlife diseases through immune suppression. The authors make this claim on the basis of geographic and temporal associations. The sheer scale and seriousness of the issue demands that this hypothesis be investigated more fully.

   Despite industry claims, the neonicotinoids are not repellant to birds. Any demonstrated avoidance can be explained by hesitation before a new food source or post-ingestion intoxication and illness. Neither is sufficient to spare birds from either acute or chronic effects. There are parallels with the cholinesterase-inhibiting insecticides where repellency was similarly thought to reduce in-field risks. For example, the organophosphorous insecticide diazinon is extremely well avoided in the laboratory. Yet, thousands of geese and other species have grazed their way to an early death on diazinon-treated turf.

6. The link between impacts on the insect food of birds and declines of bird species is difficult to establish unequivocally, save for the evidence linking the grey partridge to pesticide use in the UK. A review of the existing literature suggests that it is difficult to predict the relative importance of food supply during the breeding season (i.e. when an insect food base is critical) compared to other risks such as habitat loss, food supply during migration and during winter, predation or

even direct losses from poisoning or disturbances such as mowing or tillage. Each species responds to a different set of stressors and it is likely that many of the declines have multiple causes.

Nevertheless, it would be foolhardy to argue that dramatic losses of insect biomass from ecosystems is not going to have potential consequences on the integrity of those ecosystems and on the species that depend to varying degrees on the spring-summer flush of insect food. The impacts on terrestrial food chains from neonicotinoid (and other systemic) insecticides may be much longer-lived and pernicious than those we have seen with non-systemic products. Generally speaking, an over-efficient removal of insects in crop fields is seldom seen as a matter of serious concern by regulators – especially in North America. The indirect impacts of pesticides are not considered in registration reviews – whether in the US or anywhere else in the world.

In his book, Dutch toxicologist Henk Tennekes (2010) makes the case that the contamination of surface water by neonicotinoids is so widespread in the Netherlands (and possibly elsewhere in Europe), that loss of insect biomass on a continental scale is behind many of the widespread declines that are being seen, be they of marsh birds, heath or meadow birds or even coastal species. This suggests that we should be looking at possible links between neonicotinoid insecticides and birds, not on a farm scale, but in the context of whole watersheds and regions. Impacts from the neonicotinoids may very well be further afield than the arable area on which they are used, and many of those impacts may be mediated through the aquatic environment. Because aquatic impacts are considered during product registration reviews, it is reasonable to ask whether the potential impact of neonicotinoids to aquatic life has been assessed correctly.

7. Unfortunately, North American regulators have greatly underestimated the toxicity of imidacloprid and other neonicotinoids to aquatic invertebrates. Reference doses are set using outdated methodology which has more to do with a game of chance than with a rigorous scientific process. A complete disregard for the peer-reviewed literature is a constant factor throughout the history of neonicotinoid assessments.

   For imidacloprid, we believe that a scientifically defensible reference level (a water concentration at which undesirable effects are likely to be seen in reasonably sensitive species) for acute invertebrate effects (following short term exposure) is approximately 0.2 ug/l. European regulators acknowledge that acute effects are likely at levels exceeding 0.5 ug/l. In contrast, the EPA's regulatory and non-regulatory reference levels are set at 35 ug/l.

   Similarly, a reasonable reference level for effects following chronic exposure is at least an order of magnitude lower, or between 0.01 and 0.03 ug/l rather than the 0.5 ug/l used in the U.S.. EPA's approach to the assessment of aquatic risk is scientifically unsound and places aquatic environments at risk. In addition, there is evidence that risk managers at EPA have ignored aquatic risk ratios that exceeded the usual level of concern, notwithstanding the fact that those risk ratios were grossly underestimated in the first place.

   Based on the relative sensitivity of aquatic insects tested with several of the neonicotinoid insecticides, we suggest that these reference levels should also apply to the other neonicotinoid insecticides, notably acetamiprid, thiacloprid, clothianidin and thiamethoxam. In fact, because of their similarity in mode of action, the above reference levels should apply to the sum of all residues for all parent neonicotinoid compounds as well as some of the degradates.

Neonicotinoid insecticides may be totally unprecedented in the history of pesticide registration in that measured groundwater contamination levels have been high enough to cause aquatic impacts.

Data on surface water contamination from surveys to date, notably from California and from the Canadian Prairies, indicate that concentrations of several of the neonicotinoid insecticides are high enough to be causing impacts in aquatic food chains. Data from other jurisdictions (e.g. the Netherlands) show even higher levels of contamination.

It is clear that neonicotinoids have often replaced other insecticides of higher short-term toxicity to aquatic life – especially fish. However, the mode of action of neonicotinoids, which entails a cumulative irreversible action and delayed effects in invertebrates, as well as their persistence in the environment, makes them particularly worrisome. It is clear that we are witnessing contamination of the aquatic environment at levels that will affect aquatic food chains. This has a potential to affect consumers of those aquatic resources, be they birds, fish or amphibians.

In conclusion, policymakers and the public should be very concerned about the impact of neonicotinoid insecticides on birds and on the broader environment. Specifically, we should be concerned that:

- regulatory procedures are scientifically deficient and prone to the vagaries of chance
- risk managers appear to place minimal weight on concerns raised by environmental scientists who carry out the scientific evaluations of the products
- despite all the red flags, regulators are adding to the list of permissible uses
- neonicotinoids – the most heavily used insecticides in the world – are systemic products that are extremely persistent and very much prone to runoff and groundwater infiltration
- some neonicotinoids are capable of causing lethal intoxications and all are predicted to cause reproductive dysfunction in birds
- where we have looked, we have found broad-scale aquatic contamination at levels expected to cause impacts on aquatic food chains.
- any future re-evaluation of these products appears to focus solely on pollinator toxicity. The seriousness of pollinator losses should not be underestimated, but there is much more at stake.

A moratorium on any further use expansion is currently being discussed in the EU and Member States. Some countries have moved forward on limited cancellations. The North American regulatory system needs to act rather than continue to ignore evidence of widespread environmental damage. There is evidence that US regulators waited far too long to impose needed restrictions on the toxic insecticides responsible for millions of bird deaths per year (Mineau 2004) and that this is one of the more plausible reasons for the decline of grassland/farmland birds in North America (Mineau and Whiteside, 2013). The neonicotinoids have largely replaced that older generation of chemicals. We are urging regulators to take seriously the red flags raised by this persistent, cumulative, irreversibly-acting new class of pesticides.

Table of Contents

Soybean plants by Howard F. Schwartz, Colorado State University, Bugwood.org

DETAILED DISCUSSION

For ease of consultation, the numbering of the sections below is consistent with the main points made in the executive summary.

The neonicotinoid insecticides represent a relatively new group of insecticides. They were introduced in the early 1990s to counter widespread pest resistance and increasing health and environmental objections to the organophosphorous insecticides. Although of lower acute toxicity to vertebrates than the organophosphates, neonicotinoids' longer persistence, high water solubility and runoff potential as well as their very high toxicity to pollinators are bringing them increased scrutiny, especially now that they have become the world's most widely used insecticides. Their toxicity to pollinators has brought them the most attention so far and has dominated the recent concerns of regulatory bodies worldwide.

The intent of this report is to review the risk that neonicotinoids pose to birds. Birds have borne more than their fair share of impacts from pesticides – from the early issues of eggshell thinning with DDT to the extensive mortality caused by the organophosphorous and carbamate insecticides that followed.

The main products reviewed here are acetamiprid, imidacloprid, thiacloprid, clothianidin and thiamethoxam. Minor members of the neonicotinoid family include dinotefuran, nitenpyram and nithiazine.

For the sake of comparison, this report will discuss, where appropriate, a number of older insecticides that the neonicotinoids have replaced in key markets where they now dominate. This includes the organophosphorous insecticides diazinon, chlorpyrifos, malathion, terbufos and methamidophos, the carbamate insecticides carbofuran, methomyl, the pyrethroids tefluthrin and deltamethrin as well as the seed treatment insecticide carbathiin.

The report will emphasize US regulatory history although it will make reference to Canadian and EU documents where relevant.

1. The 'soft ride' of neonicotinoids through registration

A look at the regulatory history of the three main neonicotinoids (imidacloprid, clothianidin and thiamethoxam) shows the extent to which registration decisions have ignored repeated warnings about possible environmental impacts.

1.1. Imidacloprid

The oldest neonicotinoid, imidacloprid, was registered in 1994 in potatoes, cotton and apples. At the time, EPA[1] scientists cautioned that both the acute and the chronic aquatic risk triggers had been exceeded (USEPA 1994a, b) for both non-endangered and endangered species. A 200 ft. buffer around aquatic habitats frequented by endangered species was suggested in consultation with the

[1] The acronyms EPA, USEPA and US EPA are used interchangeably in this report. They all refer to the U.S. Environmental Protection Agency, the body responsible for federal pesticide regulation in the U.S.

registrant. Detailed geographical assessments for endangered species were to continue. In its initial review, EPA identified that imidacloprid was both persistent and mobile and was likely to give rise to groundwater contamination. The reviewers went as far as to say that there was no need to conduct long term field dissipation studies because: "…*the studies would probably only provide information that would confirm that (imidacloprid) is both persistent and mobile, which we already know*" (USEPA 1994b).

Jumping forward to more recent times, not much seems to have changed. The re-registration document of 2007 states that the ecological risk assessments to date have failed to properly assess the risks to endangered species. In this 2007 review, imidacloprid was said to carry '*an acute and chronic risk to both freshwater and estuarine/marine invertebrates*' in agreement with the 1994 conclusions, but it was also said to '*have the potential to cause chronic risk to avian species and small mammals*' as well. Under '**major risk concerns**' the EPA scientist stated: "*Regarding effects to nontarget terrestrial and aquatic organisms, the structure activity relationship between imidacloprid, a chloronicotinyl compound, and its analog nicotine, suggests a potential concern. Studies in the published literature show that nicotine can cause developmental toxicity, including functional deficits, in animals and/or humans that are exposed in utero*." This suggests a staff scientist who was concerned about the product but forced to follow an inadequate assessment paradigm when it came time to assess chronic or reproductive toxicity. **Unfortunately, there is no evidence that warnings of 'major risk concerns' such as this one have had any effect on registration decisions.**

In Canada, imidacloprid was first registered in 1995 for potatoes. Many other uses were registered in the years that followed (PMRA[2] 1997, 2001), including lettuce, turf, as well as seed treatments in canola and corn. Because of concerns over water contamination and pollinators, the PMRA stated in 2001 that only new uses with '*low environmental risk situations*' or '*critical uses in the context of sustainable pest management programs where mitigative measures can be incorporated into product labelling*' would be considered. Seed dressings were considered to represent use patterns with low environmental risk – despite an acknowledgment that imidacloprid was 'persistent' with soil DT50[3] values in the range of 1-2 years. Such slow breakdown means that the pesticide has the potential to gradually increase in concentration in the soils if used on a repeated basis. Also, the compound is extremely water soluble and therefore mobile. In September of 2001, the PMRA acknowledged that imidacloprid had the potential to contaminate ground water and that once contaminated, no practical remedial action was possible. This admission came close on the heel of the registration of imidacloprid as a seed treatment in field corn (May 2001). This raises obvious questions about the wisdom of the use expansion to corn when serious concerns about the product were known.

1.2. Clothianidin

Clothianidin, like thiamethoxam, is used principally as a seed treatment though several other uses have been registered also. This active ingredient may provide the best example of the apparent disconnect between registration decisions and the scientific review of the data.

[2] Pest Management Regulatory Agency. Under the responsibility of Health Canada, the agency responsible for pesticide regulation in Canada.
[3] DT50 is the time required for half of the parent material to break down. Units are typically days.

In 2003, EPA first reviewed the ecological risk from clothianidin – initially for corn and canola[4] seed treatments, two major uses on a continental level (USEPA 2003a, b). The Agency concluded that exposure to treated seed through ingestion might result in chronic risk to birds and mammals, especially mammals where consumption of 1-2 seeds only could push them to an exposure level at which reproductive effects are expected.

The detailed assessment of clothianidin's reproductive toxicity in mammals certainly provides cause for concern:

*"These chronic effects in mammals can include decreased body weight gains and delayed sexual maturation (males only); decreased absolute thymus weight in F1 pups (both sexes), and increased stillbirths (F1 and F2 litters). Reproductive effects were noted for adult rats that included decreased sperm motility and increased number of sperm with detached heads. These effects could especially result in toxic risk to those species that have a limited reproductive capacity (e.g., few litters or broods, those animals that reproduce only once per year, and Endangered Species). Although effects on sperm mobility may not effect (*sic*) the number of offspring in some cases, there can be an impact on the ratio of gender composition (e.g., more males produced as opposed to females) which can result in population reductions. Over time, developmental effects were noted in rabbits at 75 mglkglday, and included premature deliveries, decreased gravid uterine weights, and increased litter incidence of missing lung lobe in the fetus. The possibility of chronic risk suggests a Restricted Use compound, Endocrine Disruption candidate, as well as Endangered Species concern for mammals, birds, and invertebrates."*

The EPA made a critical error, however, in stating that "…*the prescribed agricultural practice of drilling seeds at planting should reduce exposure to these animals*." A quick review of the scientific literature (see section 2) would have shown that this was a naïve and incorrect assumption.

In the same 2003 assessment, EPA described the chemical as persistent and mobile, with '*potential to leach to ground water as well as runoff to surface waters*' (USEPA 2003a).

The high toxicity to bees was identified as well, but this is outside the scope of the current review.

With this level of concern, one might have expected regulators to move slowly on new uses, especially major ones. However, a plethora of registered uses for clothianidin followed in quick succession: Tobacco, turf, apples, pears and ornamentals (USEPA 2004); potatoes, grapes, sorghum and cotton (USEPA 2005); sugar beets (USEPA 2006, 2007); tuberous, corm and bulb vegetables, leafy greens, cole crops, cucurbits and other miscellaneous vegetables, cranberry and other low growing berries, tree nuts, cereals, figs, pomegranates, more cotton, soybean, peaches, and more potato uses (USEPA 2009); increased application rates to vegetables and tree trunk spraying (USEPA 2010); mustard and cotton seed (USEPA 2011a). By 2005, EPA scientists had significant concerns about pollinators; they had also increased concerns about both direct and indirect effects on terrestrial ecosystems. Now that more data had been gathered on acute and chronic aquatic toxicity, they had also started raising concerns about possible aquatic impacts.

[4] Canola is the term developed in Canada for specific varietals of oilseed rape. These are varietals of rape modified to have a low glucosinolate and erucic acid content and therefore fir for human consumption (e.g. 00 oilseed rape in Europe).

As is the case with many other hazardous products, the manufacturers and regulatory authorities appear to be satisfied with product labelling that shifts the responsibility of protecting the environment to the end user. A label statement on a clothianidin product such as '*Do not apply where runoff is likely to occur*' (Arena 50 WDG Reg. 59639-152) may seem reasonable enough at first blush. However, have the regulatory authorities assessed what proportion of their country's agricultural area can be treated without risk of runoff? If this is deemed to be a small proportion of the total, is it still reasonable to place this product in the hands of all growers? The same label goes on to specify: '*The properties of this chemical suggest it may leach into ground water if used in areas where soils are permeable and where the water table is very shallow.*' This statement is said to apply specifically to the State of Florida. Apparently, users elsewhere need not worry about groundwater contamination!

1.3. Thiamethoxam

Thiamethoxam's first registration dates back to 1999. Based on EPA's 2011 re-registration review document (USEPA 2011b), thiamethoxam is registered for several agricultural and non-agricultural commodities as well as for turf, ornamentals and as an antimicrobial on wood. The most recent ecological reviews are from 2010 when the Agency approved the uses in alfalfa, onions, peanuts, corn and leafy vegetables. Yet, as early as 2008, the Agency had stated, in their risk assessment for citrus fruits and tree nuts, that thiamethoxam posed a potential for '*direct adverse effects on freshwater invertebrates, birds and mammals*' (USEPA 2008b). They had also predicted '*structural and functional changes of both the aquatic and terrestrial ecosystems.*' As was the case with clothianidin, it would appear that these warnings from EPA scientists went unheeded.

Also, as of 2011, the Agency was still missing key pieces of data in order to support current uses of thiamethoxam. This included soil metabolism studies, terrestrial field dissipation studies as well as various aquatic toxicity requirements and new studies made necessary by emerging data on pollinator toxicity (USEPA 2011b). Thiamethoxam is considered by the Agency to be slightly toxic to birds on an acute and sub-acute basis. No mention is made of its reproductive toxicity in the 2011 re-registration summary document**. Interestingly, the same 2011 re-registration document stated that: *"… the Agency does not have data to indicate that thiomethoxam shares a common mechanism of toxicity with other chemical substances and therefore does not see a need for a cumulative risk assessment*." This is a strange statement indeed, if only because the major degradation product for thiamethoxam is clothianidin. Furthermore, all neonicotinoid insecticides registered to date are considered to have the same mode of action for resistance development purposes (nAChR agonists, Group 4A)** (Jeschke et al. 2011). The Agency proposes to complete reregistration review by 2018.

In 2001, Canada's PMRA registered thiamethoxam for use as a seed treatment in canola, replacing the standard lindane seed treatment or a lindane/granular terbufos combination. Despite its demonstrated water solubility and soil persistence, the agency did not assess any environmental toxicology except potential impacts on birds. It seems to have assumed that any possibility for impacts on aquatic systems was negligible. The ecological review of thiamethoxam came in 2007 (PMRA 2007) in order to register the product for use on potatoes and on a number of tree fruit crops. The Agency concluded that, other than requiring labeling for pollinators and buffer zones around aquatic bodies, the compound '*presents a negligible risk to wild mammals, birds, earthworms, fish, crustaceans, amphibians, algae and aquatic plants.*' We believe that the evidence reviewed below shows otherwise.

Increasing concerns raised in the scientific and popular literature in the last decade over imidacloprid, clothianidin and other neonicotinoid insecticides did not seem to deter pesticide manufacturers, who appeared to be in a race to register as many uses as possible in complete disregard of any environmental consequences. It looks as if the USEPA and other regulatory bodies were rushing to oblige despite their own scientists' repeated and ever-growing concerns, raised in internal reviews.

In California alone, the California Department of Pesticide Regulation, as of July 2012, stated that the re-evaluation of neonicotinoids of concern *viz*. pollinator exposure (excluding pet uses and the like) would involve 293 pesticide products from 57 registrants and that as more products became registered (suggesting that registrations are on-going), DPR would '*roll them into the re-evaluation*' (CADPR 2012). It is now to the point that it has become difficult to find commodities that do not have a registration of one or several of the neonicotinoid insecticides. Based on information from Bayer, one of the main registrants (Jeschke et al. 2011), neonicotinoids have overtaken all other insecticide classes world-wide.

2. How acutely toxic to birds are the neonicotinoids?

The standard way in which the toxicity of pesticides to birds is measured is through an acute study. Birds are given the product by gavage (forced feeding) in varying amounts and the quantity of pesticide causing the death of half of the test birds is recorded and expressed as a proportion of bodyweight (i.e. the LD50 expressed as mg of pesticide per kg of bodyweight). One of the serious failings of current risk assessment is the underestimation of interspecies variation in pesticide susceptibility. Typically, one or two species only are tested (Mallard and Bobwhite are the usual mandated species) and the risk assessment is carried out with the more sensitive of the two. Even with the application of the customary safety factors, it has been shown that sensitive bird species are under-protected (Luttik et al. 2011). When more species are tested (as happens through academic or government research with older products) inconsistencies develop among regulators as to how these data should be used. Sometimes, regulators will use the data if the supplementary species are shown to be more sensitive than the usual ones; at other times the data are ignored, especially if they were obtained in ways that differ from the usual test protocols. **The end result is often arbitrary and the toxicity of different pesticides ranked based on 'luck of the draw.' This prevents any rigorous comparison of different chemical options.**

Species sensitivity distributions were designed in part to provide an unbiased comparison among chemicals. They will be used here. The method uses all available toxicity data and fits those data to a frequency distribution – often a log normal distribution. This process has been modified (in the case of birds) by incorporating body weight scaling (Mineau et al. 2001a). This is because it has been shown that small birds tend to be more sensitive to acutely toxic pesticides (Mineau et al. 1996a), most likely because they succumb more easily to the rigours of debilitation and the resulting starvation. Scaling for body weight in birds has been accepted in principle by the US EPA in their risk assessment process (*e.g.* their internal TREX software). However, the use of species sensitivity distributions or the use of small sample methods that approximate these distributions are not yet commonplace in regulatory circles.

The main acute toxicity endpoint presented here is a value called the HD5 ('Hazardous Dose at the 5% tail of the species distribution'). It represents the amount of pesticide in mg of chemical per kg of body weight estimated to lead to 50% mortality in a species more sensitive than 95% of all bird species, calculated with a 50 percent probability of over- or underestimation. The HD5 can be calculated from a fitted distribution where several toxicity values exist, or approximations can be used for smaller data sets. The 5% threshold is totally arbitrary although it has gained a great deal of use in the published literature. It does seem to fulfill the criterion that, for reasons of ecological integrity, we might not wish to see more than 5% of species being seriously affected in any system. The 5% tail will therefore be used throughout this report with the view that this should protect 'most' exposed species.

The first approach used here is the ETX 2.0 program (Van Vlaardingen et al. 2004) developed by the Dutch Government to calculate the hazardous concentrations and fraction of species affected by given exposure levels. It assumes log-normally distributed toxicity data. Distribution-fitting was carried out for all datasets with more than 5 data points – in this case, imidacloprid only. For the other compounds with only one or two toxicity values, a 'small sample method' was used (Aldenberg and Luttik 2002). This consists of estimating the HD5 on the basis of a mean LD50 and a pooled variance estimate calculated for a large group of pesticides at large (Luttik and Aldenberg 1997). The median estimate of the HD5 is calculated here in order not to bias for data availability. We recognise that this does not guarantee that any of the estimated values achieve the 95% level of protection.

The second approach estimates a body weight scaled value following Mineau et al. (2001). The approach ensures that species at one or the other end of a weight range spanning 10 to 1000g are adequately covered. The available data are tabulated in table 2.1. The derived HD5 values are given in table 2.2.

In the case of neonicotinoids, the exact method does not matter very much; similar values were estimated by both methods. However, it is clear that regulatory risk quotients use much less protective values as their point of departure. Depending on the specific insecticide, EPA underestimates toxicity by 1.5 to 10 fold if the intent of the exercise is to protect most species, not merely mallards and bobwhites. This will result in non-conservative (i.e. non-protective) assessments, especially since the endpoint is lethality to half of the tested population.

Table 2.1. Acute toxicity of the main neonicotinyl insecticides to birds based primarily on industry studies tabulated by regulatory authorities (principally EPA & EU sources). Original references obtained through the US Freedom of Information Act and consulted for this report are indicated with an asterix.

Active ingredient	Species	LD50 (mg/kg bw)	Probit slope[5] when	Dose vehicle	Reference to original industry study	Notes

[5] The LD50 is measured using a statistical construct called the probit. The probit is a normalised proportion of birds dying from the dose administered. The slope of the probit is an indication of the relationship between dose and mortality and is used to predict the dose at which certain proportions of birds (e.g. 1% or 5% rather than 50% as in the LD50) are expected to die. The higher the slope, the faster the proportion of birds at risk will increase with slight increases in exposure.

			provided		when available	
acetamiprid	bobwhite	180			European Commission 2004	
	mallard	98	6.0	sodium carboxymethyl cellulose	Johnson 1994*	Serious clinical signs seen at lowest dose level of 52 mg/kg.
	zebra finch	5.7	8.6	water	Hubbard 2011*	NOEL for clinical signs of 1.8 mg/kg. Onset of serious debilitation between 2.5 and 3.6 mg/kg.
clothianidin	bobwhite	>2000		corn oil	Johnson 1998*	NOEL for clinical signs of 500 mg/kg. Serious clinical signs and 20% mortality at 1000 mg/kg
	Japanese quail	430		corn oil	Gallagher and Beavers 2000*	NOEL for clinical signs of 12.5 mg/kg. Light signs at 25 mg/kg. More serious incapacitation at 100 mg/kg.
	mallard	>752			European Commission 2005	
thiacloprid	bobwhite	2716	2.4	Gelatin capsules	Grau 1995*	Clinical signs NOEL of 152. Severe signs onset at 551 mg/kg.
thiamethoxam	bobwhite	1552	8.5	methyl cellulose	Johnson 1996*	NOEL for clinical signs of 500 mg/kg.
	mallard	576	8.2	methyl cellulose	Johnson 1996*	Emesis observed at all dose levels. NOEL for clinical signs of 137 mg/kg.
imidacloprid	bobwhite	152	2.7	Gelatin capsules	Toll 1990*	EFSA (2008) gives value as 503 which is in error. NOEL for clinical signs of 25 mg/kg. Onset of serious incapacitation between 50 and 100 mg/kg.
	canary	35 (25-50)		Cremophor EL in water	Grau 1986*	Serious incapacitation at lowest dose of 10 mg/kg.
	gray partridge	15			Grolleau 1990 in EC database	
	Japanese quail	31	2.4	Gum Arabic in water	Grau 1988*	Severe clinical signs at 5 mg/kg. NOEL for clinical signs at 3.1 mg/kg (2.5 mg/kg nominal).
	mallard	283	6.6	Gelatin capsules	Hancock* 1996	Severe signs at lowest dose tested – 25 mg/kg; mortalities up to 8 days post dose.
	Rock dove	25**		Gelatin capsule	Grau 1987*	Severe signs at lowest dose tested – 12.5 mg/kg
	House	41			Stafford 1991	

	sparrow				in CCME 2007	

** Female value. Male approximate LD50: 25-50.

Table 2.2. Derived HD5 values for the major neonicotinoid insecticides. This is the amount of pesticide in mg of chemical per kg of body weight estimated to lead to 50% mortality in a species more sensitive than 95% of all bird species, calculated with a 50 percent probability of over- or underestimation. The value used by the USEPA to generate risk quotients is given for comparison.

Active ingredient	Unscaled HD5 (ETx software)	Scaled HD5 (based on Mineau et al. 2001)	Acute value used by USEPA in risk assessment to which 0.5 factor has been applied to reflect current 'Levels of Concern' application factor	Notes
acetamiprid	8.0	20.9*	49	
clothianidin	149	115	211**	
thiacloprid	467	315	1358	
imidacloprid	8.5	8.4	76 (20.5***)	Dietary LC50 values were favored initially for calculating risk quotients****. These were 1536 ppm for bobwhite/mallard; 143 ppm for songbirds based on the house sparrow.
thiamethoxam	162	98	288	

* The higher value reflects the lack of a small sample extrapolation factor for the zebra finch in Mineau et al. 2001.
** Corresponds to the lower value of 430 for Japanese quail. The USEPA routinely reruns probit analyses and reports slightly different values from the cited studies.
*** This lower value is acknowledged and used in the assessment of a granular product.
**** Toxicity endpoints have changed over the years. Dietary toxicity was initially favored for risk assessment by the USEPA but attention has now shifted to acute toxicity as a more reliable measure. The dietary toxicity test has several problems associated with it that can make interpretation difficult (Mineau et al. 1994).

The neonicotinoid insecticides have replaced a number of insecticides of high acute toxicity to birds – notably organophosphorous and carbamate compounds. Table 2.3 provides scaled HD5 values for several of those alternatives in order to compare with the neonicotinoids.

Table 2.3. Comparison of avian toxicity of neonicotinoid insecticides (in bold) and several of the insecticides they have replaced, ordered from most to least toxic to birds based on avian scaled HD5 values. (Data from multiple sources – Table 3.2 above and see Mineau et al. 2001).

Active ingredient	Avian HD5 [mg/kg bw] (Most are	No. species tested

	scaled values)	
terbufos	0.16	5
carbofuran	0.21	18
diazinon	0.59	14
methamidophos	1.70	3
Carbathiin (carboxin)	3.44	5
chlorpyrifos	3.76	18
dimethoate	5.78	10
acetamiprid	8.0*	3
imidacloprid	8.43	7
methomyl	8.46	13
deltamethrin	97	5
thiamethoxam	98	2
clothianidin	115	3
malathion	139	8
tefluthrin	179	3
thiacloprid	315	1

* unscaled HD5

The toxicity of imidacloprid and acetamiprid, the most acutely toxic of the neonicotinoids, compares with the carbamate methomyl. However, the toxicity of thiamethoxam and clothianidin, both extensively used as seed treatments, is much lower and comparable to the least toxic organophosphorous insecticides such as malathion or the synthetic pyrethroids.

We do need to keep in mind that these data only refer to lethality. Different families of pesticides elicit sub-lethal effects at different fractions of the lethal dose. Callaghan and Mineau's (2008) review of 166 studies in birds found that very few compounds (< 5%) cause observable sub-lethal effects at doses as low as 1/10 of the lethal dose. **But in the case of the neonicotinoids, as seen in table 2.1 above, severe signs of debilitation (e.g. ataxia) were observed with imidacloprid a full order of magnitude below lethal doses.** Thiacloprid may behave similarly and, based on a similar mode of action, other neonicotinoids may elicit similar effects as well. There is also some indication that these symptoms persist for a long time post dose, at least relative to cholinesterase-inhibiting insecticides.

3. What is the chronic or reproductive toxicity of neonicotinoids to birds?

As mentioned in section 1, the US EPA has often commented on possible risks to avian reproduction. Only one measure of chronic risk is available for birds – a reproductive test that is typically conducted on either the bobwhite or the mallard. It is a truncated test which consists of feeding a constant concentration of the pesticide and then collecting the eggs and incubating them artificially. There is therefore no test of the ability of the birds to incubate, hatch or raise their young. The test is a hybrid between chronic toxicity and true reproductive effects and has been the subject of criticism over the years (Mineau et al. 1994, 1996, Mineau 2005). One of those criticisms is that, because of the long duration of the test, and the occasional pair that fails to 'get along,' spurious variance is introduced in a number of parameters which decreases the power of the test to see reproductive deficits. On the other hand, because the birds are offered contaminated diet only with no other food choice, the test may overestimate likely exposure. However, it remains the only test available with which to model non-acute risk.

Chronic toxicity endpoints are provided in table 3.1.

Table 3.1. Chronic toxicity endpoints for the main neonicotinoid insecticides. The values are given in ppm in mash given to the birds for the duration of the test. All studies obtained from US EPA FOIA process and reviewed for this report. Conclusions may differ from reported information in regulatory summaries.

Active ingredient	Species	NOEL[6] (ppm)	LOEL (ppm)	Dose levels	Reference	Effect
acetamiprid	bobwhite	250	500	250, 500, 1000	Taliaferro et al. 1997	Difficult study to interpret. Outlier pair should have been removed from controls. Chick survival per hen shows clear dose-response. Eggs laid also.
	bobwhite	400	800	100, 200, 400, 800	Temple et al. 2005	Chick survival, eggs laid
	mallard	125	250	62.5, 125, 250, 500	Taliaferro and Miller 1999	Tentative. Difficult to interpret because of poor dose response with worst performance in 62.5 ppm dose group.
	mallard	125	250	62.5, 125, 250, 500	Stafford 2004	Eggs laid, fertility
clothianidin	bobwhite	525 (500 nominal)	NA	0, 80, 200, 500	Gallagher et al. 2000a	
	mallard	250	525 (500 nominal)	0, 80, 200, 500	Gallagher et al. 2000b	Several small non-sig deficits in many parameters
imidacloprid	bobwhite	120	240	0, 30, 60, 120, 240	Toll 1991a	Difficult to interpret. Variable results, aberrant controls. Effect on male weight only. No true reproductive effects.
	mallard	120	240	0, 60, 120, 240	Toll 1991b	Study continued longer than normal leading to high variability. Hatching, egg laying clearly affected at higher dose
thiacloprid	bobwhite	466		53, 153, 466	Schmuck 1997	Agree with author that slight decrease in feeding rate at all concentrations is not biologically relevant
	mallard	NA	48	48, 140, 418	Hancock 1997	Parental effects, fertility or early embryonic death at high dose
	mallard	28	55	14, 28, 55	Hancock 1998	Early embryonic death, non-sig egg breakage
thiamethoxam	bobwhite	300	900	100, 300, 900	Taliaferro and Miller 1998	Non sig. but large diff. in eggs laid
	mallard	300	900	100, 300, 900	Brewer et al. 1998	Parental effects, non-sig effects in several parameters.

As with acute toxicity testing, assessing risk to all potentially exposed bird species from the lower of two bird species tested is not very realistic. This approach seriously underestimates the likely difference in sensitivity between species and the possibility that bird species other than mallards or

[6] NOEL (No Observable Effect Level) is highest dose level at which no effects were seen. It is more properly termed NOAEL to specify 'Adverse' effects. The LOEL (or LOAEL) is the lowest level producing effects in the study.

bobwhites will be affected at much lower levels of exposure. It has been argued that chronic toxicity is no less variable among species than acute toxicity and that the variance in inter-species chronic toxicity endpoints could (and should) be used as a proxy for the variance in reproductive toxicity (Mineau et al. 2001b, Luttik et al. 2005). This may give a more reliable estimate of the dose at which chronic toxicity effects are expected in those species that happen to be more sensitive to the pesticide than the standard bobwhite or mallard. Yet, EPA allows for a ratio between exposure and effect of 1 in their risk assessment before they consider that their 'Level of Concern' has been exceeded. This means that birds could be exposed to a level as high as the lower NOEL of either bobwhite or mallard without exceeding their 'level of concern'. Given that EPA's reproductive LOCs for birds are routinely exceeded with the neonicotinoids (section 1), this means that even insensitive species are likely to be affected reproductively.

3.1. A proposal for a more rigorous consideration of endpoints from the avian reproductive study.

Following a major international review hosted by the British Government in 2004, recommendations were made by the panel of assembled scientists to improve the assessment of long term or reproductive toxicity in birds. As a first step, it was recommended that the various endpoints in the studies be separated rather than basing a risk assessment on a single NOEL (Bennett et al. 2005, Shore et al. 2005). This followed on analyses (Mineau et al. 1994) showing that three major effects were at play in the current avian reproduction studies: parental effects, eggshell effects and effects on the reproductive & embryonic development process proper. Mineau and colleagues (1994) suggested that we should be most interested in those 'true' reproductive effects that are manifest at concentrations lower than those that elicit parental toxicity because these more 'pernicious' effects will be harder to detect in simple feeding studies.

Unfortunately, this proposal has not been endorsed by regulators although the US EPA is currently investigating risk models that would help with a sounder interpretation of reproductive test results (R. Bennett, pers. comm.). In the meantime, we offer the following solution, developed by Mineau and colleagues (2006) for the Canadian Government. It still uses a single NOEC (No Observable Effect Concentration) or LOEC value (as do all regulatory bodies currently) but does apply an extrapolation factor to account for inter-species differences in susceptibility as recommended previously.

For all the neonicotinoid insecticides being reviewed here (table 3.1) NOEC values were determined. Where this is not the case (i.e. when the lowest dose tested produced an effect; this occurred in some of the other seed treatment chemicals to which we compared the neonicotinoids below) Mineau et al. (2006) compiled available NOECs and LOECs from the USEPA one liner database (B. Montague pers. comm.) and calculated that the median spacing between the log NOEC and log LOEC was 1.23 based on a sample of 272 studies. This ratio was therefore used to obtain a NOEC where the lowest level tested produced an effect.

The NOEC (or more correctly stated, NOAEC – No Observable Adverse Effect Concentration) has been criticised as a toxicological endpoint because of very valid reasons having to do with statistical power, especially in the context of aquatic toxicity testing, and we fully agree with this criticism. However, it is currently not feasible to extract an ECx type of value (the concentration producing a pre-defined level of reproductive deficit) from the current avian reproduction test designs.

Manipulations of the test endpoints are carried out as follows in order to arrive at a reasonable estimate of the dose of a pesticide a bird would need to ingest daily to adversely affect reproduction.

- In the usual reproduction study, bobwhites (weight 210 g; unpublished industry studies) have a peak food consumption of approximately 10% of their bodyweight in food per day; measured food intakes for the mallard (approx. 1000g) are highly variable and peak above 20% of bodyweight (unpublished industry studies). This is counter to expected allometric relationships where, the smaller the bird, the larger its proportional food intake. Mallards in the laboratory tend to spill a lot of food and it is therefore difficult to estimate their true consumption. As verification, the allometric equation of Nagy (1987) for non-passerine birds was used to estimate food consumption even though it is recognised that Nagy's algorithms apply to birds in the wild. One expects wild birds to have higher maintenance requirements than birds kept in the laboratory. On the other hand, the birds in the laboratory are induced to lay an unreasonable clutch size which is likely to increase their food intake compared to an equivalent bird laying a normal clutch in the wild.

- Dry food intake = $0.302 * bw(g)^{0.751}$

- Laboratory diet was estimated to have 11% moisture content based on a personal communication from Joann Beavers with Wildlife International, one of the major testing laboratories.

- Therefore, for the bobwhite intake of lab diet (actual weight) should be:

  Intake = $(0.302 * 210^{0.751})/0.89$ (propn. dry wt.) = ~ 19 g

  …. which is approximately 90% of the observed 10% of bodyweight.

- For the mallard, the same formula returns a value of 61 g/day or a little over 6% of its bodyweight per day rather than the observed 20%. Because of the spillage problem mentioned previously, and assuming the figure of 21 g per day (10% of bodyweight) in the bobwhite to be correct, we adjusted the result of the Nagy calculation by the same proportionate amount – raising the approximate food intake in the Mallard to 67 g/day.

- The estimated food intakes of 21 g/day or 67 g/day for the bobwhite and mallard respectively were used to convert all NOAEC values to NOAELs (critical pesticide intake levels) expressed as mg a.i. of pesticide / kg bird / day. We believe this correction to be adequate where there is no large demonstrated effect of the chemical on food intake. This is the case for the neonicotinoids reviewed here.

- Therefore :

  $NOAEL_{mallard}$ (mg a.i./kg bw/day) = ($NOAEC_{mallard}$ (mg/kg food) * 0.067 kg food/day) / 1 kg bw

  $NOAEL_{bobwhite}$ (mg a.i./kg bw/day) = ($NOAEC_{bobwhite}$ (mg/kg food) * 0.021 kg food/day) / 0.210 kg bw

- A geometric mean of $NOAEL_{mallard}$ and $NOAEL_{bobwhite}$ was calculated as the best available average for all bird species.

- In order to use the compound-specific interspecies variation in acute toxicity, we derived standard deviations (SDs) for acute data in the following way:
  - A single geometric mean log LD50 value was obtained for each species-pesticide combination as outlined in Mineau et al. (2001).
  - Where the number of species tested was 4 or more, we derived a standard deviation. This was possible here for the active ingredient imidacloprid. For all other active ingredients, a pooled SD of 0.465 (after Aldenberg and Luttik 2002) was used.

- The extrapolation factor (a factor to be applied multiplicatively to the mean untransformed NOAEL) was defined as follows after Aldenberg and Luttik 2002):

  $EF^{median} = (10^{\sigma})^{Kp}$

  … where Kp is the z score of 1.64 in the case of the 5% tail of a normally-distributed species sensitivity distribution. This is equivalent to:

  $EF^{median} = 44.14^{\sigma}$ … or to an extrapolation factor of 5.8 for the pooled variance estimate of bird acute data.

- The median extrapolation factor (EF) was then applied to the geometric mean NOAEL in order to obtain the critical toxic effect level for a sensitive bird at 5% of the putative distribution of reproductive toxicities.

The resulting value (the calculated critical dose for a bird at the 5% tail of sensitivity) is tabulated in table 3.2 for the main neonicotinoids insecticides and some other common seed treatment pesticides (insecticides or fungicides). For the neonicotinoid insecticides, a critical intake value based on study LOAELs is also given. Assuming the current avian reproduction studies can be relied upon, effects from chronic intake should start occurring at some exposure levels between those two values.

Table 3.2. Calculated critical chronic dose intakes (NOAEL and LOAEL) for a sensitive bird species (at the 5% tail of sensitivity) for the main neonicotinoids insecticides and some other common seed treatment pesticides.

Active ingredient	Avian Chronic - Critical intake level (NOAEL - mg/kg/day) for a sensitive bird at 5% tail of acute sensitivity distribution	Avian Chronic - Critical intake level (LOAEL - mg/kg/day) for a sensitive bird at 5% tail of acute sensitivity distribution
Acetamiprid	2.49	4.97
Clothianidin	5.10	7.38
Imidacloprid	1.41	2.82
Thiacloprid	1.61	2.10
Thiamethoxam	4.22	12.66

Captan	4.95	
Carboxin	1.30	
Diazinon	0.12	
Difenoconazole	1.76	
Fludioxonil	4.16	
Iprodione	4.22	
Metalaxyl	2.44	
Tebuconazole	2.01	
Triadimenol	1.15	
Triticonazole	1.70	

4. A short primer on seed availability and bird exposure after seeding

Of particular concern to birds are those neonicotinoid compounds that are used as seed treatments. Historically, seed treatments have been associated with extensive exposure to and impacts on birds. These were well documented for mercury-based seed treatments and for coatings with the cyclodiene insecticides aldrin and dieldrin. Any contamination of avian food items from spray applications to field crops as well as non-dietary exposure is likely small in comparison to the potential for very heavy exposure from seed treatments[7]. The main point to be made here is that, as far as birds are concerned, seeds are available ad libitum on fields.

The type of machinery and planting techniques dramatically influence incorporation of treated seeds. All seed drills use the same basic principles. Seeds are dropped from a row of individual dispensing units behind the tractor. In front of each dispenser a furrow is made by soil openers (disks, hoes or knives). The seed is dropped, either by gravity, by a train-driven auger system or through a pneumatic system (air seeder). Air seeders provide better control of application rate. Side-firming discs (closure wheels) push soil laterally against the seed. Alternatively, "press wheels" roll over the whole furrow area to compress the soil against the seeds. In North America, the term "planter" is usually reserved for crops that need wide spacing between rows (*i.e.* maize/corn) and the seed dispensing units are placed far apart; the term "drill" (as in hoe drill or press drill) is used for crops that can be planted at higher densities (*i.e.* cereals) so the dispensing units are close together. In Europe, the term "seed drill" is used for all crop types.

Additional implements may be added to aid incorporation of the seeds, such as harrows[8] placed in front of the seed dispenser to help clear debris (also known as trash) for more successful seed incorporation. Many variations on seeding exist depending on the specifics of the machinery, and also on how the drill is configured. Specific implements and machinery are recommended for each type of crop; however, this is usually left to the preference of each individual grower. Growers may not always be using the "best" equipment for any given crop because the same drill is often used for several crops in rotation. A good example of this is the use of air seeders to dispense canola on the soil surface after which it is crudely harrowed in. Air seeders are designed for precision seeding of cereals (usually 4-5cm in depth). However, growers find it difficult to get good results when air

[7] For this reason, this report will not conduct an assessment of avian toxicity resulting from the contamination of avian foods such as insects or weed seeds from spray applications. It is not that this risk is necessarily negligible, but it pales in comparison to the risk from treated seed.

[8] A harrow is an agricultural implement that loosens and levels the surface of the field. Harrowing is typically carried out before or during planting operations.

seeding at very shallow depths as with canola (1-3cm). They can get around this problem by running the furrow openers above the soil surface and crudely harrowing in the seeds.

The following factors have been tested experimentally and also significantly affect the proportion of planted seed that are actually buried under the surface (i.e. placed where they will have the best chance of germinating):

- Soil condition measured as clump weight of the soil (Leeuw *et al.*, 1995).
- Field trash which impedes the action of the incorporation. Surface counts of seeds were significantly lower in summer fallow fields than in stubble fields (Maze *et al.,* 1991).
- Rain which makes incorporation during planting difficult (Davis, 1974; Leeuw *et al.,*1995)
- Seed size and planting depth: larger seeds are typically planted deeper and at lower densities (Tamis *et al.,* 1994). Conversely, small seeds such as canola are planted very shallow with a much higher risk of large numbers left on the soil surface. Deeper plantings typically result in fewer surface seeds (Pascual et al. 1999a)
- Travel speed during planting: the insertion of seeds at intended depths using drills is ensured only at certain speeds and farmers will change speed during planting. This has been shown with granular insecticides (Ellis, 1982) which are subject to the same limitations as seeds.

The soil disturbance associated with planting typically increases avian hazard by exposing soil invertebrates on the field surface which attracts invertebrate-eating birds with a higher probability that treated seed will also be ingested.

Some crops are seeded from an aircraft (e.g. rice). This may be a very high risk factor given that rice grains are likely to be widely distributed on levees and other dry areas in and around paddies.

High densities of treated seed occur on certain areas of the field, namely at row ends where the planters are lifted out of the furrows to permit turns (termed headlands in the European literature) (Pascual et al. 2009b), at irregularities in field contour resulting in the planter shoe rising out of the soil, and where the farmer loads the machine with the treated seed. These areas may increase risk to avian species because spills are more visible; they present a profitable feeding opportunity (Leeuw *et al.*, 1995). High densities can also occur midfield by means of erratic application from dispensing units resulting from incorrect calibration, clogging or obstructions such as stones.

While environmental conditions can cause high avian risk in localized parts of the field, growers have a dramatic influence on the overall number of treated seeds left on the soil surface after planting. Therefore, densities available to avian species are highly unpredictable, as illustrated by actual field counts. Furthermore, exposure can still occur if seeds are fully incorporated in the soil. Geese dig for seed in upper surface layers of soil (Lorenzen & Madsen, 1986). Western meadowlarks and many blackbirds will probe for seed by pushing their bill into the ground or beneath an object and then the buried food items are made accessible by spreading their mandibles wide (gaping) (Lanyon, 1994). In Europe, skylarks will bring grain to the surface by uprooting seedlings (Green, 1978), a technique favored by cranes and geese in North America. This will expose them to systemic residues, residues still carried on the seed or granules caught in the root hairs of the seedlings. Mourning doves will move light ground litter using their bill to find food (Mirarchi & Baskett, 1994). In light of these feeding patterns and the inefficiency of all currently used incorporating devices, we can conclude that avian exposure to high numbers of treated seeds cannot be prevented even if the product is applied at recommended rates using proper equipment.

Birds also have preferences for certain seed types. This is species dependent. For example, it has been suggested that some species dislike canola seed. Pawlina and Proulx (1996) showed that the daily consumption of canola by house sparrows was far less than that of millet or sunflower seeds even when no other food source was available. However, closely-related mustard seeds have long been used in the pet bird trade, and canola was found to be a preferred seed for house finches and was used successfully as a lethal bait (laced with strychnine) (Palmer, 1972). A mixture containing rapeseed as well as millet and canary seed is given as standard diet for Japanese quail (Barfknecht 1998a). Smith (2006) looked at the attractiveness of wheat, corn, barley, oat and soybean to a subset of common farmland species. He found that soybean was the least preferred. However, Smith's review did not include some of the larger farmland species more likely to be attracted to a larger seed: waterfowl, grouse and pheasants, turkeys etc.

In conclusion, given the high variability and lack of control regulators and manufacturers have on the methods of application at planting (field conditions, equipment, calibration, etc.), it should be assumed that unlimited quantities of treated seed will be available to foraging birds. **Therefore, we believe that regulators are clearly mistaken in believing that exposure to treated seed can be minimized by label statements or adherence to good agricultural practice.** The only factors that should be considered in avian risk assessments of seed treatment chemicals are: 1) the maximum consumption rates (preferably under food stress realistic of field conditions) of farmland foraging birds, and 2) the amount of active ingredient per seed. For the purpose of this report, we will express risk as the number of seeds needing to be ingested for a given biological effect. An initial assumption will be that seeds contain the labeled amount of active ingredient. It has been shown however, that actual concentrations of active ingredients are lower at planting than the initial 'in the bag' concentration (McKay et al. 1999). This loss of active ingredient may be to the advantage of foraging birds but has proven to be a problem with the neonicotinoids, resulting in large kills of bees from dust exhausted from pneumatic seeders.

5. What is the acute and chronic risk to birds from the ingestion of treated seed?

Working out the typical loading of active ingredient per seed is not a simple task given the many labels, formulations and inconsistent ways of reporting treatment concentrations. Only a few representative examples are given here for the main field crop seeds likely to be consumed by birds – wheat (as a representative of cereal crops), corn and canola.

Representative seed weights were obtained from a compilation of the PMRA based on a number of different sources (Chris Fraser, PMRA, *pers. comm.*) as well as EPA review documents. Seed weight values used here are as follows: canola = 2.9 mg, cereals = 35 mg and corn = 377 mg.

For imidacloprid, we consulted the Gaucho 75ST label (EPA Reg. No. 264-959). This is one of the labels for commercial seed treatments. Wheat is labeled at 2 oz. product per hundredweight (Cwt - 100 lb of seed) which works out to 0.033 mg/seed. A direct figure of 1.34 mg a.i./kernel is given for corn. The highest treatment rate for canola is 21.3 oz of product per hundredweight. This works out to 0.03 mg of imidacloprid per seed.

For clothianidin (USEPA 2003; as well as the following label: Poncho^{TM} 600; Reg. No. 264-789; updated 22 April 2010), a loading of 1.25 mg a.i./kernel is given directly for corn. The maximum rate

on canola/rapeseed is 10.23 oz. product per Cwt which works out to approximately 0.012 mg/kg seed. For wheat and other cereals not included on this particular label, USEPA (2010) gives 70 g a.i/100 kg seed. For wheat specifically, this would work out to an approximate loading of 0.025 mg/seed.

For thiamethoxam, we looked at various Cruiser labels (e.g. EPA Reg. No. 100-941, 100-1365, 100-1369). The following direct loading rates were given: 0.8 mg/corn kernel, 0.03 mg/rice seed, 0.375 mg/cotton seed, 0.25 and 0.29 mg/kg for sunflower and peanut respectively. The higher rates for wheat and canola work out to 0.018 and 0.012 mg/seed.

Based on a US EPA 2002 memorandum, acetamiprid was registered for canola treatment at 0.25 lb a.i./100 lbs of seed. However, the specific label with those use instructions (Adjust 70WP – Reg. No. 8033-27) is currently inactive and we do not know whether it has been superseded yet by a new label with the same uses (e.g. Vault^{TM} insecticide registered in Canada). That concentration of acetamiprid would work out to 0.0072 mg/seed.

We are not aware of a seed treatment use for thiacloprid.

The chosen risk measure for the current assessment is the number of seeds that a 15 g bird could ingest before reaching either a median lethal dose (Table 5.1) or the estimated reproductive NOAEL or LOAEL (Table 5.2). At this point, we assume no active avoidance of any of the seed by birds (see discussion below) and a concentration on the seeds reflecting the usual label rate. A consistent bird weight of 15g was chosen in line with previous calculations by Mineau and colleagues (2006). It is acknowledged however that sparrow-sized birds may be a little small to ingest whole corn seed in any quantity.

Table 5.1. Estimated no. of seeds needing to be ingested by a 15g bird to achieve a 50% chance of lethality given sensitivity at the 5% tail of the bird distribution.

Active ingredient	Seed type	mg/seed	Critical endpoint	Endpoint value (mg/kg)	No. seeds to endpoint
imidacloprid	Corn	1.34	HD5*	8.5	0.1
	canola/rapeseed	0.029	HD5*	8.5	4.4
	Wheat	0.033	HD5*	8.5	3.9
clothianidin	Corn	1.25	HD5*	149	1.8
	canola/rapeseed	0.012	HD5*	149	186.3
	Wheat	0.025	HD5*	149	89.4
thiamethoxam	Corn	0.8	HD5*	162	3.0
	canola/rapeseed	0.012	HD5*	162	202.5
	Wheat	0.018	HD5*	162	135.0
acetamiprid	canola/rapeseed	0.0072	HD5*	8	16.7

* Unscaled LD50 for birds at the 5% tail of species sensitivity

Table 5.2. Estimated no. of seeds needing to be ingested by a 15g bird to achieve estimated reproductive effects.

Active ingredient	Seed type	mg/seed	Critical endpoint	Endpoint value (mg/kg)	No. seeds to endpoint
imidacloprid	Corn	1.34	LOAEL	2.82	0.03
	canola/rapeseed	0.029	LOAEL	2.82	1.46
	Wheat	0.033	LOAEL	2.82	1.28
clothianidin	Corn	1.25	LOAEL	7.38	0.09
	canola/rapeseed	0.012	LOAEL	7.38	9.23
	Wheat	0.025	LOAEL	7.38	4.43
thiamethoxam	Corn	0.8	LOAEL	12.66	0.24
	canola/rapeseed	0.012	LOAEL	12.66	15.83
	Wheat	0.018	LOAEL	12.66	10.55
acetamiprid	canola/rapeseed	0.0072	LOAEL	4.97	10.35

It is clear that the loading of all neonicotinoid insecticides on corn is such that acute intoxications are possible with the three registered products. With imidacloprid, the number of seeds needing to be consumed is less than 1 even for a larger (e.g. blue jay-sized) bird more likely to be picking up whole corn seed from seeded fields. Acute intoxications in wheat or canola are not likely with clothianidin or thiamethoxam because of the number of seeds needing to be ingested.

However, based on chronic/reproduction endpoints, all seed treatments are predicted to cause effects given the very small number of seeds needing to be ingested to push birds into 'critical range.' Indeed, recent work on clothianidin in Japanese quail (Tokumoto et al. 2013 – see below) suggests that effects on bird fertility and embryonic development are occurring at dose levels lower than the critical levels indicated by the standard reproduction study. The main uncertainty here is how long the seeds will be available to birds and how long dosing is necessary before the type of effects observed in the laboratory will be seen in the wild. There are huge uncertainties such as what types of effects might be seen in altricial[9] species. However, based on our current understanding and risk assessment procedures in place, the neonicotinoids as a group have a high potential to affect avian reproduction. This is due in large part to the very high exposure potential that seed treatment chemicals represent.

Recently, Lopez-Antia and colleagues (2012) tested the effect of imidacloprid seed treatments on captive red partridges. They applied the material to wheat at the intended labeled rate of 0.7 g a.i./g of seed and twice that rate[10]. Actual measured concentrations were 74% and 62% of nominal for the

[9] Altricial species are those where the young are born naked and blind and need a prolonged period of parental care to fledge. Mallard and bobwhite, the two test species, are both precocial species with young being mobile and able to feed themselves within a few hours of hatching.

[10] This works out to 0.025 and 0.050 mg/seed. The maximum allowed in the US falls between those two concentrations. Given the reported measured concentrations, the high rate used in the experiment is almost exactly the high rate allowed in the US.

low and high dose rates respectively, meaning that the high rate was only slightly higher than labeled rate. Exposure lasted for 10 days. Exposure started 15 March and, based on a personal communication from one of the co-authors (Rafael Mateo, pers. comm.) egg-laying began 16 April and was concluded 28 May. Several of the birds died during treatment, reducing the number of pairs available for breeding. Unfortunately, food consumption was not measured, preventing an assessment of any avoidance. However, birds in both imidacloprid groups showed reduced body condition suggesting a reduction in food intake. (This was confirmed in the personal communication described above. However, in a parallel trial, it was found that birds ate a normal amount of seed when treated and untreated seed were mixed.) Cellular immune function is reported to have declined in males at the high dose rate. Both males and females showed reduced eye ring pigmentation – an interesting finding but one of unknown significance at this point. Data on reproductive success are difficult to interpret. Because of the small number of birds that survived, data were analysed using each egg laid as an independent statistical unit. This ignores that eggs within a clutch are not statistically independent and therefore limits the inferences that can be made from the research. The experiment does not add critical reproduction information beyond what is known from the regulatory studies. It does raise some questions as to new and unexpected effects not typically measured in the standard studies.

Tokumoto and colleagues (2013), gave male Japanese quail daily doses of formulated clothianidin (Dantotsu™ – a 16% formulation of clothianidin manufactured by the Sumitomo Chemical co.) at rates of 0.02, 1 and 50 mg/kg over a 30 day period. These males, along with the usual control individuals, were then mated to unexposed females and the eggs collected and checked for fertility and embryonic development. Testes, livers and spleens were collected for examination. Their working hypothesis was that sperm production would be affected though oxidative stress as seen in mammalian systems. They were most concerned about the welfare of the crested Ibis (*Nipponia nippon*), a critically endangered species being released into the wild from captive breeding facilities and known to frequent rice fields and other areas where neonicotinoid insecticides are being used. The 50 mg/kg dose in quail caused one mortality and signs of toxicity in several individuals. Interestingly, dosing caused an increase in bodyweight which the authors attributed to impaired liver function. (The authors reviewed similar reports of impaired liver function with imidacloprid and thiacloprid in chickens.) There was a dose-related increase in testicular abnormalities and DNA breakage in germ cells even though eventual fertility was not affected. Embryo length was reduced in a dose-dependent fashion with significant effects seen in the 1mg/kg group. Embryo weight was also affected. Some of the dosed embryos stopped developing altogether but sample sizes are too small to assess whether this was a significant issue.

Finally, a rather sweeping proposal was recently made by Mason and colleagues (2013). They postulate that many of the severe epizootic diseases that seem to arise with alarming frequency (chytrid fungus in amphibians, white nose syndrome in bats, mycoplasmal and other recently discovered pathogens in finches and other bird species in North America and Europe) may be the result of immune suppression resulting from low level exposure to neonicotinoids. They base their hypothesis on reports of immune suppression in bees, fish and rats following neonicotinoid exposure as well as on time and place correlations between neonicotinoid uses and disease outbreaks. Additional research is needed, given the serious potential consequences of this hypothesis.

It is relevant to ask how the neonicotinoid insecticides compare to other registered seed treatments. It is beyond our scope to conduct a complete review of all US-registered seed treatments. However,

a review of seed treatments was carried out in Canada by Mineau and colleagues (2006) and has been modified for this report. The comparison of acute lethal toxicity (Table 5.3) uses scaled HD5 values with the exception of acetamiprid where the new information available for the zebra finch is considered a critical piece of information. Application rates were adjusted for the neonicotinoids in order to reflect US conditions described in this report. This could not be done for all other active ingredients (primarily fungicides) but differences between seed treatment rates in Canada and in the US are thought to be slight. As discussed above, a 15g bird is not likely to be feeding on whole corn seed; avian body weight was increased to 50g for that seed type – a weight somewhere between that of a large sparrow and a blue jay.

Table 5.3. A comparison of the acute lethal toxicity of seeds treated with neonicotinoid insecticides (in bold) and other common seed treatment chemicals. Seed treatment rates for neonicotinoids are as labeled in the US; those for other active ingredients are as labeled in Canada.

AI Accepted Name	Type of seed treated	Average weight of individual seed (g)	Scaled HD5	Maximum rate AI per particle (mg/seed)	bird weight (g)	Risk as no. seed needed to reach HD5
Imidacloprid	Canola	0.003	8.40	0.0290	15	4.3
Acetamiprid	Canola	0.003	8.00	0.0072	15	17
Thiram	Canola	0.003	36.81	0.0197	15	28
Carbathiin	Canola	0.003	10.68	0.0030	15	53
Thiamethoxam	Canola	0.003	98.00	0.0121	15	121
Clothianidin	Canola	0.003	115.00	0.0120	15	144
Iprodione	Canola	0.003	158.40	0.0089	15	267
Metalaxyl	Canola	0.003	89.09	0.0011	15	1205
Metalaxyl-m (mefenoxam)	Canola	0.003	137.00	0.0004	15	4852
Difenoconazole	Canola	0.003	207.13	0.0006	15	5021
Fludioxonil	Canola	0.003	208.12	0.0002	15	20351
Carbathiin	Cereal	0.035	10.68	0.1504	15	1.1
Imidacloprid	Cereal	0.035	8.40	0.0330	15	3.8
Thiram	Cereal	0.035	36.81	0.0243	15	23
Clothianidin	Cereal	0.035	115.00	0.0250	15	69
Maneb	Cereal	0.035	345.34	0.0743	15	70
Thiamethoxam	Cereal	0.035	98.00	0.0180	15	82
Tebuconazole	Cereal	0.035	347.30	0.0588	15	89
Metalaxyl	Cereal	0.035	89.09	0.0129	15	103
Difenoconazole	Cereal	0.035	207.13	0.0084	15	368
Metalaxyl-m (mefenoxam)	Cereal	0.035	137.00	0.0049	15	416
Triadimenol	Cereal	0.035	965.25	0.0118	15	1231
Fludioxonil	Cereal	0.035	208.12	0.0018	15	1744
Triticonazole	Cereal	0.035	232.29	0.0019	15	1861
Diazinon	Corn	0.38	0.59	0.1421	50	0.21
Imidacloprid	Corn	0.38	8.40	1.3400	50	0.31
Captan	Corn	0.38	25.32	2.2230	50	0.57
Carbathiin	Corn	0.38	10.68	0.4723	50	1.1

Thiram	Corn	0.38	36.81	0.6866	50	2.7
Clothianidin	Corn	0.38	115.00	1.2500	50	4.6
Metalaxyl	Corn	0.38	89.09	0.7917	50	5.6
Thiamethoxam	Corn	0.38	98.00	0.8000	50	6.1
Mancozeb	Corn	0.38	710.95	0.6688	50	53
Thiophanate-methyl	Corn	0.38	482.63	0.2660	50	91
Difenoconazole	Corn	0.38	207.13	0.0916	50	113
Metalaxyl-m (mefenoxam)	Corn	0.38	137.00	0.0537	50	128
Fludioxonil	Corn	0.38	208.12	0.0212	50	490

Again, it is clear that imidacloprid seed treatments carry a higher risk of lethal intoxication than most other seed treatments. Two exceptions are diazinon on corn seed and carbathiin on cereal, both of which have been replaced by – or in the case of wheat, is in the process of being replaced by – the neonicotinoids.

For the comparison of chronic toxicity (Table 5.4), endpoints were modified to reflect the review of reproductive endpoints carried out in this report (Table 3.1). For other active ingredients, NOAEL values were obtained from EPA summary data (One liner database - B. Montague, pers. comm.).

Table 5.4. Comparison of the chronic/reproductive toxicity of neonicotinoids and other registered seed treatment chemicals.

Active ingredient	Type of seed treated	Bobwhite NOAEL (ppm)	Mallard NOAEL (ppm)	Critical intake level (mg/kg/day) for sensitive bird at 5% tail	Particle load (mg/seed)	Risk (no. seeds to critical intake)*
Imidacloprid	Canola	120.0	120.0	1.4	0.029	0.7
Thiram	Canola	500.0	9.6	1.2	0.020	0.9
Acetamiprid	Canola	250.0	125.0	2.5	0.007	5.2
Thiamethoxam	Canola	300.0	300.0	4.2	0.012	5.2
Clothianidin	Canola	525.0	250.0	5.1**	0.012	6.4
Carbathiin	Canola	1000.0	70.0	1.3	0.003	6.5
Iprodione	Canola	300.0	300.0	4.2	0.009	7.1
Metalaxyl	Canola	300.0	100.0	2.4	0.001	33.0
Difenoconazole	Canola	125.0	125.0	1.8	0.001	42.6
Fludioxonil	Canola	125.0	700.0	4.2	0.000	406.9
Carbathiin	Cereal	1000.0	70.0	1.3	0.150	0.1
Maneb	Cereal	500.0	20.0	1.4	0.074	0.3
Tebuconazole	Cereal	73.0	75.8	2.0	0.059	0.5
Imidacloprid	Cereal	120.0	120.0	1.4	0.033	0.6
Thiram	Cereal	500.0	9.6	1.2	0.024	0.7
Triadimenol	Cereal		100.0	1.2	0.012	1.5
Metalaxyl	Cereal	300.0	100.0	2.4	0.013	2.8
Clothianidin	cereal	525.0	250.0	5.1	0.025	3.1

Difenoconazole	Cereal	125.0	125.0	1.8	0.008	3.1
Thiamethoxam	Cereal	300.0	300.0	4.2	0.018	3.5
Triticonazole	Cereal	99.3	236.0	2.2	0.002	17.3
Fludioxonil	Cereal	125.0	700.0	4.2	0.002	34.9
Diazinon	Corn	32.0	6.0	0.1	0.142	0.04
Imidacloprid	Corn	120.0	120.0	1.4	1.340	0.1
Thiram	Corn	500.0	9.6	1.2	0.687	0.1
Captan	Corn	1000.0	1000.0	5.0	2.223	0.1
Mancozeb	Corn	125.0	125.0	1.8	0.669	0.1
Carbathiin	Corn	1000.0	70.0	1.3	0.472	0.1
Metalaxyl	Corn	300.0	100.0	2.4	0.792	0.2
Clothianidin	Corn	525.0	250.0	5.1	1.250	0.2
Thiamethoxam	Corn	300.0	300.0	4.2	0.800	0.3
Thiophanate-methyl	Corn	150.0	103.0	1.7	0.266	0.3
Difenoconazole	Corn	125.0	125.0	1.8	0.092	1.0
Fludioxonil	Corn	125.0	700.0	4.2	0.021	9.8

* For a 15g bird in the case of cereals or canola; 50g bird for corn.
** It is noteworthy that Tokumoto and colleagues (2013) found that doses as low as 1mg/kg clothianidin daily caused testicular anomalies and increased DNA breaks in males as well as reductions of embryonic length when those males were mated to undosed females. These endpoints have not been specifically studied with other pesticides and they are therefore not used here.

This comparison highlights one of the current problems in pesticide risk assessment. Several active ingredients currently registered have the potential to cause reproductive effects – at least based on the available laboratory studies. The need to verify some of these problems in the field was brought up almost two decades ago (Mineau et al. 1994) but persists to this day. Indeed, extrapolation from the contrived laboratory study with two precocial gamebird species to the intricacies of reproductive behavior in the field takes a veritable leap of faith. The lack of realism of the current study protocol as well as the existing difference between the two tested species (making extrapolation to a third species even more tenuous) has been well documented (Mineau et al. 1994, Mineau 2005, Luttik et al. 2005, Fernandez-Perea et al. 2009). What is missing is a solution to this conundrum. Fernandez-Perea et al. (2009) believe that the solution lies in the application of large safety factors in the risk assessment process. However, this is not the case now nor is it likely to happen given that a large number of pesticides currently fail the test even before safety factors are applied.

Nevertheless, on a comparative basis, the use of imidacloprid on corn or canola appears to be ill-advised given that consumption of 1 seed per day is expected to bring birds over the limit where reproductive effects might be seen. Even if part of the seed coating is lost at seeding or some of the pesticide is discarded when the seeds are hulled by the birds, critical dosing is likely to be exceeded.

5.1. Incidents

The monitoring and reporting of bird kills in the US has been very limited in recent years due to 1997 amendments to federal pesticide laws[11]. There have been relatively few reports involving neonicotinoids. This is in part because the acute toxicity of these insecticides is lower than that of the organophosphorous and carbamate insecticides that they replaced. Moreover, methods for diagnosing kills either do not exist, or are not widely used. There is no easy biomarker as there is for cholinesterase inhibitors, although we believe that one should be developed. **There is a strong case to be made that, where acute intoxications are possible, registrants should be compelled to develop the diagnostic tools necessary. In the case of neonicotinoids, it should be relatively easy to work out a binding assay for the neural receptor which is affected by this class of insecticides.**

Acute intoxications with seed treatments have been seen in France (Berny et al. 1999). In its 2008 re-assessment of imidacloprid, the USEPA reported an incident where grubs surfacing after a lawn treatment appear to have poisoned young robins (USEPA 2008a). More details are available from the American Bird Conservancy's AIMS database of kills (unfortunately, government funding for this database ended in 2006). A total of seven birds were found dead or dying in this incident, which occurred on an area of residential turf in Pennsylvania in 1998. In another case, 4 Canada geese were found dead or dying on a New Jersey golf course in June 2001. A mixture of chlorpyrifos and imidacloprid had been used on the course but the lack of cholinesterase inhibition suggested imidacloprid might have been responsible. On a South Carolina residential property treated with imidacloprid in 2002, 6 mallards were found dead or dying but no further information was provided. In the spring of 2012, a large number of bee deaths were reported in SW Ontario following the seeding of corn fields with clothianidin. In one such bee kill, a dead robin was reported amidst dead and dying bees thirteen days after seeding in Hensall, Ontario. About a week later, a flycatcher was also found in the same yard. The incident is currently being investigated by the PMRA.

5.2. The issue of repellency

5.2.1. Imidacloprid

Based on early research with imidacloprid-treated rice seed (Avery et al. 1993a and a follow-up study, 1993b/1994) the registrants of imidacloprid have tried to make the case that the active ingredient repels birds and, therefore, is less of a risk to birds than calculated.

Some of the tests reported employed a 'two cup' design (e.g. Avery et al. 1993b). This design makes it easy for birds to recognise and avoid treated seed when untreated seed is fed alongside. In addition, exposure to the treated seed was brief and the birds received their normal ration before and immediately after exposure to the treated seed and untreated alternative. The birds were therefore not subjected to any form of food stress. Birds given treated seed only in a single cup exhibited a marked reduction in feeding at all dosing levels. Work on seed treatments (e.g. CSL 2002) has shown that, for laboratory tests to have any bearing on the wild situation, hunger stress and motivation to eat novel seed must be manipulated carefully.

[11] Under its revised classification criteria, EPA designates as minor (and thus barely reportable, aside from cataloguing as "WB") any pesticide incident that kills fewer than 200 individuals of a "flocking species," 50 individuals of a songbird species, or 5 raptors.

A more interesting design involved broadcasting treated and untreated seed on small plots within an aviary, mimicking (albeit on a small scale) a field situation where one seeded field might be treated but a neighbouring one not. This was done at the highest seed treatment rate tested (2500 ppm). (In comparing this with the seed rates registered, the loading per seed is similar to the higher loading on corn seed[12]). More seed was removed from the control plots than from the treated seed plot. However, birds feeding on the treated plots '*did not react as if the seeds were distasteful or unpalatable'*. Birds feeding on the treated plots ingested seeds at a rate of 5.4 seeds per minute versus 6.9 seeds per min. on control plots. The experimenters estimated from another experiment that 84-87% of the total insecticide load was not consumed but left behind on the hulls. In later work, however, the same Bayer-sponsored research team (Avery et al. 1997) found that house finches (*Carpodacus mexicanus*), red-winged blackbirds (*Agelaius phoeniceus*) and boat-tailed grackles (*Quiscalus major*) only discarded between 15-41% of imidacloprid on treated millet, rice, sunflower or sorghum when shelling the seeds, and that there were several species-seed type combinations where seeds were eaten whole and all residues ingested.

In their 2007 regulatory review (EPA 2007), the EPA scientists quite rightly expressed misgivings about relying on any repellency to mitigate the high hazard suggested by the toxicology.

"*However, to what extent risk would be mitigated is still an uncertainty. Both studies suggested that avoidance of birds to imidacloprid treated seed is a learned response mediated by postingestional distress. The treated seed was not a sensory repellent or irritant to the birds. Although the birds did eat the treated seed and exhibited treatment related effects (ataxia and retching), effects were deemed as transitory. These effects,*
although deemed as transitory under laboratory conditions, may make the affected birds more susceptible to predation in the wild. However, to what extent this is a possibility is unknown."

Indeed, when avoidance is due to post-ingestional illness, the ability of birds to avoid the chemical is directly related to their ability to associate the contaminated feed with the illness. Whereas this may be relatively easy for them to do in a laboratory situation, it becomes much more difficult in the wild when habitual food sources have become contaminated**. There are clear parallels with the cholinesterase-inhibiting insecticides where repellency was similarly thought to reduce in-field risks. For example, the organophosphorous insecticide diazinon is extremely well avoided in the laboratory. Yet, thousands of geese and other species grazed their way to an early death on diazinon-treated turf** (Frank et al. 1991, Mineau et al. 1994).

Given that shelling is very species and seed specific, it is reasonable to assume that some species will incur the full toxicological risk by ingesting seeds without shelling them.

Mortality of partridges and pigeons with imidacloprid-treated seed has been seen in France (Berny et al. 1999), one of the few countries with an active investigation system for pesticide poisonings. Reports came in of birds appearing weak and reluctant to move. They subsequently tested positive for residues. Regardless of the exact conditions surrounding the kills (seed concentration etc.) they do suggest that any avoidance/repellency is not operating well enough under actual field conditions to prevent exposure and acute intoxication.

[12] A 2500 ppm concentration would work out to approximately 0.0875 mg/wheat seed or 0.95 mg/corn seed. On rice, this came to 0.068 mg/seed.

5.2.2. Clothianidin

Industry studies on avoidance were submitted for clothianidin. These followed the German BBA (Ministry of Agriculture) Test Guideline.

The first (Barfknecht 1998a) tested Japanese quail exposed to treated canola (rapeseed). The birds were habituated to a seed diet consisting of 50% rapeseed, 10% millet and 60% canary seed (sic - yes this adds up to more than 100%). A week before exposure, the birds were given a choice of 1:1 of their usual seed mixture and the untreated target seed type, in this case rapeseed scattered on the ground. At the beginning of exposure, the birds (4 males and 4 females) were fasted for 16 hours and then exposed to a mixture of their standard diet and clothianidin-coated rapeseed. The latter had a violet appearance. The amount of regular seed provided was calculated to represent 25% of their usual daily intake only, while treated seed made up the rest. Exposure lasted for 8 hours after which the birds were returned to a standard diet and observed for a further 14 days. The entire design was repeated four times.

According to the author, the birds showed a high rate of food intake during the first hour of exposure. He claimed that, with the exception of one bird, the standard diet only was consumed while the treated seed was left untouched. Without further information, we find this claim difficult to support. It is difficult to see how a single observer could observe 8 birds simultaneously and determine what the birds were actually pecking at – since the standard diet and treated seed were said to be spread uniformly on the floor. Following the first hour, birds were only observed at hourly intervals. No feeding activity was observed at any point between the first and 8th hour post dose. It is possible that the aviary floors were sieved and the remaining seed counted but this was not apparent from the methods. No signs of intoxication or mortality were observed but two individuals (of 32) showed enlarged spleens at necropsy. This was judged to be within normal variation.

In a second study (Barfknecht 1998b), domestic rock doves were exposed to treated corn (maize) seed at 50 g a.i./50 000 seeds. The usual diet in this case was composed of 30% maize, 21% peas, 20% barley, 18% wheat, 8% milo, 2% dari and 1% vetch. Procedures were the same as described above except that exposure was repeated on three consecutive days (8 hours/exposure period). As with the quail above, the author reported that the birds fed heavily during the first hour. However, only one bird (of 10) showed a 'reserved interest' on treated seeds but spat out the red-coloured treated seeds immediately after picking them up. We believe this to be a 'one off' observation without much actual relevance given that the mechanism of avoidance of neo-nicotinoids is understood to be post-ingestional illness. No signs of intoxication or mortality were observed. However, 2 of 10 birds showed enlarged spleen at necropsy, and 4 of the 10 showed reduced gonad size ascribed to the fact that breeding condition had not been induced in those birds[13] (the study was run in May/June). Unfortunately, there were no control birds with which to compare this population and the author did not ascribe any importance to those findings.

In a third study (Barfknecht 2000), rock doves were exposed to treated corn again but at half of the concentration as the previous experiment (25 g a.i./50 000 seeds). This time, birds were either given untreated seed only or treated seed only. Food consumption was measured from 3 days pre-exposure to three days post exposure. On the day of exposure, food intake (as a proportion of body weight) was said to be 5.14% of body weight for control birds and 2.32% for the treated seed. In

[13] Bird species tested here are typically brought into breeding readiness by photoperiod (the ratio of the daily light to dark period). Failure to do so may be an indication of some interference with the endocrine system.

terms of food weight, this meant that individual birds feeding on treated seed consumed between 0 and 20.5g of seed on exposure day (mean = 11.7g) compared to 20.4 to 34.8 (mean = 26.1 g) for the control birds. This led the author to conclude that the seeds were partially avoided.

On the whole, we support the US EPA view that avoidance of treated seed has not been sufficiently well demonstrated in a realistic field context to believe that this will mitigate any high toxicological risk.

6. Could neonicotinoid insecticides be disrupting food chains and affecting birds indirectly?

It has been suggested by the Dutch toxicologist Henk Tennekes (2010) that the neonicotinoid insecticides and other systemic products represent a 'disaster in the making' because of their potential to affect birds through reductions of their food supply.

This matter has several sub-questions related to it. The first is whether it is indeed feasible to affect bird populations though a reduction of their food supply. A small review of the subject is called for here.

6.1. Have reductions in the available food supply been shown to affect birds?

Food supply (i.e. abundance and availability) can affect habitat selection, reproductive success and survival in birds (Simons and Martin 1990, Martin 1987, Johansson and Blomqvist 1996, Brickle et al. 2000, Moller 2001, Hole et al. 2002, Nagy and Holmes 2004, Strong et al. 2004, Boatman et al. 2004, Morris et al. 2005, Nagy and Holmes 2005, Britschgi et al. 2006, Hart et al. 2006, Zanette et al. 2006, Golawski et al. 2008, Selas et al 2008, Dunn et al. 2010, Poulin et al. 2010). In cases where food availability has not been to found to affect life history it is either considered to be superabundant (Powell 1984, Greer and Anderson 1989, Miller et al. 1994, Rauter et al. 2000), or in the case of reproductive success, adults are considered to compensate for low food availability by travelling further to find food, or spending more time foraging (Adams et al. 1994, Howe et al. 2000, Martin et al. 2000, Bradbury et al. 2003, Zalick and Strong 2008). Given that reproductive success and survival are key components of population growth and stability, one might be tempted to assume that bird populations will readily show a response to the food supply. There certainly are examples of bird species whose populations track irruptive pests – e.g. wood warblers and spruce budworm in eastern North America. Showing this link in an agricultural context is harder.

Most of the detailed work on the effects of food supply on farmland birds has been carried out in the UK. Evidence that food supply can affect reproductive success of farmland birds in the UK is fairly strong, but links with population declines are weaker. The best documented example of food supply affecting farmland birds is the example of the gray partridge (*Perdix perdix*). Herbicide use reduces the abundance of invertebrates in farm fields, including the abundance of preferred invertebrate prey items critical to the growth and survival of gray partridge chicks. Simulation modelling shows that declines in gray partridge populations can be wholly explained by herbicide use in farmland (reviewed by Potts 1986).

Insecticide use leading to reduced invertebrate food abundance has been linked to reductions in reproductive success of at least four farmland passerines in the UK: corn bunting (*Miliaria*

calandra), yellowhammer (*Emberiza citrinella*), whinchat (*Saxicola rubetra*) and reed bunting (*Emberiza schoeniclus*) (Brickle et al. 2000, Brickle and Peach 2004, Morris et al. 2005, Hart et al. 2006, Dunn et al. 2010 but see Bradbury et al. 2000, Bradbury et al. 2003). However, in contrast to the gray partridge, changes in invertebrate abundance alone do not fully explain population declines for these species. In fact, reproductive success for these species increased during time periods when populations were declining (Siriwardena et al. 2000). Population declines have instead been linked to reduced over-winter survival, linked to reduced seed availability (Peach et al. 1999, Siriwardena et al. 2000, Butler et al. 2010). The gray partridge therefore remains the only clear example of pesticide-induced insect food reductions affecting a bird population directly.

An example of pesticide-induced effects possibly more relevant to a broad contamination of the aquatic environment by neonicotinoid insecticides is the work carried out in the Camargue region of France following the use of the biological insecticide Bti (*Bacillus thuringiensis israelensis*) for the control of mosquitoes (Poulin et al. 2010, Poulin 2012, Poulin et al. 2012). Despite the very selective nature of Bti (being toxic to mosquitoes and some midges only), the research team documented clear impacts on the broader avian food web, especially spiders and other predator species, as well as breeding success reductions in house martins (Delichon urbicum) nesting nearby.

However, it is important to note that the ability of a bird population to maintain itself is dependent on rate of re-nesting attempts and post-fledgling survival as well as success of single nesting attempts (Setchfield et al, 2012). Rate of re-nesting attempts has been shown to be affected by food supply (Nagy and Holmes 2005), and can have a major effect on annual reproductive success (Nagy and Holes 2005, Setchfield et al. 2012). Post-fledgling survival is also thought to be closely tied to food availability (Sullivan 1989, Simons and Martin 1990, Yackel Adams et al. 2006), although very little is known about this stage since juveniles are very difficult to follow or study. Survival rates of gray partridges include this vulnerable stage, since these birds are precocial and leave the nest very soon after hatching.

Although invertebrate food supply has been suggested as a mechanism for increased abundance and species richness of birds on organic farmland in North America (Freemark and Kirk 2001, Beecher et al. 2002), and for reductions in the reproductive success of tree swallows (*Tachycineta bicolor*) as the proportion of intensive agriculture in the landscape increases (Ghilain and Bélisle 2008), very little research has been conducted on diet, foraging habitat or food supply of farmland birds in North America. Farmland breeding birds in North America are known to use crop fields, hay fields and boundary features, such as hedgerows, for foraging (Best et al. 1990, Boutin et al. 1999; Puckett et al. 2009). Boutin et al. (1999) surveyed birds in corn, soybean, apple orchards and vineyards in southern Ontario and found that of 14 species regularly observed within field centers and in edges adjacent to crop fields, most species were observed in edges more than expected based on habitat availability. Vesper sparrows (*Pooecetes gramineus*) nesting in corn and soybean fields forage most often within 1 m of weedy or unplanted areas, and prefer fields with crop residue over bare fields, presumably due to increased food supply (Rodenhouse and Best 1994). Song sparrows (*Melospiza melodia*) nesting in hedgerows adjacent to hay, corn and soybean in eastern Ontario were found to obtain approximately 40% of invertebrate nestling food from crop fields and 60% from hedgerows and hayfields (Girard et al. 2012). However, Zalick and Strong (2008) examined food supply for savannah sparrows (*Passerculus sandwichensis*) in mown and unmown hayfields and found no effect of food reductions on reproductive success. In eastern Ontario, organic soybean fields were found to support greater biomass of soil-dwelling invertebrates important for feeding nestlings than conventional soybean fields, but reproductive success of song

sparrows nesting in hedgerows in this region was not affected by local invertebrate food availability (Girard 2012).

There has been a small amount of experimental manipulative work on the food supply of breeding birds in North America, but this work has occurred in forests or native grasslands, rather than in intensively managed pastures or cropland. In grasslands, the effects of experimental reductions in food supply due to insecticide application have had little or no effects of reproductive success of birds (Powell 1984, Adams et al. 1994, Martin et al. 1998, Martin et al. 2000). Girard (2012) found that differences in soil-dwelling invertebrate biomass between organic and conventional fields was greatest in the fields themselves, rather than in the field edges or hedgerows, suggesting that birds that most depend on the fields will be most affected by invertebrate food reductions. For forest species, as mentioned above, the rise and fall of warbler species in response to budworm outbreaks remains one of the best indications of the impact of food supply on populations.

In summary, the link between impacts on the insect food of birds and population declines of farmland bird species is difficult to establish unequivocally, save for the evidence linking the grey partridge to both insecticide and herbicide use. Studies linking reductions in house martin breeding success and mosquito control are directly relevant to the issue of broad aquatic contamination from the neonicotinoid insecticides. Nevertheless, existing literature suggests that it is difficult to predict the relative importance of food supply during the breeding season compared to other risks such as habitat loss, food supply during migration and during winter, predation or even direct losses from poisoning or disturbances such as mowing or tillage. Each species responds to a different set of stressors and it is likely that reasons behind many of farm bird declines are multi-factorial. Farmland species are already well adapted to use multiple, irregular food sources that may collapse overnight as a result of agricultural operations, whether tillage, mowing or insecticide use; these species already take a large proportion of their food outside of actively cropped (and pesticide-treated) areas. Insecticides registered for agriculture before the advent of neonicotinoids, whether organochlorines, cholinesterase inhibitors or synthetic pyrethroids, were all rather indiscriminate in the type of insects they killed and sudden drops in food availability following insecticide treatment were undoubtedly commonplace before the neonicotinoids became so dominant in insect control. On the other hand, systemic insecticides such as the neonicotinoids might be game-changers (Francisco-Bayo et al. 2013). Because of their persistence in plant tissue, there is some evidence that they may affect terrestrial insect populations to a greater extent than non-systemic products. Systemic insecticides can be returned to the soil and remobilised in succession crops. The impacts on terrestrial food chains may therefore be much longer-lived and pernicious than those we have seen with other types of insecticides. Not only can these questions not be answered with the information made available through the registration process – but the questions themselves have not even been considered (save a few comment by EPA scientists on ‘structural and functional changes’ to ecosystems – see section 1.3). Generally speaking, an over-efficient removal of insects in crop fields is seldom seen as a matter of serious concern by regulators – especially in North America. The indirect impacts of pesticides are not considered in registration reviews – whether the US or anywhere else in the world.

In his book, the Dutch toxicologist Henk Tennekes (2010) makes the case that the contamination of surface water by neonicotinoids is so widespread in the Netherlands (and possibly elsewhere in Europe), that loss of insect biomass on a continental scale is behind many of the widespread declines that are being seen, be they of marsh birds, heath or meadow birds or even coastal species. This suggests that we should be looking at possible links between neonicotinoid

insecticides and birds, not on a farm scale, but in the context of whole watersheds and regions. Impacts from the neonicotinoids may very well be further afield than the arable area on which they are used and many of those impacts may be mediated through the aquatic environment. Because aquatic impacts are considered during product registration reviews, it is reasonable to ask whether the potential impact of neonicotinoids to aquatic life has been assessed correctly.

7. How toxic are the neonecotinoids to aquatic life?

In terms of scale of use, clothianidin and the other more recently- registered neonicotinoid insecticides thiamethoxam, acetamiprid and thiacloprid have probably overtaken imidacloprid. Yet, much more is known about imidacloprid, and a lot of the toxicity information being published now features that active ingredient almost exclusively. By necessity, much of this review will emphasize imidacloprid. We suggest (see 7.4) that the other neonicotinoids can be assessed through comparison with imidacloprid.

7.1. Has the toxicity of imidacloprid to aquatic life been properly assessed?

In carrying out a risk assessment, it is customary for regulators to pick a critical toxicity value (or reference level) against which to compare exposure estimates or empirical water residue measurements. Various methods are used, some more scientifically rigorous than others.

In asking whether the USEPA properly assessed the aquatic risks posed by imidacloprid, it may be unfair to go back to the very first registration reviews because, clearly, we know much more about the product now than we did when it was first registered in the mid-1990s. A more recent evaluation of the active ingredient came in 2007 when EPA was considering requests to expand the use of this active ingredient, notably for soybeans, peanuts, kava, millet, oats, artichoke, wild raspberry, and cane berries (USEPA 2007a). At the time, imidacloprid was already registered for a variety of leafy and fruiting vegetables, pome fruits, cotton, potatoes, hops, pecans, cucurbits, citrus, and tobacco, and had been studied extensively.

In this 2007 risk assessment, the EPA stated that "*imidacloprid is categorized as very highly toxic (0.069 - 0.115 ppm) to freshwater invertebrates on an acute basis.*" This was based on two freshwater species tested by the registrant in the early 1990s; the lower value was used to compute risk ratios with predicted exposure levels. By 2007, there were already a host of studies in the open literature showing acute toxicity levels as low as 0.003 ppm (see annex 1). Despite the fact that *Daphnia* had been shown to be a very insensitive species compared to other aquatic invertebrates, this was the only chronic data examined or required by EPA; on that basis, EPA concluded that "*imidacloprid exposure to freshwater invertebrates can potentially result in growth effects at 3.6 ppm.*" The NOEC for that same study was given as 1.6 ppm – a full 23 times higher than acute toxicity levels. Fortunately, when it came time to compute final risk ratios, the EPA scientists abandoned this value in favour of a value of 0.001 ppm obtained through an acute toxicity value and an acute/chronic extrapolation factor.

As luck would have it,[14] the marine invertebrate species that happened to be tested proved to be more sensitive to the pesticide and reference levels were deemed to be lower in the marine

[14] In relying on a handful of test species, it is clear that current regulatory assessments have more to do with a game of chance than with good science.

environment. The 2007 EPA review stated: "*Imidacloprid is very highly toxic to estuarine/marine invertebrates (mysid shrimp) on an acute basis (0.037 ppm)*" and "*chronic exposure of imidacloprid to estuarine/marine invertebrates can result in growth and survival effects (0.0013 ppm)*."

In fact, all of these reference levels are at least an order of magnitude too high (see below) and totally fail to protect the aquatic environment. **This example highlights the problems of blindly adhering to strict review protocols that ignore much of the accumulated scientific evidence and scientific insights available from the open literature in favour of a few outdated studies carried out by the registrant.** By the time risk quotients are calculated by EPA scientists, it is difficult to know how much the selection of specific reference levels has a bearing on registration decisions. Despite the incomplete use of available data by EPA in 2007 and the inherent underestimation of risk, calculated risk quotients for all proposed new uses exceeded EPA's chronic 'level of concern.' Yet, it appears that all new uses were approved for registration.

In December of 2008 (EPA 2008), the EPA launched a re-evaluation of imidacloprid. It is clear from the re-evaluation notice that the emphasis is to be on honeybees. Despite an acknowledgment of imidacloprid's high aquatic toxicity, no requirements are set out for a better characterisation of aquatic risk.

The EU (EFSA 2008) based its final 2008 risk assessment of imidacloprid on the most sensitive of two species tested (*Daphnia magna* and *Chironomus riparius*) as well as on a mesocosm study. The use of mesocosm results sets the EU process apart from that used by EPA. The European regulatory body proceeded to calculate their risk ratios with the following:

- Acute risk: 24 h EC50 of 55.2 ug/l
- Chronic risk: EC5 (emergence) for 28 d exposure of 1.9 ug/L
- Community risk: NOEC of 0.6 ug/l given DT50 of 5.8-13 d in the system studied. The LOEC was 1.5 ug/l but, at this concentration, no recovery was seen at the conclusion of the experiment. The Agency suggested that a safety factor of 1-3 would be appropriate along with the NOEC value cited above, giving an approximate value of 0.2 ug/l on which to compare calculated or empirical water concentrations.

In Canada, the CCME[15] developed non-regulatory water quality guidelines for imidacloprid in 2007. For freshwater bodies, they used the same *Chironomus* emergence study but retained the EC15 (emergence) of 2.25 ug/l to which they applied an arbitrary safety factor of 10. They therefore proposed an interim freshwater protection level of 0.23 ug/l. For the marine environment, they only had acute studies. They retained a 48h LC50 of 13 ug/l for the salt marsh mosquito to which they applied a safety factor of 20 on the grounds that imidacloprid is non-persistent in water[16]. The interim proposed guideline for saltwater environments was therefore set at 0.65 ug/l.

It is more difficult to assess the adequacy of the PMRA's assessment of aquatic risk from imidacloprid. That Agency often does not make its assessments public and the two documents available for imidacloprid (PMRA 1997, 2001) not provide any details.

[15] Canadian Council of Ministers of the Environment. A federal/provincial entity which, among other things, sets proposed (i.e. non-binding and non-regulatory) 'action levels' for concentrations of various chemicals in water in order to protect both human health and the environment.

[16] However, as the main degradation pathway is photolytic, this may not be a safe assumption in all bodies of water; e.g. turbid ones.

It is appropriate to question the continued separation of freshwater and marine endpoints in assessing aquatic toxicity. Maltby et al. (2005) explored the differences between toxicity estimates from distributions generated with data for freshwater and saltwater crustaceans for 10 well characterized insecticides. No significant differences were seen between estimates from these habitats. Even though saltwater species tended to be more sensitive, this was ascribed to the make-up of taxa most represented in the two habitats rather than any fundamental (toxicologically-driven) salt vs. freshwater difference.

7.2. Towards a more scientific approach of assessing toxicity information

A critical failure of existing regulatory evaluation protocols is that they typically look at data generated from a very small number of species. For example, submitted crustacean data may be for *Daphnia* only. By relying on a single indicator species, interspecies differences in susceptibility are not adequately addressed and, as argued above, much is left to chance. This is especially true in the case of pesticides with targeted (receptor-based) modes of action, such as the neonicotinoids. For this review, we opted to consider the ever-growing body of data from the published literature in addition to the few species mandated by regulatory authorities. The disadvantage of using these data is that they may be of varying quality and protocols may not be as standardised as those data mandated by regulatory agencies. (However, most of these studies are published and have therefore gone through a peer-review process which may indeed be more rigorous than regulatory scrutiny.) The advantage is that the published studies more fully represent the range of species likely to be exposed, thus providing a measure of the differences in sensitivity of aquatic organisms at large.

Once these data are assembled, the most credible way of determining a critical toxicity endpoint is through a species sensitivity distribution (see section 2 for an introduction to this topic). Species sensitivity distributions were generated separately for aquatic insects and crustacea and we derived HC5 (hazardous concentration) values, using the ETX 2.0 software (van Vlaargingen et al. 2004).

Data were obtained from regulatory documents as well as the primary literature. It was not always possible to obtain the source information so the study details were not always available. However, even standardised tests can show wide variations in results. This argues for being inclusive when it comes to test results. In assembling data, priority was given to 96h test duration, the lowest of EC50 or LC50 if both were measured, and technical versus formulated material in that order. Geometric means were computed where several equally acceptable values were available. To derive water quality criteria, the U.S EPA (Stephan et al. 1985) recommended the use of EC50 measures based on death or immobilization[17] to better reflect the total severe acute adverse impact of the test material on the test species. Sanchez Bayo and Goka (2006) reported that the effective dose (EC50 – immobilisation) was 100-600X lower than the LC50 (true death) with imidacloprid specifically. They recommended that EC50 values should be used in risk assessment and suggested that the gap between EC50 and LC50 might be greater with neonicotinoids than with other classes of pesticides. Beketov and Liess (2008a) found that with neonicotinoids and other neurotoxic

[17] The distinction can be difficult to make with some organisms. If an organism is sufficiently incapacitated and fails responding when gently prodded, it is to be classified as dead whether or not it is clinically dead.

insecticides, drift of invertebrates[18] was already considerable at water concentrations 1/10 of the LC50.

For reasons outlined in the previous section, marine and freshwater species were considered together.

7.2.1. A quick note on test variability and repeatability

There is a tendency in regulatory circles to become overly preoccupied with the accuracy and precision of any given toxicity test value. This fixation is driven by various factors: risk quotients are derived from very few tests, they may need to be defended in the courts, internal agency guidelines insist on stringent test conditions and therefore expect perfect repeatability etc. In reality, whether dealing with aquatic invertebrates or warm-blooded vertebrates, experience shows us that there could be significant test-to-test variation, even when those tests are conducted under carefully standardised conditions.

As an example, Table 7.1 illustrates the various test results obtained for 48h static or static renewal acute tests with imidacloprid and *Daphnia magna,* the best known and best characterised aquatic test species.

Table 7.1. Toxicity test results for 48h EC50 and LC50 values for Daphnia magna exposed to imidacloprid. TECH refers to technical material; FORM to a formulated end product. All toxicity values are given in ug/l of active substance.

Form of the a.i.	Measure	Toxicity (ug/l)	CL	Probit slope	Source	Reference	Comments
TECH	LC50	10,440	6,970-17,710	1.86	Original publication	Song et al. 1997	Test at 27 degrees C
TECH	LC50	17,360	12,510-30,050	1.86	Original publication	Song et al. 1997	Test at 20 degrees C
FORM	LC50	30,000	28,000-44,000		Original publication	Tisler et al. 2009	
FORM	EC50 (immobility)	43,265	34,302-53,592		Original publication	Hayasaka et al. 2012	
TECH	LC50	56,600	34,400-77,200		Original publication	Tisler et al. 2009	
TECH	LC50	64,873			Original publication	Sanchez-Bayo 2009	

[18] Defined as the organisms being sufficiently impaired to detach from the substrate and be carried downstream by the current. The removal of aquatic life from stretches of a stream represents an ecologically undesirable effect.

TECH	EC50 (immobility)	85,200	75,000-113,000	11	One liner 2004, 2007; Pesticide Manual, EPA 2007 assessment	Young 1990 (Bayer)	
TECH	EC50	>32,000			Agritox	Bayer France	

Based on these data, 10X differences within species should not be surprising. This level of variation also underscores the importance of obtaining multiple tests on multiple species in order to derive a credible critical toxicity threshold for environmental protection.

7.2.2. Other factors influencing sensitivity of organisms

Life stage

Yokoyama and colleagues (2009) showed that sensitivity could vary greatly between different larval instars[19] of the same species with younger instars tending to be more sensitive, possibly because of greater surface to mass ratios. For example, sensitivity of the caddis fly *Cheumatopsyche brevilineata* to imidacloprid dropped by 5.1-5.7 fold as the larvae matured from first to fifth instar. Interestingly, these authors showed that for an organophosphorous and carbamate insecticide, individuals from cleaner urban streams were much more sensitive than those taken from agricultural areas. This did not hold true for imidacloprid however.

Technical vs. formulated insecticide

The technical product is the pure form of a pesticide synthesised by the registrant. Because it is synthesized under industrial conditions, its level of purity typically approaches 95-99%. The pesticide purchased by the consumer contains the active ingredient to which has been added: solvents, emulsifiers, chemicals to help the droplets stick to or penetrate plant surfaces, etc. This final (formulated) product typically contains 40-80% active ingredient – but this can sometimes be much lower. The formulants are often called 'inerts' but they are often nothing of the sort toxicologically. There are enough comparable test data with imidacloprid to provide a comparison of technical vs. formulated material (Table 7.2).

Table 7.2. A comparison of acute toxicity values for technical and formulated imidacloprid. All values corrected to ug/l in active ingredient.

Species	Endpoint	Value for technical material (ug/l)	Value for formulated material (ug/l)	Reference
Americamysis bahia	96h LC50	38	159	EPA One liner
Daphnia magna	24h LC50	97,900	38,000	Tisler et al. 2009
Daphnia magna	48h LC50	56,600	30,000	Tisler et al. 2009
Hyalella azteca	96h LC50	65.4	9.7/17.4	Stoughton et al. 2008
Chironomus tentans	96h LC50	5.4	5.75	Stoughton et al. 2008

[19] An insect's period of postembryonic growth between molts.

On that basis, we feel justified in pooling data from both technical and formulated material in the same distributions (see below).

Temperature
Song and colleagues obtained almost identical values for 48h LC50 values with *Aedes aegypti* at either 20 or 27 degrees C. This does not argue for strong temperature-dependence as is the case for pyrethroid insecticides for example. On the other hand, Mohr and colleagues (2012) obtained more pronounced effects on an assemblage of benthic species from imidacloprid pulses in their summer applications which they attributed to higher water temperatures.

Light
Because photolysis is the main mode of degradation for imidacloprid, the amount of illumination provided during testing is expected to be critical to the results. Because water clarity is variable in nature, the extrapolation from lab to field will be very difficult as a result. Light levels are seldom reported in the test data. For this reason, the Dutch government (RIVM 2008) in its assessment of imidacloprid toxicity rejected all tests conducted in the light unless concentrations were empirically verified. Sanchez-Bayo and Goka (2006) found that values obtained in the dark could be two-fold lower than values obtained in the light. This is not that great a difference given some of the information shown above on repeat testing. Therefore, we chose not to restrict data in the same way. Because we were not as strict with the test data, some of the studies may have underestimated the toxicity of imidacloprid compared to what it could be in turbid or strongly coloured water.

Season
Season was found to be one of the most important factors affecting the toxicity of imidacloprid to the amphipod *Gammarus roselli* (Bottger et al. 2012). Depending on test conditions, the 96h EC50 varied from 1.9 to 129 ug/l. Small hungry individuals in the spring were found to be the most sensitive and tests manipulated to mimic those conditions gave results that best approximated what was observed in the field.

7.3. Deriving HC5 values for imidacloprid

The ETx software was used to determine the HC5 or hazardous concentration based on available acute and chronic toxicity data.

7.3.1. Acute data

All aquatic toxicity data are given in appendix 1. The following tables summarise the data entered into the calculation of HD5 values.

Table 7.2. Imidacloprid. Summary of acute toxicity values in ug/l for crustacean species.

Taxonomic_SD	Study Time (h)	FORM	Measure	Toxicity SD_ppb
Ceriodaphnia dubia*	48	FORM	LC50	2.07
Cypridopsis vidua	48	TECH	EC50	3

Ilyocypris dentifera	48	TECH	EC50	3
Cypretta seurati	48	TECH	EC50	16
Gammarus roselli	96	UNKNOWN	EC50	29
Americamysis bahia	96	FORM	LC50	36
Hyalella azteca	96	TECH	LC50	65
Gammarus pulex	96	TECH	LC50	350
Palaemonetes pugio	96	TECH	LC50	417
Ceriodaphnia dubia*	48	FORM	EC50	572
Gammarus fossarum	48	FORM	LC50	800
Chydorus sphaericus	48	TECH	EC50	832
Ceriodaphnia reticulata	48	FORM	EC50	5553
Asellus aquaticus	48	FORM	LC50	8500
Daphnia magna	48	TECH	EC50/LC50	35539
Daphnia pulex	48	FORM	EC50	36872
Moina macrocopa	48	FORM	EC50	45271
Artemia sp.	48	TECH	LC50	361230

*Both values for Ceriodaphnia were kept because of their wide divergence and the apparent validity of both independent tests performed on different continents.

The wide inter-species range in recorded toxicity with imidacloprid is notable. Mayer and Ellerseck (1986) looked at in-house acute toxicity tests for 82 pesticides and chemicals. In all test species confounded, the average ratio between the lowest and highest LC/EC50 was 256X (868X for insecticides only). The highest recorded spread was 166,000X for an insecticide. The ratio for imidacloprid values is greater than 174,000X. Also remarkable is the low sensitivity of the cladoceran *Daphnia magna*. This is the most common test species on which much of the aquatic risk assessment is usually based. There is evidence that cladocera as a group are insensitive to neonicotinoid insecticides (Hayasaka et al. 2012) although there is an alternate study which found the cladoceran *Ceriodphnia dubia* to be among the most sensitive species tested (Chen et al. 2009).

Table 7.3. Imidacloprid. Summary of acute toxicity values in ug/l for aquatic insect species.

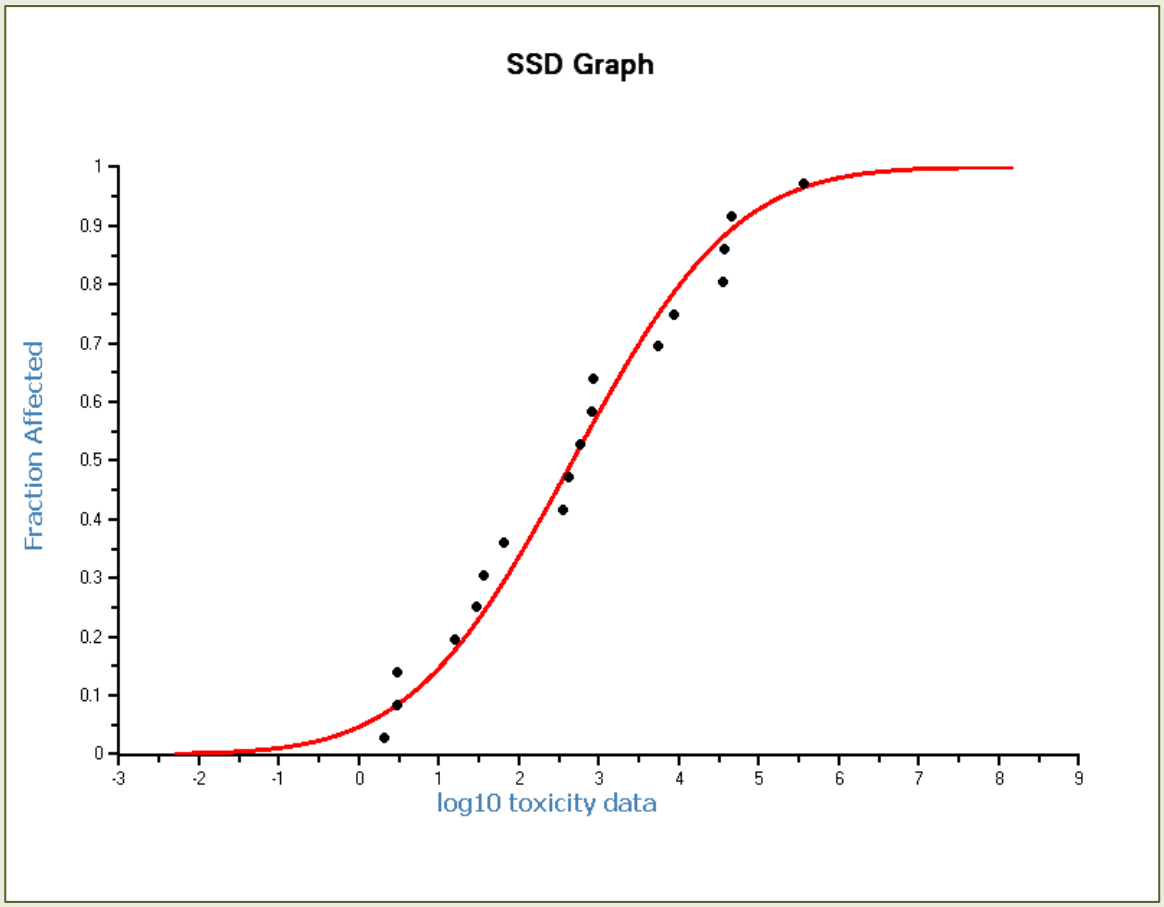
FORM_SD	Taxonomic_SD	Study Time (Value)	Study time (Unit)	Measure	Toxicity SD_ppb
FORM	Epeorus longimanus	96	h	LC50	0.65
FORM	Chironomus dilutus	96	h	EC50	2.65
FORM	“Heptageniid mayfly”	96	h	LC50	3.7

TECH	Simulium latigonium	96	h	LC50	3.73
TECH	Cheumatopsyche brevilineata	48	h	LC50	6.59
TECH	Chironomus tentans	96	h	LC50	7.8
TECH	Simulium vittatum	48	h	LC50	8.09
TECH	Baetis rhodani	48	h	LC50	8.49
FORM	Chironomus riparius	96	h	EC50	12.9
TECH	Aedes taeniorhynchus	48	h	LC50	13
TECH	Aedes aegypti	48	h	LC50	44

A species sensitivity distribution based on the normally distributed acute data returns an HC5 of 1.01 ug/l for crustacea (0.06-6.8) and an almost identical 1.02 ug/l for aquatic insects (0.31-2.06). Despite the overlap, the insects appear to have a much lower sensitivity variance – i.e. more similarity in response. A pulse of imidacloprid in the ug/l range would therefore be expected to affect a larger proportion of the insect community.

Dragonfly on wheat by Jim Occi, BugPics, Bugwood.org

The following figure illustrates the species sensitivity distribution for imidacloprid and crustacean species.



For the combined dataset of aquatic insects and crustacea, the calculated HC5 is 0.22 (0.03-1.0). However, the data do not fulfill the condition of normality; forcing a normal distribution[20] may not be the best way to proceed. Using slightly different methods which involve collapsing data within genera before applying a species sensitivity distribution, Nagai and colleagues (2012) arrived at a similar value with an HC5 of 0.43 ug/l.

7.3.2. Chronic data

There are enough chronic toxicity data for imidacloprid to run a species sensitivity distribution (Table 7.4). Although they address slightly different endpoints, most deal with survival and reproduction over a 21-28 day period. The HC5 for NOEC values is calculated to be 0.029 (0.00038-0.28).

Table 7.4. Imidacloprid. Available chronic data for aquatic invertebrate species.

Form of the pesticide	Taxon	Species	Study Time (d)	Expo-sure type*	Measure	Value ug/l	Source	Reference
	Crustacea	Mysidopsis bahia	28		EC50 (body length)	0.3	Stoughton et al. 2008	Cox 2001 and Felsot & Ruppert 2002

[20] A normal distribution is a continuous probability density function symmetrical around a mean of 0 and with a standard deviation of 1. It is the 'standard bell curve' often used to characterise a variable subject to random influences.

TECH	Crustacea	Americamysis bahia			NOEC (growth and survival)	0.6	EPA 2007 assessment	Ward 1990 (Bayer)
TECH	microcosm	Chironomidae and Batidae		S, S	NOEC	0.6	EFSA 2008 Scientific report	
TECH	Insecta	Chironomus tentans	28		EC50 (emergence)	0.91	Original publication	Stoughton et al. 2008
TECH	Insecta	Chironomus riparius	28	S	EC50 (emergence)	3.11	EFSA 2008 Scientific report	
FORM	Crustacea	Hyalella azteca	28	SR	LC50	7.08	Original publication	Stoughton et al. 2008
TECH	Crustacea	Gammarus pulex	28	S	NOEC (swimming behavior)	64	Draft assessment report from Germany (Rapporteur State) 2005	
TECH	Crustacea	Daphnia magna	21	SR	NOEC (repro)	1800	EPA 2007 assessment EFSA 2008 Scientific Report	Young 1990 (Bayer)

* S = Static; SR = Static with renewal; S,S = 2 applications at 21 d interval.

Another way to approach the problem is to consider the acute-chronic ratio for the compound and apply this to the appropriate acute toxicity endpoint. This is scientifically much more credible than accepting a chronic toxicity endpoint that is much higher than most acute toxicity endpoints merely because it was determined for a species that happened to be insensitive.

There are four species for which we can derive an acute-chronic ratio. This ratio is lower in the crustacea - 2.5 in *Hyalella* and 5.5 in *Gammarus* but much higher in the two *Chironomus* species studied to date – 17.7 and 75.8. The latter values, applied to the most sensitive insect species tested to date (*Epeorus*) would return a chronic toxicity value of 0.0086 ug/l (using a factor of 75.8) to 0.037 ug/l (using a factor of 17.7).

It is clear that a more credible consideration of all the species toxicity information collected to date suggests that the toxicity of imidacloprid to aquatic invertebrates has been greatly underestimated by EPA (summary in tables 7.5 and 7.6). Effects on aquatic invertebrates are likely to be substantial indeed at sub ppb levels of water contamination. Sanchez-Bayo and Goka (2006) reported that, in rice mesocosms, all zooplankton species were eliminated as long as water concentrations remained above 1 ug/l.

Table 7.5. A summary of reference concentrations (in chronological order) for acute (peak) exposure of imidacloprid in freshwater environments.

Source	Reference level against which exposure concentrations are to be	Justification

	compared for freshwater environments (ug/l)	
EPA (2007) (US)	35	Lowest of three tests examined – to which a factor of 2 has been applied in keeping with the 0.5 LOC (Level of Concern) for a risk quotient
EFSA (2008) (Europe)	0.55	Lower of two species tested to which factor of 100 has been applied in keeping with Annex VI triggers for the Toxicity/Exposure Ratio.
RIVM (2008) (Netherlands – non regulatory)	0.2	Maximum acceptable concentration from short term exposure or exposure peaks – based on mesocosm study and 3X safety factor
Nagai et al. 2012	0.43	HC5 but with SSD methodology which combines species within the same genus – also with 50% confidence
EPA (2012)* (US – non regulatory)	35	Aquatic life benchmark – presumably same methodology as regulatory review
This report	1.01	HC5 (with 50% confidence) for acute exposure in crustacea
This report	1.02	HC5 (with 50% confidence) for acute exposure in insects
This report	0.22	HC5 (with 50% confidence) for acute exposure in all aquatic invertebrates (ignoring lack of normality)

* http://www.epa.gov/oppefed1/ecorisk_ders/aquatic_life_benchmark.
Htm. Accessed December 2012.

Table 7.6. A summary of critical toxicity levels for aquatic invertebrates exposed to chronic (3-4 week) exposures to imidacloprid.

Source	Reference level against which averaged exposure concentrations are to be compared for freshwater environments (ug/l)	Justification
EPA (2007) (US)	0.5	Obtained with an acute/chronic ratio and applying a factor of 2 for the usual LOC. (Using the usual chronic NOAEC for Daphnia would have meant accepting a value of 800 – much higher than the acute value)
CCME (2007) (Canada – non regulatory)	0.23	EC15 for the most sensitive of two freshwater species tested chronically to which a factor of 10 has been applied
EFSA (2008) (Europe)	0.2 – 0.6	NOEC from microcosm study (same study used for deriving an acute criterion in the Netherlands) to which a 1-3 safety factor has been applied based on expert deliberations
RIVM (2008) (Netherlands – non regulatory)	0.067	Maximum permissible concentration for long term exposure derived from lowest NOAEC value and factor of 10. This replaces an older value of 0.013 ug/l.
EPA (2012)* (US – non regulatory)	1.05	Aquatic life benchmark – methodology uncertain
This report	0.029	Distribution analysis of NOECs for chronic studies on 7 single species and one species assemblage.
This report	0.0086	The higher of two empirically-determined acute-chronic ratios for insects applied to the most sensitive insect species of 8 tested to date

* http://www.epa.gov/oppefed1/ecorisk_ders/aquatic_life_benchmark.
Htm. Accessed December 2012.

Based on our assessment as well as that of various jurisdictions around the world, it is clear that the US EPA has underestimated the toxicity of imidacloprid to aquatic invertebrates by over an order of magnitude. Severe impacts to aquatic environments are expected from short term (pulse) exposures as low as 0.2 ug/l (ppb) and chronic exposures to concentrations at least 10 times lower.

7.4. Deriving critical water concentrations with other neonicotinoid insecticides

Only two other neonicotinoid insecticides have a sufficient amount of data to fit to a distribution (annex 1) – but then only by pooling all invertebrates (crustacea and insecta).

Tables 7.7 and 7.8 provide the data entered into ETx to derive an HC5 value. Thiamethoxam is at the limit of credibility given the small sample size and the fact that one of the values is a limit value. Nevertheless, we believe that this is a more reasonable approach than simply basing a critical concentration on one or two standard species as is currently the case (especially when the main test species is known to be insensitive).

Table 7.7. Thiamethoxam acute toxicity data for aquatic invertebrates.
TECH = technical material. See annex 1 for details.

Taxon	Species	Study Time (h)	Form	Measure	Toxicity (ug/l)
Crustacea	Daphnia magna	48	TECH	EC50	>106000*
Crustacea	Chaoborus sp.	48	TECH	EC50	180
Crustacea	Americamysis bahia	96	TECH	EC50	5400
Insecta	Cloeon sp.	48	TECH	EC50	14
Insecta	Chironomus riparius	96(?)	TECH	EC50	35

* Value entered as such regardless of >

Table 7.8. Thiacloprid acute toxicity data for aquatic invertebrates.
FORM = formulated material; ANALYTICAL = analytical grade material. See annex 1 for details.

Taxon	Species	Study Time (h)	Form	Measure	Toxicity (ug/l)
Crustacea	Daphnia magna	24	FORM	LC50	4100
Crustacea	Asellus aquaticus	24	FORM	LC50	153
Crustacea	Gammarus	24	FORM	LC50	190

	pulex				
Insecta	Sympetrum striolatum	24	FORM	LC50	31.19
Insecta	Notidobia ciliaris	24	FORM	LC50	6.78
Insecta	Simulium latigonium	24	FORM	LC50	5.47
Insecta	Culex pipiens	24	FORM	LC50	5.76
Crustacea	Gammarus pulex	96	ANALYTICAL	LC50	350
Insecta	Baetis rhodani	96	ANALYTICAL	LC50	4.6

HC5 (with 50% confidence) values are estimated as 0.74 and 0.80 ug/l for thiamethoxam and thiacloprid respectively. With their own data (7 species tested), Beketov and Liess (2008b) had determined an HC5 value of 0.72 ug/l. Given the small number of species tested, this certainly places these compounds in the same general range as imidacloprid.

Rather than attempt to derive unique values for the other compounds that are based on very little data, we propose a comparative approach; i.e. how do the various neonicotinoids compare to imidacloprid where comparable data exist. Table 7.9 provides data where species, formulation and test duration were a reasonable match.

Table 7.9. Comparison of neonicotinoid acute toxicity to aquatic invertebrates. Crustacea in normal type, insect species are in bold. All data derived with technical material unless otherwise stated. All times as indicated in table unless otherwise specified. IMI = Imidacloprid, ACE = Acetamiprid, THC = Thiacloprid, CLO = Clothianidin, THM = Thiamethoxam, DIN = Dinotefuran.

Species	Study Time (h)	End-point	IMI (ug/l)	ACE (ug/l)	THC (ug/l)	CLO (ug/l)	THM (ug/l)	DIN (ug/l)
Daphnia magna	48	EC50	35,539	49,800	43,777	109,523	>106,000	1,000,000
Americamysis bahia	96	LC50	36	66	31	51	6900	790
Gammarus pulex	96	LC50	350	50	350			
Asellus aquaticus	48	LC50	8500*		153* **			
Hyalella azteca	96	LC50	65		37			
Chironomus riparius	48	EC50	20*			22	35	
Simulium latigonium	96	LC50	3.7	3.7	5.5* **			

Baetis rhodani	48	LC50	8.5		4.6***			

* formulated
** 24h
*** 96h

The table highlights more similarities than differences between the active ingredients. Whereas clothianidin and thiamethoxam appear at first blush to be less toxic to crustacea, the *Chironomus* data suggest that they are equally toxic to nontarget aquatic insects. Acetamiprid and thiacloprid appear to be very similar to imidacloprid. There isn't enough information for dinotefuran to say one way or the other. From the point of view of protecting aquatic communities, we suggest that the critical values derived in section 7.3 for the protection of aquatic ecosystems against imidacloprid could easily apply to all other neonicotinoids. Indeed, because of the similarity in mode of action, we suggest that the critical concentration values derived for imidacloprid should be applied to the sum of all neonicotinoid residues.

We believe that the above is a more credible approach than relying on a few aberrant data points as the EPA has done repeatedly. For example, in their 2003 assessment of clothianidin for corn and canola seed treatments (US EPA 2003) the agency used an NOAEC of 42 ug/l based on the chronic life cycle test in daphnia for the protection of fresh water environments. This is despite the fact that by the time of the 2003 review, Daphnia had been shown to be comparatively insensitive to both imidacloprid and clothianidin; we now know this insensitivity extends to all neonicotinoids. The 42 ug/l value for chronic exposure retained by EPA in 2003 is actually higher than the 22 ug/l value that was retained for acute effects. If nothing else, a chronic reference level that is twice as high as the acute reference level in the same receiving waters should have rung a few alarm bells. **Once again, this leads one to conclude that EPA's approach to the assessment of aquatic risk is scientifically unsound and places aquatic environments at risk.**

In the Netherlands, Van Dijk (2010) reports that chronic reference values were set independently by the government for each of the neonicotinoids: 0.025 ug/l for thiacloprid, 1 ug/l for thiamethoxam, 14 ug/l for clothianidin and, the older value of 0.013 ug/l for imidacloprid set in 2007 but reviewed upwards in 2008 (table 7.6). We question whether the data are sufficient to ascribe a different aquatic toxicity to each of these active ingredients.

7.4.1. Degradates or metabolites

Most of the neonicotinoid insecticides have complex degradation pathways in soil or in receiving waters. There are a few cases where this degradation needs to be taken into account when assessing the full toxicity of the active ingredient in the environment. The most obvious example is the production of clothianidin as a major degradation product of thiamethoxam. The higher aquatic toxicity of the TZNG metabolite of clothianidin also needs to be considered[21] as well as that of the NOA407475 metabolite of thiamethoxam (Annex 1). Even when of equal or lesser toxicity than the parent material, metabolites must be considered because they may prolong the toxicity profile of the insecticide.

[21] Acute toxicity to Daphnia magna is given as 640 ug/l relative to approx. 110,000 ug/l for the parent material.

7.5. Concerns that 'standard approaches' to risk assessment are not adequate for neonicotinoid insecticides.

As seen above, the US EPA and, to a lesser extent, other regulatory bodies have grossly underestimated the toxicity of neonicotinoids to aquatic environments. Critical concentrations at which effects are expected are much lower than currently assumed by regulators. However, there is even more reason to be concerned about these compounds in the aquatic environment.

Sanchez-Bayo and Goka (2007) and Sanchez-Bayo (2009) argued, as have some before them[22] that the conventional method of assessing toxicity at fixed exposure times makes it difficult to extrapolate to exposures of different duration – whether shorter pulse exposures or prolonged exposures resulting from compound persistence. Using imidacloprid specifically, Sanchez-Bayo showed that a 48h LC50 of 390 ug/l for the ostracod *Cypridopsis* dropped 100 fold to 4 ug/l after a 5 day exposure period. This time dependence is not unique to neonicotinoids. However, the more toxicity is shown to be a function of time (keeping concentration equal), the more it can be argued that the compound is having an irreversible mode of action. This argument was made by Tennekes (2010) who likened the toxicity of neonicotinoid insecticides to a 'one hit' model of chemical carcinogenesis. Tennekes went on to describe how neonicotinoids closely follow Haber's rule which states that the product of exposure concentration and duration is a constant. In theory, this means that an infinitesimally small dose can result in a toxic effect provided duration of exposure is sufficient. He argued that the toxicity of neonicotinoids to both bees and aquatic organisms showed this characteristic. These insecticides bind almost irreversibly to invertebrate cholinergic receptors – which incidentally makes them very powerful insecticides and helps explain why their use has increased so dramatically over time. Despite Bayer Corporation's protestations that the mode of action of imidacloprid is not irreversible (Maus and Nauen 2011), Tennekes (2011) counter-argued successfully that evidence to date shows otherwise (despite minor deviations, the insecticide is dangerously close to showing irreversible activity) and even used some of Bayer Corporations' earlier reports on imidacloprid's mode of action to make his point.

Of course, what is of interest is the internal (i.e. at the receptor level) exposure rather than the external (i.e. test medium) exposure. **Possibly the most troublesome piece of evidence on neonicotinoid insecticides to date is that of Beketov and Liess (2008b) studying the toxicity of thiacloprid to several aquatic invertebrate species. What they reported is that the apparent LC50 to various test species dropped dramatically merely by extending the post-exposure observation period. The most extreme example of delayed mortality was for Gammarus pulex where the calculated LC50 was 50X lower after observing the exposed individuals for 17d even though exposure in all cases was for 24h only.** Similarly, Stoughton et al. (2008) compared a 96h pulse of imidacloprid with a prolonged observation period in clean water with a continuous 28d exposure. The 96h pulse was intended to mimic a realistic runoff scenario. The calculated NOAEC was identical under both exposure scenarios in one of the two species tested (the amphipod *Hyaella azteca*); continuous exposure proved more damaging for the midge *Chriromus tentans*.

These types of observation do lend credence to Tennekes's comment on irreversibility of action and increase our concern with exposure to the neonicotinoids even if those are pulse exposures. There

[22] These authors provide a good review of time-dependent approaches to toxicity estimation and references going back to the 1930s.

has been at least another effort to look at the effect of a pulsed neonicotinoid exposure. Mohr and colleagues (2012) exposed stream mesocosms to weekly imidacloprid pulses of 12 ug/l. The most sensitive species in the system was affected following the first pulse whereas effects on other taxa were more gradual and increasingly evident after 2 or 3 pulses. Pond mesocosms have effect levels that are much lower than this but the authors argued that effect concentrations are not that dissimilar once a time weighted concentration approach is used in the case of the pulse exposure.

Tennekes and Sanchez-Bayo finally collaborated in 2011 to reiterate the points made above and argued that neonicotinoids are far more dangerous than other insecticides of higher toxicity. This is a key point because the neonicotinoids have replaced insecticides (such as synthetic pyrethroids) of very high aquatic toxicity (see section 7.5.1.).

7.5.1. A quick comparison of the toxicity of neonicotinoids and older insecticides to aquatic ecosystems

Whiteside and colleagues (2008) compared the toxicity of all insecticides registered at the time in Canada to aquatic environments. They ran all products through a simplified runoff model assuming maximum label rates and a standard application scenario, and assessed the acute risk of registered products to fish, crustacea, insects and plants through a 'weighted community score.' They weighted fish more heavily than invertebrates and invertebrates more heavily than algae – reflecting the ease with which these ecosystem components could be replaced if lost. Because the toxicity of neonicotinoids to fish is quite low compared to either pyrethroid or organophosphorous insecticides, the neonicotinoids fared quite well when compared to a number of older insecticides they have replaced (Table 7.10).

Table 7.10. Comparison of aquatic toxicity and relative aquatic community risk (after Whiteside et al. 2008) of neonicotinoid insecticides and several of the insecticides they have replaced.

Active ingredient	Fish HC5	Crustacea HC5	Aquatic insect HC5	Weighted community risk score
tefluthrin	0.0101	0.000961		8700
dimethoate	12.6	0.010	14.7	2900
methamidophos	16100	0.0196		660
diazinon	56.9	0.191	2.98	380
chlorpyrifos	0.966	0.05	0.350	200
carbofuran	72.3	18.0	1.01	98
terbufos	1.41	0.180	1.40	40
deltamethrin	0.254	0.00147	0.0122	8.3
imidacloprid	16000	0.704 (1.01*)	1.40 (1.02*)	4.4
malathion	48.2	0.417	3.30	4.4
methomyl	610	14.3	6.23	4.4
acetamiprid	10600	28.7		0.08
clothianidin	10500	38.9		0.03
carbathiin	232	1090		0.01
thiamethoxam	10900	427		0.00
thiacloprid				NA

* Updated value based on this report

Again, this comparison may be misleading if the chronic risk of neonicotinoids is different, whether for reasons invoked by Tennekes and Sanchez-Bayo above – or because of exposure characteristics. Exposure will be reviewed briefly below. Care must therefore be exercised before concluding (as have some authors – e.g. Barbee and Stout 2009) that the neonicotinoids are an improvement over older classes of insecticides. **Whereas neonicotinoids are clearly less acutely toxic to fish than many other insecticides, we might expect fish to be affected indirectly though efficient and prolonged removal of aquatic invertebrates.**

7.5.2. Sublethal and delayed effects of neonicotinoids

All pesticides have the potential to cause effects at doses that are not immediately lethal. However, there is some evidence that neonicotinoids are more of an issue here than other registered pesticides. The issue of disorientation of honeybees at extremely low exposure levels suggests that their mode of action (i.e. the quasi-irreversible binding of neonicotinic synapses) causes behavioural effects. Alexander et al. (2007) showed that short (12h) exposure pulses of 1 ug/l and higher caused feeding inhibition in mayflies. Even pulse exposures as low as 0.1 ug/l affected the size of the adults at emergence (Alexander et al. 2008). Englert and colleagues found that predator-prey interactions and leaf litter breakdown were affected at concentrations of thiacloprid between 0.5 and 1 ug/l in a simple laboratory ecosystem. Pestano et al. (2009) found effects on respiration in chironomids an order of magnitude below lethal levels.

7.5. Will exposure levels be high enough to cause problems in aquatic environments?

7.5.1. The regulatory view

In its earliest review of imidacloprid (USEPA 1994b), the Agency reviewers already had concluded that the chemical's mobility, solubility and persistence were a concern for groundwater contamination and aquatic systems. This concern was echoed in most if not all reviews carried out since that time; e.g. "*EFED has concluded that the available data on imidacloprid shows that the compound is mobile and persistent, has potential to leach to ground water, and also presents concerns for transport to surface water via runoff. In addition to the persistence issue, EFED also has a concern for imidacloprid residual carry-over to other crops after the previous year's application*." (USEPA 2007a)

In Canada, imidacloprid was first registered in 1995 although a number of data gaps existed at the time. The PMRA updated its review in 2001 (PMRA 2001). Their review determined that "*imidacloprid is classified as persistent under agricultural field crop conditions according to the classification scheme of Goring et al. (1975), with a DT50 in soil in the order of 1-2 years.*" They went on to compare imidacloprid to atrazine, a problematic well known aquatic contaminant, the latter having a much shorter 'official' DT50 of 120 days. The PMRA also acknowledged the high probability of both surface and groundwater contamination with imidacloprid.

Given some of the data presented below, it appears that regulatory agencies in Canada, the US, and EU were absolutely correct in their early assessment. Yet they proceeded to allow a multitude of labeled registrations under varied agronomic conditions. In 2001, the PMRA stated that they were willing to entertain label extensions provided these new uses were "*in low environmental risk situations or critical need uses in the context of sustainable pest management programs and where*

mitigative measures can be incorporated into product labelling." Unfortunately, imidacloprid is still registered for a wide range of field, horticultural and orchard crops.
In their latest re-evaluation of imidacloprid (EFSA 2008), European Regulators appeared to be trying to 'bend over backwards' to make the compound pass their aquatic triggers. Even after the application of draconian mitigation steps in the water modeling work (e.g. reducing drift by 95%) they were unable to make common uses of the insecticide (e.g. tomatoes) not trigger their criteria for concern. As discussed above, the situation would be worse still if they adopted more realistic toxicity reference levels.

The situation is largely repeated with clothianidin, and to a lesser extent thiamethoxam (see section 1). Regulators fully expected these compounds to have an impact on the aquatic environment.

7.5.2. Empirical data to date

A review of data on groundwater contamination is beyond our scope; however, as of 1997, Bayer was already reporting concentrations of imidacloprid as high as 1 ug/l in California groundwater (Bacey 2003). USEPA (2008a) reported detections ranging from 0.2 to 7 ug/l in New York State. In Quebec, samples from wells in potato-growing areas were reporting levels as high as 6.4 ug/l and detections in 35% of 28 wells sampled (Giroux 2003). Detection of three imidacloprid metabolites was also reported. Data are sparser and just emerging with the other neonicotinoids. Huseth and Groves (2013) reported contamination with thiamethoxam in Wisconsin wells in 2008 and 2009. The levels ranged as high as 9 ug/l with several wells having values above 1 ug/l. **These are levels at which we would expect <u>acute</u> effects on aquatic invertebrates -- this may be totally unprecedented in the history of pesticide registration to have groundwater samples show such a high biological activity to aquatic systems.**

There isn't much empirical data for surface water monitoring for the neonicotinoids. The most comprehensive effort is the recently published data by Starner and Goh (2012) who reported on imidacloprid alone in three irrigated agricultural regions of California (Imperial Valley, Salinas and Santa Maria). They sampled 23 rivers, small creeks or drains. The data are reproduced below (Table 7.11) by sampling site (the original publication listed residues by date). Based on crops grown in the areas, the authors believe that most of the contamination is from the production of lettuce and, to a lesser extent, cole crops and wine grapes.

Table 7.11. Imidacloprid water monitoring results from agricultural watersheds in California (Starner and Goh 2012).

Date	Site	Time	Imidacloprid conc. (ug/L)	Max. for site (ug/l)
May-17-10	27-7	11:45:00	1.02	
June-07-10	27-7	11:45:00	0.544	
April-25-11	27-7	11:45:00	0.581	
June-13-11	27-7	12:00:00	2.09	
July-19-11	27-7	10:15:00	0.157	2.09
May-17-10	27-8	12:30:00	0.443	

June-07-10	27-8	12:30:00	0.626	
April-25-11	27-8	12:15:00	0.372	
May-16-11	27-8	12:10:00	0.787	
June-13-11	27-8	12:45:00	0.44	
July-19-11	27-8	11:00:00	0.635	
August-30-11	27-8	12:00:00	0.35	0.787
April-26-11	27-9	13:30:00	ND	ND
October-05-10	13-10	13:00:00	0.353	
October-11-10	13-10	15:00:00	0.301	0.353
May-17-10	27-10	13:50:00	1.03	
June-07-10	27-10	13:45:00	1.24	
April-25-11	27-10	13:45:00	3.05	
May-16-11	27-10	13:30:00	2.06	
June-13-11	27-10	14:00:00	0.57	
August-30-11	27-10	13:15:00	1.3	3.05
April-26-11	27-11	12:15:00	0.272	
June-14-11	27-11	7:30:00	0.2	
July-19-11	27-11	8:20:00	0.114	
August-30-11	27-11	14:15:00	0.13	0.272
October-05-10	13-22	11:30:00	0.133	
October-11-11	13-22	12:45:00	0.262	0.262
October-11-11	13-23	13:30:00	3.29	3.29
October-11-11	13-24	17:00:00	0.241	0.241
October-05-10	13-25	10:45:00	0.08	
October-11-11	13-25	11:15:00	0.114	0.114
October-05-10	13-56	12:20:00	0.276	0.276
October-11-11	13-56	14:15:00	0.269	
October-05-10	13-69	9:45:00	0.602	
October-11-11	13-69	10:25:00	0.789	0.789
October-11-11	13-71	9:40:00	0.559	0.559
October-11-11	13-73	12:00:00	ND	ND
April-26-11	27-13	14:00:00	ND	ND
May-17-10	27-14	15:50:00	ND	
April-25-11	27-14	15:30:00	ND	
May-16-11	27-14	15:30:00	0.05	
June-13-11	27-14	15:45:00	ND	
July-19-11	27-14	14:20:00	ND	
August-30-11	27-14	15:45:00	ND	0.05
June-14-11	27-50	10:40:00	0.167	0.167
May-17-10	27-66	14:45:00	0.223	
June-07-10	27-66	14:30:00	0.647	
April-25-11	27-66	14:30:00	0.418	
May-16-11	27-66	15:00:00	0.488	

June-13-11	27-66	15:00:00	0.334	
June-14-11	27-66	13:15:00	0.203	
July-18-11	27-66	12:20:00	0.178	
August-30-11	27-66	15:15:00	0.162	0.647
May-17-10	27-70	13:00:00	0.489	
June-07-10	27-70	13:00:00	0.924	
April-25-11	27-70	13:00:00	2.09	
May-16-11	27-70	12:45:00	1.79	
June-13-11	27-70	13:20:00	0.48	
July-19-11	27-70	11:55:00	1.03	
August-30-11	27-70	12:30:00	0.45	2.09
June-08-10	40-13	15:15:00	0.544	
August-31-11	40-13	13:45:00	0.578	0.578
June-08-10	42-48	13:00:00	0.723	
August-31-11	42-48	12:00:00	1.24	1.24
June-08-10	42-49	13:40:00	0.168	0.168
June-08-10	42-50	12:15:00	0.938	
June-08-10	42-50	14:15:00	0.876	
May-17-11	42-50	10:45:00	1.11	
May-17-11	42-50	11:45:00	1.18	
May-17-11	42-50	12:45:00	1.38	
May-17-11	42-50	13:45:00	1.26	
May-17-11	42-50	14:15:00	1.21	
August-31-11	42-50	11:10:00	0.984	
August-31-11	42-50	12:30:00	0.842	
August-31-11	42-50	14:20:00	0.878	1.38

Most of the samples are above any reasonably set reference level for acute effects and at least an order of magnitude higher than a chronic effect level (see tables 7.5 and 7.6). **Yet, most remarkable is the fact that on sites where multiple samples were taken, concentrations remain consistently high and often above acute impact levels throughout the entire season.** Having rearranged the data by site makes this easy to see (Table 7.11). This is exactly what we would expect from a compound either used repeatedly throughout the growing period or a compound with very high persistence being gradually released to the aquatic environment after any rain or irrigation period. It is notable that grab samples such as these never reveal true maxima (by chance alone, how could a grab sample find the maximum?) so the situation (already looking very bleak) is worse than depicted. As the authors point out, a true picture would require that other neonicotinoids as well as the many imidacloprid degradates be measured as well.

Hladik and Calhoun (2012), in a methods-oriented report for the USGS, provide data on two Georgia streams: Scope creek and the Chattahoochee River sampled between October 2011 and April 2012. A full interpretation of the results will be given in a later publication for this ongoing sampling effort, but Scope creek was described as being primarily urban. On this site, imidacloprid was detected in 86% of the samples at concentrations ranging from 4.5 (essentially the detection limit) to

35.3 ng/l. The Chattahoochee River drains a much larger area of mixed forest, urban and agricultural areas. Imidacloprid was detected in 60% of the samples at concentrations ranging from 3.4 to 10.1 ng/l. The other neonicotinoid insecticides acetamiprid, clothianidin, thiacloprid and thiamethoxam were not detected at detection limits ranging from 3.6 to 6 ng/l.

An earlier effort (2007-2008) to sample imidacloprid in drinking water supplies (Smith 2011) had revealed that imidacloprid was one of the more frequently detected pesticides from the Hobbs and Stony Brook basins in Massachusetts. Most samples were composites taken during storm flow. One of the 5 sampling stations on the reservoir tributaries recorded imidacloprid in all of the base flow samples and in 83% of the storm flow samples (detection limit of 0.06 ug/l) with a maximum detected level estimated to be 1.21 ug/l.

These last two sampling efforts highlight the fact that, because of the use of imidacloprid on turf and ornamentals, we cannot discount urban areas as sources of aquatic contamination.

In its review of imidacloprid in Canada, the CCME (2007) reported the results of early monitoring efforts by Environment Canada to assess runoff from potato fields in Eastern Canada (Table 7.12). These results were inconsistent, with early detections reaching as high as 11.9 ug/l but later samples showing either lower or no residues. Detection limits were often high, however, meaning that the frequency of detection was consistently underestimated.

Table 7.12. Summary of early sampling for imidacloprid by Environment Canada in runoff and surface waters in proximity to potato fields. Based on unpublished reports reviewed by CCME 2007.

Location	Year	Type of sample	No. samples	Detection limit (ug/l)	No. positive	Highest level detected (ug/l)	Source cited in CCME (2007)
Prince Edward Island	2001-2002	Runoff		0.5		11.9	Denning 2004
Prince Edward Island	2003-2004	Runoff	45	1.0	0		Murphy and Mutch 2005
New Brunswick	2003-2004	Runoff	42	2.0	0		Murphy and Mutch 2005
Nova scotia	2003-2004	Runoff	18	2.0	0		Murphy and Mutch 2005
Prince Edward Island	2003-2005	Surface waters (stream)	82	0.2	0		Murphy et al. 2006
Nova scotia	2003-2005	Surface waters (stream)	48	0.2	0		Murphy et al. 2006
New Brunswick	2003-2005	Surface waters (stream)	57	0.2	2	0.3	Murphy et al. 2006
New Brunswick	2003-2005	Runoff and surface water – single site				0.3	Hewitt 2006

The first effort to look for a wider suite of neonicotinoids in Canada was in the Fall (October 4-15) of 2011. For seed treatment uses, this would be 5-6 months after application. Single samples were

taken from streams in southern Ontario draining either urban or rural areas, the latter being either orchard-dominated or field-crop dominated. The data are summarised in Table 7.13.[23]

Honeybees by Jessica Lawrence, Eurofins Agroscience Services, Bugwood.org

[23] We are indebted to the following individuals for use of their unpublished data: John Struger and John Kraft, Environment Canada Water Quality Monitoring and Surveillance (WQM&S) – Ontario; and Josey Grabuski, Steve Cagampan and Ed Sverko, Environment Canada National Laboratory for Environmental Testing (NLET) – Burlington.

Table 7.13. Environment Canada surveillance data for neonicotinoid insecticides; Fall 2011.

		URBAN OR TURF SITES							
	Minimum Detection Limit (ng/L)	**taylor 4-11**	**indian 5-11**	**highland 5-11**	**credit 5-11**	**mimico 5-11**	**spencer 4-11**	**kossuth 5-11**	**indian 13-11**
Analytes		**ng/L**	**ng/L**	**ng/L**	**ng/L**	**ng/L**	**ng/L**	**ng/L**	**ng/L**
clothianidin	**1.76**	nd	nd	nd	nd	nd	<MDL	<MDL	nd
thiacloprid	**0.49**	nd	nd	nd	nd	nd	nd	nd	nd
thiamethoxam	**1.39**	nd	nd	nd	nd	nd	<MDL	<MDL	nd
imidacloprid	**1.28**	2.13	4.72	<MDL	1.66	nd	nd	1.31	3.49
dinotefuran	**3.28**	nd	nd	nd	nd	nd	nd	nd	nd
TOTAL		**2.13**	**4.72**	**0.00**	**1.66**	**0.00**	**0.00**	**1.31**	**3.49**

		ROW CROPS					POTATOES PRIMARILY			VINES AND ORCHARDS
	Minimum Detection Limit (ng/L)	**welland 4-11**	**20bailey 4-11**	**20westbrk 4-11**	**LThames 5-11**	**LGrand 5-11**	**innisfil 13-11**	**nott-baxter 13-11**	**nott-SR10 13-11**	**vineland 4-11**
Analytes		**ng/L**	**ng/L**	**ng/L**	**ng/L**	**ng/L**	**ng/L**	**ng/L**	**ng/L**	**ng/L**
clothianidin	**1.76**	2.22	32.6	nd	19.9	7.52	nd	<MDL	nd	34.8
thiacloprid	**0.49**	nd	nd	<MDL	nd	nd	nd	nd	nd	3.49
thiamethoxam	**1.39**	6.46	174	nd	7.87	2.11	6.13	1.75	1.78	<MDL
imidacloprid	**1.28**	nd	26.9	nd	6.14	6.56	6.03	4.63	2.95	9.02
dinotefuran	**3.28**	nd	nd	nd	nd	nd	nd	nd	nd	nd
TOTAL	**8.20**	**8.68**	**233.00**	**0.00**	**33.90**	**16.20**	**12.20**	**6.38**	**4.73**	**47.30**

Although the highest reported value (0.23 ug/l total neonicotinoids) from a row crop site is much lower than imidacloprid concentrations reported by Starner and Goh (2012) for California, we need to remember that these values represent water concentrations 5-6 months after use, at least in the case of the thiamethoxam seed treatment likely responsible for the highest level recorded downstream from the Ontario corn/soy field. This clearly puts us into the concentration range where chronic effects are likely. Water collections were extended to the full summer in 2012 (J. Struger, pers. comm.) but these data are not yet available. It is interesting to see that detected residues follow predicted use patterns: urban and turf sites showing primarily imidacloprid; agricultural sites showing a mixture of the three main products.

Huseth and Groves (2013) analysed leachate samples (collected at a depth of 75 cm) following the use of thiamethoxam. The insecticides had been applied to potato seed pieces before planting or applied as a foliar spray afterwards. For one of the two years of the study, leachate concentrations averaged between 10-15 ug/l regardless of application method; in the following year they averaged approximately 5 ug/l.

The most worrisome analysis is that of Van Dijk (2010) for the Netherlands. Based on national monitoring data for water analyses from 1998 to 2007, she reports that imidacloprid was detected as high as 325 ug/l[24] with the bulk of detections falling between 0.013 and 1.6 ug/l[25]. She was able to match these monitoring data to aquatic invertebrate species abundance data (another national monitoring scheme in the Netherlands). She was able to see a clear inverse relationship between imidacloprid residues and the abundance of diptera. Non-significant differences were also seen in coleopteran, amphipoda and odonata. To be fair, a few positive relationships were also seen (especially hydracarina), suggesting that some species might be more affected than others and that imidacloprid may be affecting the relative competing ability of different taxa. This is well known from mesocosm work where insensitive taxa can exhibit large increases as a result of release from competition or predation.

Unfortunately, Van Dijk (2010) could not assess whether neonicotinoids had resulted in temporal changes in invertebrate abundance over the decades of use because, even in the Netherlands, the historical data proved inadequate to the task.

The special case of prairie potholes

[24] This is based on the author reporting that the highest concentration detected was 25,000 times the older Dutch reference value of 13 ng/l.
[25] In the Netherlands, major uses of imidacloprid include flower bulbs – a large industry in that country – as well as potatoes and chicory.

The case has long been made that pesticide application to, or runoff into, small prairie wetlands (sloughs) could have disastrous consequences on waterfowl as well as other aquatic bird species that depend on the rich supply of invertebrates for egg production as well as chick growth and development (Mineau et al. 1987; Sheehan et al. 1987, 1995). The agricultural areas of the prairies are critical to North American waterfowl populations. Euliss and Mushet (1999) sampled wetlands in cropland and grassland in North Dakota and confirmed that wetlands in cropland areas were much more likely to be devoid of cladocera and have reduced numbers of key invertebrate species recognised as waterfowl food.

Morrissey and Main (2010) concluded that the highest intensity of neonicotinoid use in the Canadian prairies overlaps directly with areas of high wetland density. Sediment and macroinvertebrate collections as well as a tree swallow nest box study are underway. In June of 2012, they also sampled a number of wetlands. In all, 63% of their samples were positive, with the following maxima being reported: imidacloprid 0.19 ug/L, thiamethoxam 1.1 ug/L, clothianidin 2.3 ug/L, acetamiprid 0.044 ug/L[26]. Seed treatments in canola were the principal sources.

8. Putting it together: Next steps

8.1. Priority research directions

A rigorous analysis of avian trends in North America, and attempts to link these to neonicotinoid uses, is beyond what we can accomplish in this review. As discussed in section 3, avian declines are likely to be multi-faceted and respond to many factors, both here and on their wintering grounds. The analysis will not be simple.

As discussed more fully in the section below, we believe that it is essential to design biochemical assays that will allow diagnosis of poisonings in wildlife. It is also critical to assess the potential of neonicotinoids to affect avian reproduction given the laboratory evidence to date. The hypothesis that neonicotinoid exposure might result in increased vulnerability of wildlife to pathogens deserves further investigation, as well.

It is clear that we are witnessing contamination of the aquatic environment at levels that will affect aquatic food chains. This has a clear potential to affect consumers of those aquatic resources, be they birds, fish or amphibians. Based on this review, a few priority avenues of research are indicated:

- For population trend analyses, we recommend expanding the assessment from farmland/grassland species (the usual place where researchers start looking for pesticide impacts) to those species known to be more reliant

[26] We are indebted to Dr. Christy Morrissey and her research team at the University of Saskatchewan for these early (preliminary) results.

on the aquatic or emergent insect food supply even if further from cropland.

- The case of prairie potholes was mentioned above. Because these are static water bodies often surrounded by field crops, they are the ideal testing ground for looking at aquatic impacts resulting from the use of neonicotinoids in cereal and oilseed crops.

- Aerial insectivores, as a group, are currently experiencing widespread population declines. Their dependence on emergent insects is well known; seeing whether population declines can be linked to the increased contamination of aquatic systems with neonicotinoids may be a worthwhile direction, especially in light of the existing work linking poor reproductive success in some species with prey reduction following mosquito control operations.

Any analysis will need to refer to pesticide use statistics. This will be difficult to carry out in Canada because these data are not collected. However, some simplifying assumptions can be made as to the increasing popularity of the neonicotinoid seed treatments since their introduction in the early 2000s. For US-based analyses, information on pesticide use does allow for enquiries into the role of pesticides in bird declines (Mineau end Whiteside, 2013). However, we do not believe current USDA pesticide surveys cover seed treatment chemicals if applied to the seed by commercial seed treatment operations. This is a serious knowledge gap.

8.2. Needed changes to the regulatory system

This review has shown how current regulatory procedures are inconsistent, scientifically outmoded, and prone to the vagaries of chance. There is a significant disconnect between the red flags raised by scientists who evaluate the neonicotinoid ingredients and the risk managers who approve the neonicotinoid product registrations. This problem has been raised previously in the context of the lethal impact of insecticides to birds (Mineau, 2004).

Simply put, EPA has not been heeding the warnings of its own toxicologists. Internal Agency reviews voice major concerns about neonicotinoid risks, particularly with respect to developmental and reproductive toxicity. Their official cautions would be even more dire if EPA scientists went beyond their antiquated protocols and correctly assessed the full extent of the impacts. For example, risk

assessment methods for birds fail to fully account for the interspecies variation in toxicity, underestimating acute risk by up to 10 fold for the universe of species beyond mallards and bobwhites. As for aquatic invertebrates, EPA has underestimated the toxicity of imidacloprid by over an order of magnitude, because of the Agency's failure to consider data from the peer-reviewed literature. The Agency has grossly underestimated the toxicity of the other neonicotinoids as well, in part due to the Agency's reliance on a test species, *Daphnia magna*, that is uniquely insensitive to neonicotinoids.

Recent studies in the U.S. and Europe have shown that small amounts of neonicotinoids from treated seeds can cause disorientation, suppressed immunity, and early death in honeybees. This report makes clear that birds – critical agents in the control of agricultural pests -- are adversely affected as well. A single seed treated with imidacloprid is enough to kill a blue-jay-sized bird, and less than one corn seed per day treated with any of the neonicotinoid insecticides is sufficient to cause reproductive abnormalities. This is extremely worrisome given the extensive use of neonicotinoids as seed treatments for corn, soy, canola, and increasingly for cereals. As this report shows, unlimited quantities of these treated seeds are readily available to birds while regulators mistakenly assume that exposure can be minimized by label statements or adherence to good agricultural practices.

Neonicotinoid-treated seeds present a lethal risk for the birds that eat them. Yet when a state or county officer receives a report of dead birds or other wildlife, the inspector has no way of determining whether neonicotinoids contributed to the death. There is no readily available biomarker for neonicotinoids as there is for cholinesterase inhibitors such as the organophosphorous pesticides. It is astonishing that EPA would allow a pesticide to be used in hundreds of products without ever requiring the registrant to develop the tools needed to diagnose poisoned wildlife. It would be relatively simple to create a binding assay for the neural receptor which is affected by this class of insecticides.

It is perplexing, as well, that EPA does not require registrants to report any bird kills involving fewer than 200 of a "flocking species," 50 individuals of a songbird species, or 5 raptors. The agency's 1997

revisions to its incident reporting requirements under FIFRA section 6(a)2 essentially place the Agency in a state of enforced ignorance in this regard. These feeble reporting requirements and the failure to require the development of basic biomarkers help keep the government in the dark on a range of pesticide effects on wildlife.

The neonicotinoids are systemic, persistent in soils (and thus prone to accumulation from year to year), and susceptible to runoff and groundwater infiltration. These physical properties and their near-ubiquity in pest control products have led to strikingly high groundwater contamination levels, already beyond the threshold found to kill many aquatic invertebrates. The resulting effects on birds and other organisms are cause for concern. It is clear that these chemicals have the potential to affect entire food chains.

Neonicotinoids have been suspended for some uses in several European countries. The European Commission and the British government are currently taking steps to assess the risks. Meanwhile the U.S. continues to sanction new uses. There is evidence that U.S. regulators historically have waited far too long to impose needed restrictions on toxic insecticides responsible for millions of bird deaths per year (Mineau 2004) and that these chemicals likely contributed to the significant decline of grassland birds in North America (Mineau and Whiteside, 2013). Given the red flags raised by this new class of pesticides, a serious independent review of the neonicotinoids is warranted, one that goes well beyond the effects on honeybees.

The results of this study and others have led American Bird Conservancy and partners in the National Pesticide Reform Coalition to urge the EPA to take the following actions:

- Suspend all applications of neonicotinoids pending independent review of these products' effects on birds, terrestrial and aquatic invertebrates, and other wildlife.
- Expand its re-registration review of neonicotinoids beyond bees to include birds, aquatic invertebrates, and other wildlife.
- Ban the use of neonicotinoids as seed treatments.
- Require that registrants of acutely toxic pesticides develop the tools necessary to diagnose poisoned birds and other wildlife.

Northern Bobwhite by Bill Hubick

References Cited

Open literature

Adams, J. S., R. L. Knight, L. C. Mcewen, and T. L. George. 1994. Survival and growth of nestling Vesper Sparrows exposed to experimental food reductions. Condor 96:739-748.

Aldenberg, T. and R. Luttik. 2002. Extrapolation factors for tiny toxicity data sets from species sensitivity distributions with known standard deviation. IN Species Sensitivity Distributions in Ecotoxicology, L. Posthuma, G.W. Suter II and T.P. Traas [eds.], Lewis Publishers, Boca Raton, Florida, pp. 103-118.

Alexander, A.C., J.M. Culp, K. Liber, and A.J. Cessna. 2007. Effects of insecticide exposure on feeding inhibition in mayflies and oligochaetes. Env. Toxicol. Chem. 26(8):1726-1732.

Alexander, A.C., K. Heard, and J.M. Culp. 2008. Emergent body size of mayfly survivors. Freshwater Biology 53, 171–180.

Avery, M.L., G.G. Decker, D.L. Fisher and T.R. Stafford. 1993a. Responses of captive blackbirds to a new insecticidal seed treatment. J. Wildl. Manage. 57:652-656.

Avery, M.L., D.G. Decker, and D.L. Fischer. 1994. Cage and flight pen evaluation of avian repellency and hazard associated with imidacloprid-treated rice seed. Crop protection 13(7): 535-540.

Avery, M.L., D.L. Fischer, and T.M. Primus. 1997. Assessing the hazard to granivorous birds feeding on chemically treated seeds. Pestic Sci 49:362-366.

Bacey, J. 2003. Environmental fate of imidacloprid. California Department of Pesticide Regulation. 8 pp.

Barbee, G.C. and M. J. Stout. 2008. Comparative acute toxicity of neonicotinoid and pyrethroid insecticides to non-target crayfish (Procambarus clarkii) associated with rice–crayfish crop rotations. Pest Manage Sci. 65:1250-1256.

Beecher, N. A., R. J. Johnson, J. R. Brandle, R. M. Case, and L. J. Young. 2002. Agroecology of birds in organic and nonorganic farmland. Conservation Biology 16:1620-1631.

Beketov, M.A. and M. Liess. 2008a. Potential of 11 pesticides to initiate downstream drift of stream macroinvertebrate. Archives of Environ Contam Tox. 55:247-253.

Beketov, M.A. and M. Liess. 2008b. Acute and delayed effects of the neonicotinoid insecticide thiacloprid on seven freshwater arthropods. Environ Tox. 28:461-470.

Bennett, R.S., I.C Dewhurst, A. Fairbrother, A.D.M. Hart, M.J. Hooper, A. Leopold, P. Mineau, S.R. Mortensen, R.F. Shore and T.A. Springer. 2005. A new interpretation of avian and mammalian reproduction toxicity test data in ecological risk assessment. Ecotoxicology 14(8):801-815.

Berny, P.J., F. Buronfosse, B. Videmann,T. Buronfosse. 1999. Evaluation of the toxicity of imidacloprid in wild birds. A new high performance thin layer chromatography (HPTLC) method for the analysis of liver and crop samples in suspected poisoning cases. J. Liq. Chrom. & Rel. Technol., 22(10), 1547–1559.

Best, L. B., R. C. Whitmore, and G. M. Booth. 1990. Use of cornfields by birds during the breeding season: The importance of edge habitat. American Midland Naturalist 123:84-99.

Boatman, N. D., N. W. Brickle, J. D. Hart, T. P. Milsom, A. J. Morris, A. W. A. Murray, K. A. Murray, and P. A. Robertson. 2004. Evidence for the indirect effects of pesticides on farmland birds. Ibis 146:131-143.

Böttger, R., J. Schaller and, S.Mohr. 2012. Closer to reality — the influence of toxicity test modifications on the sensitivity of Gammarus roeseli to the insecticide imidacloprid. Ecotox Environm Safety 81:49-54.

Boutin, C., K. E. Freemark, and D. A. Kirk. 1999. Farmland birds in southern Ontario: field use, activity patterns and vulnerability to pesticide use. Agriculture Ecosystems & Environment 72:239-254.

Bradbury, R. B., A. Kyrkos, A. J. Morris, S. C. Clark, A. J. Perkins, and J. D. Wilson. 2000. Habitat associations and breeding success of yellowhammers on lowland farmland. Journal of Applied Ecology 37:

Bradbury, R. B., J. D. Wilson, D. Moorcroft, A. J. Morris, and A. J. Perkins. 2003. Habitat and weather are weak correlates of nestling condition and growth rates of four UK farmland passerines. Ibis 145:295-306.

Brickle, N. W., D. G. C. Harper, N. J. Aebischer, and S. H. Cockayne. 2000. Effects of agricultural intensification on the breeding success of corn buntings Miliaria calandra. Journal of Applied Ecology 37:742-755.

Brickle, N. W. and W. J. Peach. 2004. The breeding ecology of Reed Buntings Emberiza schoeniclus in farmland and wetland habitats in lowland England. Ibis 146:69-77.

Britschgi, A., R. Spaar, and R. Arlettaz. 2006. Impact of grassland farming intensification on the breeding ecology of an indicator insectivorous passerine, the Whinchat Saxicola rubetra: Lessons for overall Alpine meadowland management. Biological Conservation 130:193-205.

Butler, S. J., E. H. A. Mattison, N. J. Glithero, L. J. Robinson, P. W. Atkinson, S. Gillings, J. A. Vickery, and K. Norris. 2010. Resource availability and the persistence of seed-eating bird populations in agricultural landscapes : a mechanistic modelling approach. Journal of Applied Ecology 47:67-75.

CADPR 2012. Department of Pesticide Regulation (California) Pesticide Registration and Evaluation Committee. Meeting minutes – July 2012. 6 pp.

Callahan, J. and P. Mineau. 2008. Evaluation of clinical sign data from avian acute oral toxicity studies. Appendix 11; Scientific Opinion of the Panel on Plant Protection Products and their Residues on Risk Assessment for Birds and Mammals, EFSA Journal (2008) 734, 10pp.

CCME 2007. Canadian water quality guidelines: Imidacloprid. Scientific supporting document. Canadian Council of Ministers of the Environment. PN 1388. 51pp.

Chen X.D., E. Culbert, V. Hebert and, J.D. Stark. 2010. Mixture effects of the nonylphenyl polyethoxylate, R-11 and the insecticide, imidacloprid on population growth rate and other parameters of the crustacean, *Ceriodaphnia dubia*. Ecotoxicology and Environmental Safety 73:132–137.

CSL (Central Science Laboratory) 2002. Risks to birds and mammals from solid formulations. Final Project report. 39 pp.

Davis, B.N.K. 1974. Levels of dieldrin in dressed wheat seed after drilling and exposure on the soil surface. *Environmental Pollution*. 7: 309-317.

Dunn, J. C., K. C. Hamer, and T. G. Benton. 2010. Fear for the family has negative consequences: indirect effects of nest predators on chick growth in a farmland bird. Journal of Applied Ecology 47:994-1002.

EFSA (European Food safety Authority) 2008. Conclusion on the peer review of imidacloprid. 120 pp.

Ellis, C.R. 1982. A survey of granular application equipment and insecticide rates used for control of corn rootworms (coleoptera:chrysomelidae) in southern Ontario. *Proceedings of the Entomological Society of Ontario.* 113: 29-34.

Englert, D., M. Bundschuh, R. Schulz. 2012. Thiacloprid affects trophic interaction between gammarids and mayflies. Environm. Pollution 167:41-46.

Euliss, N.H. Jr. and D.M. Mushet. 1999. Influence of agriculture on aquatic invertebrate communities of temporary wetlands in the prairie pothole region of North dakota, USA. Wetlands 19(3): 578-583.

European Commission 2004. Acetamiprid. SANCO/1392/2001 – Final. 34 pp.

European Commission 2005. Clothianidin. SANCO/10533/05 – Final. 26 pp.

Fernández–Perea, M.T., E.A. Prados , A.N. Villajos, J. L.A. Prados, and J.M. García Baudín. 2009. Influence of avian reproduction ecotoxicological endpoints in the assessment of plant protection products. Journal of Environmental Science and Health, Part B 44:106-112.

Frank, R., P. Mineau, H.E. Braun, I.K. Barker, S.W. Kennedy and S. Trudeau. 1991. Deaths of Canada Geese following spraying of turf with diazinon. Bull. Env. Contam. Toxicol. 46: 852-858.

Freemark, K. E. and D. A. Kirk. 2001. Birds on organic and conventional farms in Ontario: partitioning effects of habitat and practices on species composition and abundance. Biological Conservation 101:337-350.

Ghilain, A. and M. Bélisle. 2008. Breeding success of Tree Swallows along a gradient of agricultural intensification. Ecological Applications 18:1140-1154.

Geis, A.D. 1980. Relative attractiveness of different foods at wild bird feeders. U.S. Dept. of the Interior, Fish and Wildlife Service, Special Scientific Report-Wildlife No. 233, Washington D.C., pp11.

Girard, J. M., A. Baril, P. Mineau, and L. Fahrig. 2012. Foraging habitat and diet of Song Sparrows (Melospiza melodia) nesting in farmland: A stable isotope approach. Canadian Journal of Zoology

Girard, J. M. 2012. The effects of conventional and organic cropping systems on food and reproductive success of Song Sparrows in eastern Ontario farmland. PhD thesis, Carleton university, Ottawa.

Giroux, I. 2003. Contamination de l'eau souterraine par les pesticides et les nitrates dans les régions en culture de pommes de terre. Campagne d'échantillonnage de 1999-2000-2001. Direction de suivi de l'état de l'environnement, Ministère de l'Environnement, Gouvernement du Québec, Québec. www.mddep.gouv.qc.ca/pesticides/pomme_terre/Pesticides_pomme_terre.pdf

Golawski, A. and W. Meissner. 2008. The influence of territory characteristics and food supply on the breeding performance of the Red-backed Shrike (Lanius collurio) in an extensively farmed region of eastern Poland. Ecological Research 23:347-353.

Green, R. 1978. Factors affecting the diet of farmland skylarks, Alauda arvensis. Journal of Animal Ecology. 47: 913-928.

Greer, R. D. and S. H. Anderson. 1989. Relationships between population demogrphy of McCown's Longspurs and habitat resources. Condor 91:609-619.

Hart, J. D., T. P. Milsom, G. Fisher, V. Wilkins, S. J. Moreby, A. W. A. Murray, and P. A. Robertson. 2006. The relationship between yellowhammer breeding performance, arthropod abundance and insecticide applications on arable farmland. Journal of Applied Ecology 43:81-91.

Hayasaka, D., T. Korenaga, F. Sanchez-Bayo, K. Goka. 2012a. Differences in ecological impacts of systemic insecticides with different physicochemical properties on biocenosis of experimental paddy fields. Ecotoxicology 21:191–201.

Hayasaka, D., T. Korenaga, K. Suzuki, F. Sánchez-Bayo, K. Goka. 2012b. Differences in susceptibility of five cladoceran species to two systemic insecticides, imidacloprid and fipronil. Ecotoxicology 21:421–427.

Hladik ML and Calhoun DL. 2012. Analysis of the herbicide diuron, three diuron degradates, and six neonicotinoid insecticides in water – Method details and application to two Georgia streams. USGS Scientific Investigations Report 2012-5206. 9 pp.

Hole, D. G., M. J. Whittingham, R. B. Bradbury, G. Q. A. Anderson, P. L. M. Lee, J. D. Wilson, and J. R. Krebs. 2002. Widespread local house-sparrow extinctions. Nature 418:931-

Howe, F. P., R. L. Knight, L. C. Mcewen, and T. L. George. 2000. Diet switching and food delivery by shrubsteppe passerines in response to an experimental reduction in food. Western North American Naturalist 60:139-154.

Huseth, A.S. and R.L. Groves. 2013. Environmental fate of neonicotinoids: a potato case study. www.soils.wisc.edu/extension/wcmc/2013/pap/Huseth.pdf (accessed February 2013).

Jemec, A., T. Tisler, D. Drobne, K. Sepcic, D. Fournier, and P. Trebse. 2007. Comparative toxicity of imidacloprid, of its commercial liquid formulation and of diazinon to a non-target arthropod, the microcrustacean Daphnia magna. Chemosphere 68(8): 1408-1418.

Jeschke, P., R. Nauen, M. Schindler, and A.Elbert. 2011. Overview of the Status and Global Strategy for Neonicotinoids. J. Agric. Food Chem. 59: 2897–2908.

Key, P., K. Chung, T. Siewicki, and M. Fulton. 2007. Toxicity of three pesticides individually and in mixture to larval grass shrimp. Ecotoxicol Environ Saf 68(2): 272-277.

Kreuzberg, E. 2011. Effects of landscape structure and agricultural practices on farmland birds in Ontario.

Kreutzweiser, D.P., K.P. Good, D. Chartrand, T.A. Scarr, and D.G. Thompson. 2008. Toxicity of the systemic insecticide, imidacloprid, to forest stream insects and microbial communities. Bull Environ Contam Toxicol. 80(3):211-4.

Lanyon, W.E. 1994. Western Meadowlark (*Sturnella neglecta*). *In* The Birds of North America, No. 104. American Ornothologists Union. The Academy of Sciences of Philadelphia.

Leblanc, H.M., K. LeBlanc, J.M. Culp, D.J. Baird, A.C. Alexander, and A.J. Cessna. 2012. Single versus combined lethal effects of three agricultural insecticides on larvae of the freshwater insect *Chironomus dilutes.* Arch Environ Contam Toxicol 63:378–390.

Leeuw, J.de, M. Gorree, G.R. de Snoo, W.L.M. Tamis, R.J.van der Poll, and R. Luttik. 1995. Risks of granules and treated seeds to birds on arable fields. National Institute of Public Health and the Environment. CML report 118 - Section Ecosystems & Environmental Quality, Leiden.

Lopez-Antia, A., M.E. Ortiz-Santaliestra, F. Mougeot, and R. Mateo. 2012. Experimental exposure of red-legged partridges (Alectoris rufa) to seeds coated with imidacloprid, thiram and difenoconazole. Ecotoxicology (online) DOI 10.1007/s10646-012-1009-x.

Lorenzen, B. and J. Madsen. 1986. Feeding by geese on the Filso Farmland, Denmark, and the effect of grazing on yield structure of spring barley. Holarctic Ecology. 9: 305-311.

Lukančič, S., U. Žibrat, T. Mezek, A. Jerebic, T. Simčič, A. Brancelj. 2010. Effects of exposing two non-target crustacean species, *Asellus aquaticus* L., and *Gammarus fossarum* Koch., to atrazine and imidacloprid. Bull Environ Contam Toxicol: 84:85–90.

Luttik, R. and Aldenberg, T. 1997. Extrapolation factors for small samples of pesticide toxicity data: special focus on LD50 values for birds and mammals. Environ. Toxicol. Chem. 16, 1785–88.

Luttik, R., P. Mineau, and W. Roelofs. 2005. A review of interspecies toxicity extrapolation in birds and mammals and a proposal for long-term toxicity data. Ecotoxicology 14(8):817-832.

Luttik, R.L., A. Hart, W. Roelofs, P. Craig and P. Mineau. 2011. Variation in the level of protection afforded to birds and crustaceans exposed to different pesticides under standard risk assessment procedures. Integrated Environmental Assessment and Management 7(3):459-465.

Malev, O., R. Sauerborn Klobučar, E. Fabbretti, P. Trebše. 2012. Comparative toxicity of imidacloprid and its transformation product 6-chloronicotinic acid to non-target aquatic organisms: Microalgae *Desmodesmus subspicatus* and amphipod *Gammarus fossarum*. Pesticide Biochemistry and Physiology In Press.

Maltby, L., Blake, N., Brock, T.C.M., Van den Brink, P.J. 2005. Insecticide species sensitivity distributions: importance of test species selection and relevance to aquatic ecosystems. Environmental Toxicology and Chemistry 24: 379-388.

Martin, P. A., D. L. Johnson, D. J. Forsyth, and B. D. Hill. 1998. Indirect effects of the pyrethroid insecticide deltamethrin on reproductive success of chestnut-collared longspurs. Ecotoxicology 7:89-97.

Martin, P. A., D. L. Johnson, D. J. Forsyth, and B. D. Hill. 2000. Effects of two grasshopper control insecticides on food resources and reproductive success of two species of grassland songbirds. Environmental Toxicology and Chemistry 19:2987-2996.

Martin, T. E. 1987. Food as a limit on breeding birds: A life-history perspective. Annual Review of Ecology Evolution and Systematics 18:453-487.

Mason, R., H. Tennekes, F. Sánchez-Bayo, P.U. Jepsen. 2013. Immune suppression by neonicotinoid insecticides at the root of global wildlife declines. Journal of Environmental Immunology and Toxicology; In Press September/October 2012.

Maus, C. and R. Nauen. 2011. Response to the publication: Tennekes, H.A. (2010):The significance of the Druckrey–Küpfmüller equation for risk assessment—The toxicity of neonicotinoid insecticides to arthropods is reinforced by exposure time. Toxicology 280(3): 176-177.

Mayer, F.L. and M.R. Ellersieck. 1986. Manual of acute toxicity: Interpretation and database for 410 chemicals and 66 species of freshwater animals. USDI Fish and Wildlife Service Resource Publication 160, Washington D.C. 63 pp.

Maze, R.C., R.P. Atkins, P. Mineau and B.T. Collins. 1991. Measurement of pesticide residue in seeding operations. Trans. Amer. Soc. Agric. Eng. 34(3): 795-799.

McKay, H.V., Prosser, P.J., Hart, A.D.M., Langton, S.D., Jones, A., McCoy, C., Chandler-Morris, S.A. and Pascual, J.A. 1999. Do wood pigeons avoid pesticide treated cereal seed? Journal of Applied Ecology 36, 283-296.

Miller, C. K., R. L. Knight, L. C. Mcewen, and T. L. George. 1994. Responses of nesting Savannah Sparrows to fluctuations in grasshopper densities in interior Alaska. Auk 111:962-969.

Mineau, P., P.J. Sheehan and A. Baril. 1987. Pesticides and waterfowl on the Canadian prairies: A pressing need for research and monitoring. (In) The value of birds. A.W. Diamond and F. Filion (eds.) I.C.B.P. Technical Publication No. 6, Cambridge, U.K. pp. 133-147.

Mineau, P., B. Jobin, A. Baril. 1994. A critique of the avian 5-day dietary test (LC50) as the basis of avian risk assessment. Technical Report Series. No. 215. Environment Canada, Canadian Wildlife Service, Ottawa. 23 pp.

Mineau, P., D.C. Boersma, and B. Collins. 1994. An analysis of avian reproduction studies submitted for pesticide registration. Ecotoxicology and Environmental Safety 29:304-329.

Mineau, P., B.T. Collins and A. Baril. 1996a. On the use of scaling factors to improve interspecies extrapolation of acute toxicity in birds. Regulatory Toxicology and Pharmacology 24:24-29.

Mineau, P., R. Balcomb, R. Bennett, S. Dobson, M. Fry, M. Jaber, A. Leopold, R. Munk, B. Ringer, A. Rispin, L. Sileo, R.Solecki and H. Thompson. 1996b. Testing for effects on reproduction. [In] Report of the SETAC/OECD Workshop on Avian Toxicity Testing. Inter-Organizational Programme for the Sound Management of Chemicals, OECD Environmental Health and Safety Publications, Series on Testing and Assessment No. 5, pp. 44-62.

Mineau, P., A. Baril, B.T. Collins , J. Duffe, G. Joerman, R. Luttik. 2001a. Reference values for comparing the acute toxicity of pesticides to birds. Reviews of Environmental Contamination and

Toxicology 170:13-74.

Mineau, P., M. Hooper, N. Elmegaard, R. Grau, R. Luttik, R. Ringer. 2001b. Case Study 5: Foliar Insecticide II, Chapter 8. In: Hart, A., D. Balluff, R. Barfknecht, P. Chapman, A. Hawkes, G. Joermann, A. Leopold, and R. Luttik (eds.) Avian effects assesment: A framework for contaminant studies. SETAC Press, Pensacola, Florida. pp. 111-136.

Mineau, P. 2004. Birds and pesticides: Are pesticide regulatory decisions consistent with the protection afforded migratory bird species under the Migratory Bird Treaty Act? The William and Mary Environmental Law and Policy Review 28(2): 313-338.

Mineau, P. 2005. A review and analysis of study endpoints relevant to the assessment of 'long term' pesticide toxicity in avian and mammalian wildlife. Ecotoxicology. 14(8):775-799.

Mineau, P. C. Morrison, M. Whiteside, and K. Harding. 2006. Developing risk-based rankings for pesticides in support of standard development at Environment Canada: Preliminary terrestrial rankings. National Agri-Environmental Standards Initiative Technical Series Report No. 2-43, Environment Canada, 92 pp.

Mineau, P. and M. Whiteside. In press. Pesticide acute toxicity is a better correlate of U.S. grassland bird declines than agricultural intensification. PLOS ONE.

Miranda G.R.B., C.G. Raetano, E. Silva, M.A. Daam, and M.J. Cerejeira. 2011. Environmental fate of neonicotinoids and classification of their potential risks to hypogean, epygean, and surface water ecosystems in Brazil. Human and Ecological Risk Assessment: An International Journal17:4:981-995.

Mirarchi, R.E. and T.S. Baskett. 1994. Mourning Dove (*Zenaida macroura*). *In* The Birds of North America, No. 117. American Onrothologists Union. The Academy of Sciences of Philadelphia.

Mohr, S., R. Berghahn, R. Schmiediche, V. Hübner, S. Loth, M. Feibicke, W. Mailahn, J. Wogram. 2012. Macroinvertebrate community response to repeated short-term pulses of the insecticide imidacloprid. Aquatic Toxicology 110-111: 25-36.

Moller, A. P. 2001. The effect of dairy farming on barn swallow Hirundo rustica abundance, distribution and reproduction. Journal of Applied Ecology 38:378-389.

Morris, A. J., J. D. Wilson, M. J. Whittingham, and R. B. Bradbury. 2005. Indirect effects of pesticides on breeding yellowhammer (Emberiza citrinella). Agriculture Ecosystems & Environment 106:1-16.

Morrissey, C. and A. Main. 2010. Analysis and identification of neonicotinoid applications in prairie watersheds. University of Saskatchewan. Unpublished report to Environment Canada. 19pp.

Murton, R.K. and M. Vizoso. 1963. Dressed cereal seed as a hazard to wood-pigeons. *Annals of Applied Biology.* 52: 503- 517.

Nagai, T. and A. Yokohoma. 2012. Comparison of ecological risks of insecticides for nursery-box application using species sensitivity distribution. J. Pestic. Sci. 37(3): 233-239.

Nagy, K.A. 1987. Field metabolic rate and food requirement scaling in mammals and birds. Ecological Monographs 57(2):111-128.

Nagy, L. R. and R. T. Holmes. 2004. Factors influencing fecundity in migratory songbirds: is nest predation the most important? Journal of Avian Biology 35:487-491.

Nagy, L. R. and R. T. Holmes. 2005. Food limits annual fecundity of a migratory songbird: An experimental study. Ecology 86:675-681.

Overmyer, J.P., B.N. Mason, K.L.Armbrust. 2005, Acute toxicity of imidacloprid and fipronil to a nontarget aquatic insect, Simulium vittatum Zetterstedt cytospecies IS-7. Bull Environ Contam Tox. 74:872-879.

Palmer, T.K. 1972 The house finch and starling in relation to California's agriculture. In Productivity, Population Dynamics and Systematics of Granivorous Birds. Proceedings of General Meeting of the Working Group on Granivorous Birds, IBP, PT Section, Holland.

Pascual, J.A., Hart, A.D.M., Saunders, P.J., McKay, H.V., Kilpatrik, J. & Prosser, P. 1999a. Agricultural methods to reduce the risk to birds from cereal seed treatments on fenlands in eastern England. I. Sowing depth manipulation. Agricultrure, Ecosystems and the Environment 72, 59-73.

Pascual, J.A., Saunders, P.J., Hart, A.D.M. & Mottram, J. 1999b. Agricultural methods to reduce the risk to birds from cereal seed treatments on fenlands in eastern England II. Rolling and harrowing as post-sowing cultivations. Agricultrure, Ecosystems and the Environment 72, 75-86.

Pawlina, I.M. and Proulx, G. 1996. Study of house sparrow (Passer domesticus) feeding preference to natural color and guard coat blue coated seeds. Crop Protection. 15(2): 143-146.

Peach, W. J., G. M. Siriwardena, and R. D. Gregory. 1999. Long-Term changes in over-winter survival rates explain the decline of Reed Buntings Emberiza schoeniclus in Britain. Journal of Applied Ecology 36:798-811.

Pestana, J.L.T., S. Loureiro, D.J. Baird, A.M.V.M. Soares. 2009a. Fear and loathing in the benthos: Responses of aquatic insect larvae to the pesticide imidacloprid in the presence of chemical signals of predation risk. Aquatic Toxicology 93: 138–149.

Pestana, J.L.T., A.C. Alexander, J.M. Culp, D.J. Baird, A.J. Cessna, A.M.V.M. Soares. 2009b. Structural and functional responses of benthic invertebrates to imidacloprid in outdoor stream mesocosms. Environ Pollution. 157(8-9):2328-2334.

PMRA. 1997. Admire. Regulatory Note R97-01. 4 pp.

PMRA. 2001. Imidacloprid. Regulatory Note 2011-11. 9 pp.

Potts, G. R. 1986. The Partridge: pesticides, predation and conservation.

Poulin, B., G. Lefebvre, and L. Paz. 2010. Red flag for green spray: adverse trophic effects of Bti on breeding birds. Journal of Applied Ecology 47:884-889.

Poulin, B. 2012. Indirect effects of bioinsecticides on the nontarget fauna: The Camargue experiment calls for future research. Acta Oecologica 44:28-32.

Poulin, B., F. Albalat, C. Claeys, L. Després, C. Jakob and C. Tétrel. 2012. Rapport intermédiaire sur le suivi scientifique annuel mené en 2012 en parallèle aux opérations de démoustication au Bti sur le périmètre du Parc Naturel Régional de Camargue. Rapport présenté au Parc Naturel Régional de Camargue le 30 novembre 2012. 72 pp.

Powell, G. V. N. 1984. Reproduction by an altricial songbird, the Red-winged Blackbird, in fields treated with the organophosphate insecticide fenthion. Journal of Applied Ecology 21:83-95.

Puckett, H. L., J. R. Brandle, R. J. Johnson, and E. E. Blankenship. 2009. Avian foraging patterns in crop field edges adjacent to woody habitat. Agriculture, Ecosystems and Environment 131:9-15.

Rauter, C. M., P. A. Brodmann, and H. Reyer. 2000. Provisioning behaviour in relation to food availability and nestling food demand in the Water Pipit Anthus spinoletta. Ardea 88:81-90.

RIVM 2008. Environmental risk limits for imidacloprid. C.J.A.M. Posthuma-Doodeman. RIVM Letter report 601716018/2008. 25pp.

Rodenhouse, N. L. and L. B. Best. 1994. Foraging patterns of Vesper Sparrows (Pooecetes gramineus) breeding in cropland. American Midland Naturalist 131:196-206.

Sanchez-Bayo, F. and K. Goka. 2006. Influence of light in acute toxicity bioassays of imidacloprid and zinc pyrithione to zooplankton crustaceans. Aquatic Toxicology 78: 262-271.

Sanchez-Bayo, F. and K. Goka. 2007. Simplified models to analyse time- and dose-dependent responses of populations to toxicants Ecotoxicology 16:511–523.

Sanchez-Bayo, F. 2009. From simple toxicological models to prediction of toxic effects in time. Ecotoxicology 18:343–354.

S n chez-Bayo, F., H.A. Tennekes and K. Goka. 2013. Impact of Systemic Insecticides on Organisms and Ecosystems, Insecticides - Development of Safer and More Effective Technologies, Stanislav Trdan (Ed.), DOI: 10.5772/52831. Available from: http://www.intechopen.com/books/insecticides-development-of-safer-and-more-effective-technologies/impact-of-systemic-insecticides-on-organisms-and-ecosystems

Selås, V., R. Steen, S. Kobro, T. Lislevand, and I. Stenberg. 2008. Direct and indirect weather impacts on spring populations of lesser spotted woodpecker (Dendrocopos minor) in Norway. Scandinavian Journal of Forest Research 23:148-153.

Setchfield, R. P., C. Mucklow, A. Davey, U. Bradter, and G. Q. A. Anderson. 2012. An agri-environment option boosts productivity of Corn Bunting Emeriza calandra in the UK. Ibis 154:235-247.

Sheehan, P.K., A. Baril, P. Mineau, D.K. Smith, A. Harfenist and W.K. Marshall. 1987. The impact of pesticides on the ecology of prairie-nesting ducks. Canadian Wildlife Service Technical Report Series No. 19. Environment Canada, Ottawa. 653 pp.

Sheehan, P., A. Baril, P. Mineau and D. Paustenbach. 1995. Predicting the effects of insecticides on aquatic systems and the waterfowl that use them. In: G.M. Rand. (Ed.) Fundamentals of Aquatic Toxicology (Second Edition), Taylor and Francis, North Palm Beach, Florida, pp. 827-857.

Shore, R.F., D.R. Crocker, H.R. Akcakaya, R.S. Bennett, P.F. Chapman, M. Clook, M. Crane, I.C. Dewhurst, P.J. Edwards, A. Fairbrother, S. Ferson, D. Fischer, A.D.M. Hart, M. Holmes, M.J. Hooper, M. Lavine, A. Leopold, R. Luttik, P. Mineau, D.R.J. Moore, S.R. Mortenson, D.G. Noble, R.J. O'connor, W. Roelofs, R.M. Sibly, G.C. Smith, M. Spendiff, T. A. Springer, H.M. Thompson, C. Topping. 2005. Case Study Part 1: How to Calculate Appropriate Deterministic Long-term Toxicity to Exposure Ratios (TERs) for Birds and Mammals. Ecotoxicology. 14(8):877-893.

Simons, L. S. and T. E. Martin. 1990. Food limitation of avian reproduction: An experiment with the Cactus Wren. Ecology 71:869-876.

Siriwardena, G. M., S. R. Ballie, H. Q. P. Crick, and J. D. Wilson. 2000. The importance of variation in the breeding performance of seed-eating birds in determining their population trends on farmland. Journal of Applied Ecology 37:128-148.

Sanchez-Bayo, F. and K. Goya. 2006. Influence of light in acute toxicity bioassays of imidacloprid and zinc pyrithione to zooplankton crustaceans. Aquat Toxicol 78(3): 262-271.

Smith, G.K. 2006. Risks to Birds from Pesticide-treated Seed and the Possible Role of Ultraviolet Reflection in Seed Colour Preferences and Repellent Strategies. Unpublished MSc. Thesis. Carleton University. 176 pp.

Smith, K.P., 2011, Surface-water, water-quality, and meteorological data for the Cambridge, Massachusetts, drinking-water source area, water years 2007–08: U.S. Geological Survey Open-File Report 2011–1077, 109 p., at http://pubs.usgs.gov/of/2011/1077.

Song, M.Y., J.D. Stark, J.J. Brown. 1997. Comparative toxicity of four insecticides, including imidacloprid and tebufenozide, to four aquatic arthropods. Environ Tox Chem. 16: 2494-2500.

Starner, K. and KS Goh. 2012. Detections of the neonicotinoid insecticide imidacloprid in surface waters of three agricultural regions of California, USA, 2010-2011. Bull Environ Contam Toxicol 88(3): 316-21.

Stephan C.E., Mount, D.I., Hansen, D.J., Gentile, J.H, Chapman, G.A., Brungs, W.A. 1985. Guidelines for deriving numerical national water quality criteria for the protection of aquatic organisms and their uses. U.S. Environmental Protection Agency. PB85-227049, Springfield, VA. 98pp.

Stoughton, S., J. Leber, J. Culp, and A. Cessna. 2008. Acute and chronic toxicity of imidacloprid to the aquatic invertebrates Chironomus tentans and Hyalella azteca under constant- and pulse-exposure conditions. Arch. Environ. Contam. Toxicol. 54(4):662-673.

Strong, A. M., C. C. Rimmer, and K. P. McFarland. 2004. Effect of prey biomass on reproductive success and mating strategy of Bicknell's Thrush (Catharus bicknelli), a polygynandrous songbird. Auk 121:446-451.

Sullivan, K. A. 1989. Predation and starvation: Age-specific mortality in juvenile juncos (Junco phaenotus). Journal of Animal Ecology 58:275-286.

Tamis, W.L.M., Gorree, M., J. Leeuw, G.R. De Snoo, and R. Luttik. 1994. The number of exposed dressed seeds in the field; an outline for field research. *In* Seed treatment: Progress and prospects. BCPC Monograph 57:471- 476.

Tennekes, H.A. 2010a. The systemic insecticides: a disaster in the making. Weevers Walburg Communicatie, Zutphen, Netherlands, 72 pp.

Tennekes, H.A. 2010b. The significance of the Druckrey–Küpfmüller equation for risk Assessment —The toxicity of neonicotinoid insecticides to arthropods is reinforced by exposure time. Toxicology 276:1-4.

Tennekes, H.A. 2011. The significance of the Druckrey–Küpfmüller equation for risk assessment —The toxicity of neonicotinoid insecticides to arthropods is reinforced by exposure time: Responding to a Letter to the Editor by Drs. C. Maus and R. Nauen of Bayer Crop Science AG. Toxicology 280(3):173-175.

Tennekes, H.A., F. Sanchez-Bayo. 2011. Time-dependent toxicity of neonicotinoids and other toxicants: implications for a new approach to risk assessment. J Environ Anal Toxicol . S4:001. http://dx.doi.org/10.4172/2161-0525.S4-001.

Tokumoto, J., M. Danjo, Y. Kobayashi, K. Kinoshita, T. Omotehara, A. Tatsumi, M. Hashiguchi, T. Sekijima, H. Kamisoyama, T. Yokoyama, H. Kitagawa, and N. Hoshi. 2013. Effects of Exposure to Clothianidin on the Reproductive System of Male Quails. The Journal of Veterinary Medical Science
J-STAGE Advance Published Date: 29 Jan 2013.

Tišler, T., A. Jemec, B. Mozetič, P. Trebše. 2009. Hazard identification of imidacloprid to aquatic environment. Chemosphere.. 76:907–914.

U.S. Environmental Protection Agency. 1994a. Imidacloprid. Review rebuttal to earlier EEB risk assessment on cotton, potatoes and apple. DP Barcode: D204032. 64pp.

U.S. Environmental Protection Agency. 1994b. Registration for imidacloprid (NTN33893). Decision Memorandum.9 pp.

U.S. Environmental Protection Agency. 2002. Response to 'Assessment of handler exposure resulting from the commercial application of acetamiprid to canola and mustard seed@. MRID 456734-01. PC Code No. 099050, DP Barcode 283286.

U.S. Environmental Protection Agency. 2003a. EFED Risk Assessment for the Seed Treatment of Clothianidin 600FS on Corn and Canola (PC Code 044309; DP Barcode: D278110). 99pp.

U.S. Environmental Protection Agency. 2003b. Addendum referring to EFED's risk assessment on clothianidin use as a seed treatment on corn and canola (PC code 044309). 4 pp.

U.S. Environmental Protection Agency. 2004. EFED Registration Chapter for Clothianidin for use on Tobacco, Turf, Apples, Pears and Ornamentals. DP Barcodes: D296177 and D257186. 96 pp.

U.S. Environmental Protection Agency. 2005. EFED Registration Chapter for Clothianidin for use on Potatoes and Grapes as a Spray treatment and as a Seed Treatment for Sorghum and Cotton. DP Barcodes: D313414, D314536 and D313415. 110 pp.

U.S. Environmental Protection Agency. 2006. Section 18 Request for Use of Clothianidin on Sugar Beet Seed to Control the Beat Leafhopper (Vector of Beet Curly Top Virus).

U.S. Environmental Protection Agency. 2007a. EFED Section 3 and IR-4 risk assessment for imidacloprid for use on soybeans, peanuts, kava, millet, oats, artichoke, wild raspberry, and caneberry subgroup 13A.
PC code 129099. 72 pp.

U.S. Environmental Protection Agency. 2007b. EFED Sction 3 Registration for a Clothianidin and Beta-Cyfluthrin combination prodct for use on sugar beets as a seed treatment. DP barcode: D335254. 91 pp.

U.S. Environmental Protection Agency. 2008a. Imidacloprid summary document registration review: Initial docket December 2008. Docket Number: EPA-HQ-OPP-2008-0844.

U.S. Environmental Protection Agency. 2008b. Ecological Risk Assessment for the Section 3 New Use Registration of Thiamethoxam on Citrus Fruits and Tree Nuts.

U.S. Environmental Protection Agency. 2009. Clothianidin Registration of New products Sepresto 75WS and PROCEED™OPTIMUM, for Seed Treatment; New Uses for the Chemical on

Tuberous and Corm Vegetables (CSG 1C), Bulb Vegetables (Seed Treatment only) (CG 3), Leafy Greens (CG4), Brassica (Cole) Vegetables (CG 5), Fruiting Vegetables (CG8), Cucurbit Vegetables (CG9), Cranberry and Low Growing Berries (Except Strawberry) (GSG13-07H), Tree Nuts (CG 14), Cereal Grains (Except Rice, Seed Treatment Only) (CG 15), Figs, Pomegranates, Cotton, Soybeans, Peach and Potato Seed Pieces Treatment. DP Barcodes: 343422, 355370, 355371, 355372, 357017, 362361, 362362.

U.S. Environmental Protection Agency. 2010. Clothianidin (Arena 50 WDG Insecticide): increase in application rate to vegetables and addition of basal bark application to trees. DP Barcode: D382365.

U.S. Environmental Protection Agency. 2011a. Revised Assessment for Clothianidin Registration of Prosper T400 Seed Treatment on Mustard Seed (Oilseed and Condiment) and PonchoN otivo Seed Treatment on Cotton. 101pp.

U.S. Environmental Protection Agency. 2011b. Thiamethoxam summary document registration review: Initial docket December 2011. Docket Number: EPA-HQ-OPP-2011-0581. 17 pp.

Van Dijk, T. 2010. Effects of neonicotinoid pesticide pollution of Dutch surface water on non-target species abundance. Unpublished MSc Thesis in Sustainable Development Track Land use, Environment and Biodiversity,Utrecht University. 75pp.

Van Vlaardingen, P.L.A., T.P. Traas, A.M. Wintersen, and T. Aldenberg. 2004. ETX2.0. A program to calculate hazardous concentrations and fraction affected, based on normally-distributed toxicity data. RIVM report (and software) 601501028/2004. National Institute for Public Health and the Environment, The Netherlands.

Verbeek, N.A.M. 1994. The use of grit in pipits, especially the American pipit. Journal of Field Ornithology. 65(4): 498-503.

Whiteside, M., P. Mineau, C. Morrison, and L.D. Knopper. 2008. Comparison of a score-based approach with risk based ranking of in-use agricultural pesticides in Canada to aquatic receptors. Integrated Environmental Assessment and Management 4(2):215-236.

Wilson, L., J. Elliot, S. Szeto, and B.Vernon. 1996. Degradation of four granular insecticides in Fraser Delta soils and implication for wildlife poisonings. Preliminary report, CWS & Agriculture and Agri-Food Canada Research Station, British Columbia.

Yackel Adams, A. A., S. K. Skagen, and J. A. Savidge. 2006. Modeling post-fledgling survival of Lark Buntings in response to ecological and biological factors. Ecology 87:178-188.

Yokoyama, A., K. Ohtsu, T. Iwafune, T. Nagai, S. Ishihara, Y. Kobara, T. Horio and S. Endo. 2009. Sensitivity difference to insecticides of a riverine caddisfly, Cheumatopsyche brevilineata (Trichoptera: Hydropsychidae), depending on the larval stages and strains. J. Pestic. Sci., 34(1), 21–26.

Zalik, N. J. and A. M. Strong. 2008. Effects of hay cropping on invertebrate biomass and the breeding of Savannah Sparrows (Passerculus sandwichensis). Auk 125:700-710.

Zanette, L., M. Clinchy, and J. N. M. Smith. 2006. Combined food and predator effects on songbird nest survival and annual reproductive success: results from a bi-factorial experiment. Oecologia 147:632-640.

Industry studies obtained through the US Freedom of Information process and reviewed for the current report

Avery, M.L., D.G. Decker and D.L. Fischer. 1993b. Cage and flight pen evaluation of avian repellency and hazard associated with imidacloprid-treated rice seed. Miles Incorporated. 57 pp.

Barfknecht, R. 1998a. Acceptance of TI 435 FS 600 - coated rape seeds (1.67 L product/100 kg seed) by Japanese Quail (Coturnix coturnix japonica). Bayer AG. 30 pp.

Barfknecht, R. 1998b. Acceptance of TI 435 FS 600 - Coating of Maize Seeds (50 g a.i./50000 seeds) by Domestic Pigeon (Columba livia-f domestica) according to BBA -Test Guideline 25-1. Bayer AG. 24 pp.

Barfknecht, R. 2000. Acceptance of TI 435 FS 600 (25 g a.i./unit) Treated Seeds by Domestic Pigeons (Columba livia f. domestica). Bayer AG. 18 pp.

Brewer, L.W., M.C. Taliaferro and V.C. Miller. 1998. The reproductive toxicity test of CGA-293343 technical with the mallard duck (Anas platyrhynchos). Novartis Crop Protection Inc. 322 pp.

Gallagher, S.P. and J.B. Beavers. 2000. TI-435 Technical: An acute oral toxicity study with the Japanese quail. Bayer Corp. 41 pp.

Gallagher, S.P., C.S. Casey, J.B. Beavers, M.J. Jaber and T.Z. Kendall. 2000a. TI-435 Technical. A reproduction study with the northern bobwhite (Colinus virginianus). Bayer Corp. 183 pp.

Gallagher, S.P., C.S. Casey, J.B. Beavers, M.J. Jaber and T.Z. Kendall. 2000b. TI-435 Technical. A reproduction study with the mallard (Anas platyrhinchos). Bayer Corp. 182 pp.

Grau, R. 1986. Bird toxicity oral / Canary Bird (Serinus canaries). NTN 33893 techn. Bayer AG. 2 pp.

Grau, R. 1987. Bird toxicity oral / pigeon (Columba livia). NTN 33893 techn. Bayer AG. 2 pp.

Grau, R. 1988. Acute oral LD50 of NTN 33893 to Japanese quail. Bayer AG. 42pp.

Grau, R. 1995. YRC 2894 techn. Acute oral Toxicity to Bobwhite Quail. Bayer AG. 39 pp.

Hancock, G.A. 1996. NTN 33893 Technical: An acute oral LD50 with mallards. Bayer Corp. 32 pp.

Hancock, G.A. 1997. Effect of technical YRC 2894 on mallard reproduction. Bayer Corp. 106 pp.

Hancock, G.A. 1998. Effect of technical YRC 2894 on mallard reproduction. Bayer Corp. 106 pp.

Hubbard, P. 2011. Acetamiprid: An Acute Oral Toxicity Study with the Zebra Finch (Poephila guttata). Nippon Soda Co. 76 pp.

Johnson, A.J. 1994. NI-25. Acute toxicity (LD50) to the mallard duck. Nippon Soda Co. 50 pp.

Johnson, A.J. 1998. TI-435 Technical acute oral toxicity (LD50) to Bobwhite quail. Ayer Corp. 47 pp.

Schmuck, R. 1997. Effects of a subchronic dietary exposure of YRC 2894 on bobwhite quail including effects on reproduction and health. Bayer AG. 163 pp.

Stafford, J.M. 2004. Acetamiprid (NI-25) – Reproductive toxicity test with mallard duck (Anas platyrhinchos). Nippon soda Co. 153 pp.

Taliaferro, M.C., L.W. Brewer and V. Miller. 1997. Reproduction study with acetamiprid in the Northern Bobwhite. Amended Final report. Rhone Poulenc Ag Company. 319 pp.

Taliaferro, M.C., and V. Miller. 1998.
Taliaferro, M.C. and V. Miller. 1999. Reproduction study with acetamiprid in the mallard duck. Rhone Poulenc Ag Company. 346 pp.

Temple, D.L., K.H. Martin, J.B. Beavers, and M. Jaber. Acetamiprid: A reproduction study with the Northern Bobwhite. Nippon Soda Co. Ltd. 186 pp.

Toll, P.A. 1990. Technical NTN 33893: An Acute Oral LD50 with Bobwhite Quail. Mobay Corporation. 25 pp.

Toll, P.A. 1991a. Technical NTN 33893: A one generation reproduction study with mallard ducks. Mobay Corporation. 114 pp.

Toll, P.A. 1991b. Technical NTN 33893: A one generation reproduction study with Bobwhite Quail. Mobay Corporation. 105 pp.

Dickcissel by Owen Deutsch

California Quail chick by Precocial, wikimedia.org

Caddisfly by Bruce Marlin, Wikimedia.org

ANNEX 1 – Toxicity of imidacloprid to aquatic invertebrates

Under Form of pesticide: FORM = formulation, TECH = Technical a.i., DEG = degradate. Under study type: A = Acute, C = Chronic. Under exposure type: S = Static, F = Flow through, SR = Static renewal.

Chemical	ai	Form	Taxon1	Taxon2	Common Name	Taxonomic	Age	AGE Class	Study Time (Value)	Study time (Unit)	Study type	Exposure type	Measure	Qualifier for Toxicity	Toxicity (ug/l)	CL (in original units)	Probit slope	Source	Reference	Study Date	Notes
Acetamiprid	Analytical grade	TECH	Crustacea	Amphipoda	Scud	Gammarus pulex			96	h	A	S	LC50		50	30.0-90.0		Original publication	Beketov and Liess 2008b		
Acetamiprid	99	TECH	Crustacea	Branchiopoda	Water flea	Daphnia magna	<24 hr	LARVAE	48	h	A	S	EC50		49800	46-62	1.48	One liner 2007, EU 2004 review		1998	
Acetamiprid	EXP 60707A (20%)	FORM	Crustacea	Branchiopoda	Water flea	Daphnia magna	<24 hr	LARVAE	48	h	A	S	EC50	>	15900			EU 2004 review			
Acetamiprid		TECH	Crustacea	Branchiopoda	Water flea	Daphnia magna			24	d	C		NOEC (reproduction)		5000			EU 2004 review		1998	
Acetamiprid	99.9	TECH	Crustacea	Malacostraca	Opossum shrimp	Americamysis bahia	<24 hr	LARVAE	96	h	A	F	LC50		66	0.056-0.082	4.5	One liner 2007		1998	
Acetamiprid		TECH	Insecta		Midge	Chironomus riparius			28	d	C		NOEC (emergence & development)		5			EU 2004 review			
Acetamiprid	Analytical grade	TECH	Insecta		Black fly	Simulium latigonium		LARVAE	96	h	A	S	LC50		3.73	1.54-9.05		Original publication	Beketov and Liess 2008b		
Acetamiprid (IC-0 Metabolite)	99.7	DEG	Crustacea	Branchiopoda	Water flea	Daphnia magna	<24 hr	LARVAE	48	h	A	SR	EC50	>	95100	N.A.	N.A.	One liner 2007, EU 2004 review		1997	
Acetamiprid (IM-1-2 Metabolite)	99.6	DEG	Crustacea	Branchiopoda	Water flea	Daphnia magna	<24 hr	LARVAE	48	h	A	SR	EC50	>	99800	N.A.	N.A.	One liner 2007, EU 2004 review		1997	
Acetamiprid (IM-1-4	98.7	DEG	Crustacea	Branchiopo	Water flea	Daphnia magna	<24	LARVAE	48	h	A	SR	EC50		43900	34.8-55.9	3.56	One liner 2007		1997	

Metabolite)				da			hr													
Acetamiprid (IM-1-4 Metabolite)	98.7	DEG	Crustacea	Branchiopoda	Water flea	Daphnia magna	<24 hr		48	h	A		EC50		43900	34.8-55.9	3.56	One liner 2007, EU 2004 review		1997	
Acetamiprid (IM-1-4 Metabolite)	99.6	DEG	Crustacea	Malacostraca	Opossum shrimp	Americamysis bahia	<24 hr	LARVAE	96	h	A	F	LC50		19000	15-24	4.5	One liner 2007		1997	
Acetamiprid (IM-1-4 Metabolite)		DEG	Insecta		Midge	Chironomus riparius			48	h	A		LC50		76000			EU 2004 review			
Clothianidin	97.6	TECH	Crustacea	Branchiopoda	Water flea	Daphnia magna	<24 hr	LARVAE	48	h	A	S	EC50	>	119000	N.A.		One Liner 2007, EPA 2003 assessment for corn and canola	Palmer 2000	2000	
Clothianidin	97.6	TECH	Crustacea	Branchiopoda	Water flea	Daphnia magna	<24 hr	LARVAE	48	h	A		EC50		109523	N.A.		EPA 2003 Fact Sheet		2000	
Clothianidin		TECH	Crustacea	Branchiopoda	Water flea	Daphnia magna			21	d	C		NOEC (number of young)		120	N.A.	N.A.	EU 2005 Summary; PMRA 2011			
Clothianidin		TECH	Crustacea	Branchiopoda	Water flea	Daphnia magna			21	d	C		NOEC (number of young)		42	N.A.	N.A.	EPA 2003 assessment for corn and canola	Noack et al. 1998	1998	
Clothianidin		TECH	Crustacea	Branchiopoda	Water flea	Daphnia magna			21	d	C		LC50		17300	N.A.	N.A.	PMRA 2011			
Clothianidin	97.6	TECH	Crustacea	Malacostraca	Opossum shrimp	Americamysis bahia	<24 hr	LARVAE	96	h	A	F	LC50		51	0.044-0.057		One Liner 2007, EPA 2003 Fact sheet; PMRA 2011		2000	
Clothianidin		TECH	Crustacea	Malacostraca	Opossum shrimp	Americamysis bahia			39	d	C		NOEC (number of young)		5.1		N.R.	EPA 2003 assessment for corn and canola; PMRA 2011	Drottar et al. 2000		Note factor of 10 from acute data. Very different from Daphnia ratio of >2800
Clothianidin		TECH	Crustacea	Malacostraca	Opossum shrimp	Americamysis bahia			39	d	C		EC50 (reproduction)		7.6		N.R.	PMRA 2011	Drottar et al. 2000		
Clothianidin		TECH	Insecta		Midge	Chironomus riparius			28	d	C		EC15 (larval emergence)		0.72			EU 2005 Summary; Footprint			Footprint DB gives this as the NOEC

																	DB; PMRA 2011			
Clothianidin		TECH	Insecta		Midge	Chironomus riparius			28	d	C		EC50 (emergence)		1			PMRA 2011			Footprint DB gives this as the NOEC
Clothianidin		TECH	Insecta		Midge	Chironomus riparius			48	h	A		EC50		22			EPA 2003 Fact Sheet, corn and canola assessment	Mattlock 2001		
Clothianidin		TECH	Insecta		Midge	Chironomus riparius			48	h	A		EC50		29			EU 2005 Summary			
Clothianidin		TECH	microcosm			micocosm					C		EAC		3.1			EU 2005 Summary			
Clothianidin MNG metabolite	99	DEG	Crustacea	Branchiopoda	Water flea	Daphnia magna	<24 hr	LARVAE	48	h	A	S	EC50	>	100800	N.A.	N.A.	EPA 2003 corn and canola assessment.	Hendel 2000	2000	Note that One Liner 2007 refers to this value as TZNG
Clothianidin TNG metabolite	95.1	DEG	Crustacea	Branchiopoda	Water flea	Daphnia magna	<24 hr	LARVAE	48	h	A	S	EC50	>	115200	N.A.	N.A.	EPA 2003 corn and canola assessment.	Hendel 2000	2000	
Clothianidin TZNG metabolite	99	DEG	Crustacea	Branchiopoda	Water flea	Daphnia magna	<24 hr	LARVAE	48	h	A	S	EC50		640	N.A.	N.A.	EPA 2003 corn and canola assessment	Hendel 2000	2000	
Clothiniadin MU metabolite		DEG	Insecta		Midge	Chironomus riparius	2-3D	LARVAE	48	h	A		LC50	>	83600	NA	NA	EPA 2003 corn and canola assessment.			Note possible inconsistency between test species in naming of metabolites
Clothiniadin TMG metabolite	98.2	DEG	Insecta		Midge	Chironomus riparius	2-3D	LARVAE	672	h	C	S	LC50	<	18	NA	NA	One liner 2005	BAY	1998	
Clothiniadin TZMU metabolite		DEG	Insecta		Midge	Chironomus riparius	2-3D	LARVAE	48	h	A		LC50	>	102000	NA	NA	EPA 2003 corn and canola assessment.			Note possible inconsistency between test species in naming of metabolites
Clothiniadin TZNG metabolite		DEG	Insecta		Midge	Chironomus riparius	2-3D	LARVAE	48	h	A		LC50		386	NA	NA	EPA 2003 corn and canola assessmen			Note possible inconsistency between

																	t.			test species in naming of metabolites
Dinotefuran	99.2	TECH	Crustacea	Malacostraca	Opossum shrimp	Americamysis bahia	<24 Hr		96	h	A	F	LC50		790	0.49-1.0	NA	One Liner 2007		2001	
Dinotefuran			Crustacea	Branchiopoda	Water flea	Daphnia magna	<24 Hr		48	h	A		EC50	>	110600	NA	NA	One Liner 2007		2001	
Dinotefuran	97.26	TECH	Crustacea	Branchiopoda	Water flea	Daphnia magna	<24 Hr	LARVAE	48	h	A	S	EC50	>	968300	NA	NA	One Liner 2007		2000	
dinotefuran		TECH	Crustacea	Branchiopoda	Water flea	Daphnia magna		UNKNOWN	48	h	A		EC50		1000000			FOOTPRINT DB			
Dinotefuran		TECH	Crustacea	Malacostraca	Crayfish	Orconectes nais	NR	UNKNOWN	48	h	A		LC50		4840			Pesticide Manual (14th ed)			
dinotefuran	NR	TECH	Crustacea	Malacostraca	Crayfish	Orconectes nais	NR	UNKNOWN	48	h	A		LC50		7071.067812			PM 2000			
Imidacloprid	96.2	TECH	Crustacea	Malacostraca	Opossum shrimp	Americamysis bahia	Juv	JUVENILE	96	h	A	F	LC50		38	0.0260-.046	N.R.	One liner 2004, 2007	TES	1990	
Imidacloprid	22.7	FORM	Crustacea	Malacostraca	Opossum shrimp	Americamysis bahia	<24 hr	LARVAE	96	h	A	S	LC50		159	0.138-0.046	N.R.	One liner 2004, 2007	TES	1992	
Imidacloprid			Crustacea	Malacostraca	Saltwater shrimp	Americamysis bahia			96	h	A		LC50		37			Stoughton et al. 2008	Cox 2001 and Felsot & Ruppert 2002		
Imidacloprid	96.2	TECH	Crustacea	Malacostraca	Saltwater shrimp	Americamysis bahia			96	h	A		LC50		34.1			CCME 2007	Ward 1990b (Bayer)		
Imidacloprid	240 g/L	FORM	Crustacea	Malacostraca	Saltwater shrimp	Americamysis bahia			96	h	A		LC50		36			CCME 2007	Lintott 1992 (Bayer)		
Imidacloprid	96.2	TECH	Crustacea	Malacostraca	Saltwater shrimp	Americamysis bahia			96	h	A		LC50		37.7			CCME 2007	Ward 1990b (Bayer)		
Imidacloprid	>95%	TECH	Crustacea		Brine shrimp	Artemia sp.			48	h	A		LC50		361230	307830-498090	3.47	Original publication	Song et al. 1997		Test at 27 degrees C
Imidacloprid		FORM	Crustacea		Isopod	Asellus aquaticus			48	h	A	S	LC50		8500			Original publication	Lukancic et al. 2010		
Imidacloprid	40.00%	FORM	Crustacea	Cladocera	Cladocera n	Ceriodaphnia dubia			48	h	A	S	LC50		2.07	1.14-3.30	0.78	Original publication	Chen et al. 2009		
Imidacloprid	99.50%	TECH	Crustacea			Chydorus sphaericus			24	h	A	S	EC50 (immobility)		1469	250-8619		Original publication	Sanchez-Bayo and Goka 2006		
Imidacloprid		FORM	Crustacea	Amphipoda	Scud	Hyalella azteca	2-9 d		28	d	C	SR	LC50		7.08	2.95-16.98		Original publication	Stoughton et al. 2008		Observation time extended to 28 d

Imidacloprid	99.50%	TECH	Crustacea			Chydorus sphaericus			48	h	A	S	EC50 (immobility)		832	274-2522		Original publication	Sanchez-Bayo and Goka 2006		
Imidacloprid	99.50%	TECH	Crustacea			Cypretta seurati			24	h	A	S	LC50		732	456-1176		Original publication	Sanchez-Bayo and Goka 2006		Note wide spread between immobility EC50 and LC50
Imidacloprid			Crustacea		Saltwater shrimp	Americamysis bahia			28	d	C		EC50 (body length)		0.3			Stoughton et al. 2008	Cox 2001 and Felsot & Ruppert 2002		
Imidacloprid	99.50%	TECH	Crustacea			Cypretta seurati			24	h	A	S	EC50 (immobility)		46	13-161		Original publication	Sanchez-Bayo and Goka 2006		Note wide spread between immobility EC50 and LC50
Imidacloprid	99.50%	TECH	Crustacea			Cypretta seurati			48	h	A	S	LC50		301	187-485		Original publication	Sanchez-Bayo and Goka 2006		Note wide spread between immobility EC50 and LC50
Imidacloprid	99.50%	TECH	Crustacea			Cypretta seurati			48	h	A	S	EC50 (immobility)		16	7-39		Original publication	Sanchez-Bayo and Goka 2006		Note wide spread between immobility EC50 and LC50
Imidacloprid	99.50%	TECH	Crustacea	Ostracoda		Cypridopsis vidua			24	h	A	S	LC50	>	4000			Original publication	Sanchez-Bayo and Goka 2006		Note large difference between EC50 and LC50
Imidacloprid	99.50%	TECH	Crustacea	Ostracoda		Cypridopsis vidua			24	h	A	S	EC50 (immobility)		8	1.3-47		Original publication	Sanchez-Bayo and Goka 2006		Note large difference between EC50 and LC50
Imidacloprid	99.50%	TECH	Crustacea	Ostracoda		Cypridopsis vidua			48	h	A	S	LC50		715	365-1400		Original publication	Sanchez-Bayo and Goka 2006		Note large difference between EC50 and LC50
Imidacloprid	99.50%	TECH	Crustacea	Ostracoda		Cypridopsis vidua			48	h	A	S	EC50 (immobility)		3	0.5-15		Original publication	Sanchez-Bayo and Goka 2006		Note large difference between EC50 and LC50
Imidacloprid		TECH	Crustacea	Branchiopo	Water flea	Daphnia magna			24	h	A		LC50		97900	81.4-127.7		Original publication	Tisler et al. 2009		

				da																
Imidacloprid		FORM	Crustacea	Branchiopoda	Water flea	Daphnia magna			24	h	A		LC50		38000	32-48		Original publication	Tisler et al. 2009		
Imidacloprid	95.4	TECH	Crustacea	Branchiopoda	Water flea	Daphnia magna	<24 hr	LARVAE	48	h	A	S	EC50 (immobility)		85200	75-113	11	One liner 2004, 2007; Pesticide Manual, EPA 2007 assessment	Young 1990 (Bayer)	1990	
Imidacloprid	>95%	TECH	Crustacea	Branchiopoda	Water flea	Daphnia magna			48	h	A		LC50		17360	12510-30050	1.86	Original publication	Song et al. 1997		Test at 20 degrees C
Imidacloprid		TECH	Crustacea	Branchiopoda	Water flea	Daphnia magna			48	h	A		LC50		56600	34.4-77.2		Original publication	Tisler et al. 2009		
Imidacloprid		FORM	Crustacea	Branchiopoda	Water flea	Daphnia magna			48	h	A		LC50		30000	28-44		Original publication	Tisler et al. 2009		
imidacloprid	NR	TECH	Crustacea	Branchiopoda	Water flea	Daphnia magna	NR	UNKNOWN	48	h	A		EC50	>	32000			Agritox	Bayer France		
Imidacloprid		TECH	Crustacea	Branchiopoda	Water flea	Daphnia magna			48	h	A		LC50		64873			Original publication	Sanchez-Bayo 2009		
Imidacloprid	>95%	TECH	Crustacea	Branchiopoda	Water flea	Daphnia magna			48	h	A		LC50		10440	6970-17710	1.86	Original publication	Song et al. 1997		Test at 27 degrees C
Imidacloprid		FORM	Crustacea		Scud	Gammarus fossarum			48	h	A	S	LC50		800			Original publication	Lukancic et al. 2010		
Imidacloprid	Analytical grade	TECH	Crustacea	Amphipoda	Scud	Gammarus pulex			96	h	A	S	LC50		350	210-570		Original publication	Beketov and Liess 2008b		Drift seen at approx. 1/10 of LC50
Imidacloprid			Crustacea	Amphipoda	Scud	Gammarus roselli		ADULTS	96	h	A		EC50		29			Mohr et al. 2012	R. Boettger, pers. Comm.		
Imidacloprid		TECH	Crustacea	Amphipoda	Scud	Hyalella azteca			48	h	A		EC50		115			EPA 2007 assessment	England & Bucksath 1991 (Bayer)	1991	Stoughton et al. using the same industry source give EC50 of 55
Imidacloprid		TECH	Crustacea	Amphipoda	Scud	Hyalella azteca	2-9 d		96	h	A	S	LC50		65.43			Original publication	Stoughton et al. 2008		
Imidacloprid		FORM	Crustacea	Amphipoda	Scud	Hyalella azteca	2-9 d		96	h	A	S	LC50		17.44			Original publication	Stoughton et al. 2008		
Imidacloprid		FORM	Crustacea	Amphipoda	Scud	Hyalella azteca	2-9 d		96	h	A	S	LC50		9.74	5.56-17.05		Original publication	Stoughton et al. 2008		Observation time extended to 28 d

Imidacloprid		TECH	Crustacea	Amphipoda	Scud	Hyalella azteca			96	h	A		LC50		526			Stoughton et al. 2008	England & Bucksath 1991 (Bayer)	1991	Reporting error? Much higher than 48h value.
Imidacloprid		TECH	Crustacea	Amphipoda	Scud	Gammarus pulex			28	d	C	S	NOEC (swimming behaviour)		64			Draft assessment report from Germany (rapporteur State) 2005			
Imidacloprid	95.9	TECH	Crustacea	Branchiopoda	Water flea	Daphnia magna			21	d	C	SR	NOEC (Reproduction)		1800			EPA 2007 assessment, EFSA 2008 Scientific Report	Young 1990 (Bayer)	1990	
Imidacloprid		FORM	Crustacea	Branchiopoda	Water flea	Daphnia magna			21	d	C	SR	NOEC (Reproduction)		5000			Original publication	Jemec et al. 2007		NOEC for protein content of 2500
Imidacloprid		TECH	Crustacea	Branchiopoda	Water flea	Daphnia magna			21	d	C	SR	NOEC (Reproduction)		2500			Original publication	Jemec et al. 2007		NOEC for protein content of 1250
Imidacloprid	99.50%	TECH	Crustacea			Ilyocypris dentifera			24	h	A	S	LC50		759	337-1709		Original publication	Sanchez-Bayo and Goka 2006		Note large difference between EC50 and LC50
Imidacloprid		TECH	Crustacea	Branchiopoda	Water flea	Daphnia magna			10	d	C		LC50		9500			Original publication	Sanchez-Bayo 2009		
Imidacloprid	99.50%	TECH	Crustacea			Ilyocypris dentifera			24	h	A	S	EC50 (immobility)		5	1-25		Original publication	Sanchez-Bayo and Goka 2006		Note large difference between EC50 and LC50
Imidacloprid	96.2	TECH	Crustacea	Malacostraca	Opossum shrimp	Americamysis bahia					C		NOEC (growth and survival)		0.6			EPA 2007 assessment	Ward 1990 (Bayer)	1990	
Imidacloprid	99.50%	TECH	Crustacea			Ilyocypris dentifera			48	h	A	S	LC50		214	98-463		Original publication	Sanchez-Bayo and Goka 2006		Note large difference between EC50 and LC50
Imidacloprid	99.50%	TECH	Crustacea			Ilyocypris dentifera			48	h	A	S	EC50 (immobility)		3	0.2-48		Original publication	Sanchez-Bayo and Goka 2006		Note large difference between EC50 and LC50

Imidacloprid	99.50%	TECH	Crustacea		Grass shrimp	Palaemonetes pugio		LARVAE	96	h	A	SR	LC50		308.8	273.6-348.6		Original publication	Key et al. 2007		
Imidacloprid	99.50%	TECH	Crustacea		Grass shrimp	Palaemonetes pugio		ADULTS	96	h	A	SR	LC50		563.5	478.1-664.2		Original publication	Key et al. 2007		
Imidacloprid		TECH	Insecta		Midge	Chironomus tentans		LARVAE	48	h	A		EC50		69			EPA 2007 assessment	Gagliano 1991 (Bayer)	1991	
Imidacloprid		TECH	Insecta		Midge	Chironomus riparius			24	h	A		LC50		55.2			EFSA 2008 Scientific report			
Imidacloprid		TECH	Insecta		Midge	Chironomus riparius			28	d	C	S	EC50 (emergence)		3.11			EFSA 2008 Scientific report			
Imidacloprid	Confidor SL 200	FORM	Insecta		Midge	Chironomus riparius			28	d	C	S	EC50 (emergence)		3.6			EFSA 2008 Scientific report			
Imidacloprid		FORM	Insecta		Mayfly	Epeorus longimanus		LARVAE	24	h	A	S	LC50		2.1			Original publication	Alexander et al. 2007		
Imidacloprid		FORM	Insecta		Mayfly	Epeorus longimanus		LARVAE	96	h	A	S	LC50		0.65			Original publication	Alexander et al. 2007		
Imidacloprid		FORM	Insecta		Midge	Chironomus riparius		LARVAE	96	h	A	S	EC50		12.9			Original publication	Pestana et al. 2009		Anti-predator behavious compromised
Imidacloprid		TECH	Insecta		Midge	Chironomus tentans		LARVAE	96	h	A	S	LC50		5.75			Original publication	Stoughton et al. 2008		
Imidacloprid		FORM	Insecta		Midge	Chironomus tentans		LARVAE	96	h	A	S	LC50		5.4			Original publication	Stoughton et al. 2008		
Imidacloprid		TECH	Insecta		Midge	Chironomus tentans		LARVAE	28	d	C		EC50 (emergence)		0.91	0.73-1.12		Original publication	Stoughton et al. 2008		Observation period extended to 28 d
Imidacloprid		TECH	Insecta		Midge	Chironomus tentans		LARVAE	96	h	A		LC50		10.5			Stoughton et al. 2008	Gagliano 1991 (Bayer)	1991	
Imidacloprid		FORM	Insecta		Mayfly	Heptageniid mayfly'		LARVAE	96	h	A		LC50		3.7			Leblanc et al. 2012	Leblanc et al. 2010 (unpublished thesis)		
Imidacloprid		FORM	Insecta		Midge	Chironomus dilutus		LARVAE	96	h	A		LC50		2.65			Original publication	Leblanc et al. 2012		
Imidacloprid		FORM	Insecta		Midge	Chironomus tentans		LARVAE	10	d	C		LC50		3.17			Stoughton et al. 2008	Gagliano 1991 (Bayer)	1991	
Imidacloprid	>95%	TECH	Insecta		Freshwater mosquito	Aedes aegypti			48	h	A		LC50		44	41-47	4.02	Original publication	Song et al. 1997		Test at 27 degrees C
Imidacloprid	>95%	TEC	Insecta		Freshwat	Aedes aegypti			48	h	A		LC50		45	42-48	4.33	Original	Song et al.		Test at 20

		H			er mosquito													publication	1997		degrees C
Imidacloprid	>95%	TEC H	Insecta		Saltwater mosquito	Aedes taeniorhynchus			48	h	A		LC50		13	10.0-16.0	3.63	Original publication	Song et al. 1997		Test at 27 degrees C
Imidacloprid	>98%	TEC H	Insecta		Black fly	Simulium vittatum			48	h	A	S	LC50		8.09			Original publication	Overmyer et al. 2005		Geomean from 3 separate tests based on measured concentrations
Imidacloprid	200 g/L	FOR M	Insecta			Pteronarcys dorsata		LARVAE	14	d	C		LC50		70.1			van Dijk 2010	Kreutzweiger et al. 2008		Not found with ref provided
Imidacloprid	Analytical grade	TEC H	Insecta		Black fly	Simulium latigonium		LARVAE	96	h	A	S	LC50		3.73	1.54-9.05		Original publication	Beketov and Liess 2008b		
Imidacloprid	Analytical grade	TEC H	Insecta		Mayfly	Baetis rhodani		LARVAE	48	h	A	S	LC50		8.49	4.45-16.20		Original publication	Beketov and Liess 2008b		Drift seen at approx. 1/10 of LC50
Imidacloprid		TEC H	microcosm			microcosm					C	S (2X at 21 d interval)	NOEC		0.6			EFSA 2008 Scientific report			Based on toxicity to chironomids and Batidae
Imidacloprid	20.00%	FOR M	Crustacea	Cladocera	Cladoceran	Ceriodaphnia dubia			48	h	A	SR	EC50 (immobility)		572	290-841		Original publication	Hayasaka et al. 2012		
Imidacloprid	20.00%	FOR M	Crustacea	Cladocera	Cladoceran	Ceriodaphnia reticulata			48	h	A	SR	EC50 (immobility)		5553	4213-7388		Original publication	Hayasaka et al. 2012		
Imidacloprid	20.00%	FOR M	Crustacea	Cladocera	Cladoceran	Daphnia magna			48	h	A	SR	EC50 (immobility)		43265	34302-53592		Original publication	Hayasaka et al. 2012		
Imidacloprid	20.00%	FOR M	Crustacea			Daphnia pulex			48	h	A	SR	EC50 (immobility)		36872	28399-48106		Original publication	Hayasaka et al. 2012		
Imidacloprid	20.00%	FOR M	Crustacea	Cladocera		Moina macrocopa			48	h	A	SR	EC50 (immobility)		45271	34378-62218		Original publication	Hayasaka et al. 2012		
Imidacloprid	Analytical grade	TEC H	Insecta		Caddisfly	Cheumatopsyche brevilineata		LARVAE	48	h	A	S	LC50		6.59			Original publication	Yokoyama et al. 2009		First instar results (most sensitive). Geomean of two populations
Imidacloprid		FOR M	Insecta		Midge	Chironomus riparius		LARVAE	48	h	A	S	EC50		19.9			Leblanc et al. 2012	Azevedo-Pereira et al. 2011		
Imidacloprid-5-hydroxy		DEG	Insecta		Midge	Chironomus riparius			24	h	A		LC50		668			EFSA 2008 Scientific report			
Imidacloprid-AMCP		DEG	Insecta		Midge	Chironomus riparius			28	d	C	S	EC50 (emergence)	>	105000			EFSA 2008 Scientific report			

Imidacloprid-desnitro		DEG	Insecta		Midge	Chironomus riparius			28	d	C	S	EC50 (emergence)		46000			EFSA 2008 Scientific report			
Imidacloprid-desnitro-olefine		DEG	Insecta		Midge	Chironomus riparius			28	d	C	S	EC50 (emergence)		21300			EFSA 2008 Scientific report			
Imidacloprid-nitroso		DEG	Insecta		Midge	Chironomus riparius			24	h	A		LC50		283			EFSA 2008 Scientific report			
Imidacloprid-urea		DEG	Insecta		Midge	Chironomus riparius			28	d	C	S	EC50 (emergence)		73600			EFSA 2008 Scientific report			
Thiacloprid	97.5	TECH	Insecta		Midge	Chironomus riparius	1st in	LARVAE	672	h	C	S	EC50		1.8	0.0016 -0.002	NR	One liner 2005	BCA	1996	
Thiacloprid	44SC	FORM	Crustacea	Malacostraca	Opossum shrimp	Americamysis bahia	<24 hr	LARVAE	96	h	A	F	LC50		50	0.039-0.064	NR	One liner 2007	WLI	1997	
Thiacloprid	99.3	TECH	Crustacea	Malacostraca	Opossum shrimp	Americamysis bahia	<24 hr		96	h	A	F	LC50		31	0.027-0.037	5.06	One Liner 2007		1996	
Thiacloprid	97.2	TECH	Crustacea	Amphipoda	Scud	Hyalella azteca	14-21		96	h	A	S	LC50		37	0.03-0.05	2.62	One Liner 2007		1996	
Thiacloprid	97.2	TECH	Crustacea	Branchiopoda	Water flea	Daphnia magna	1st in	LARVAE	48	h	A	S	EC50		22520	19.24-26.	3.94	One Liner 2007		1995	
Thiacloprid		TECH	Crustacea	Branchiopoda	Water flea	Daphnia magna			48	h	A		EC50		85100			Footprint DB			
Thiacloprid		TECH	Crustacea	Branchiopoda	Water flea	Daphnia magna			21	d	C		NOEC		580			Footprint DB			
Thiacloprid		FORM	Crustacea	Branchiopoda	Water flea	Daphnia magna			24	h	A	S	LC50		4100			Original publication	Beketov and Liess 2008a		Extended post treatment observation period - evidence of delayed effects
Thiacloprid		FORM	Crustacea		Isopod	Asellus aquaticus			24	h	A	S	LC50		153			Original publication	Beketov and Liess 2008a		Extended post treatment observation period - evidence of delayed effects
Thiacloprid		FORM	Crustacea	Amphipoda	Scud	Gammarus pulex			24	h	A	S	LC50		190			Original publication	Beketov and Liess 2008a		Extended post treatment observation

																				period - evidence of delayed effects
Thiacloprid		FORM	Insecta		Dragon fly	Sympetrum striolatum		LARVAE	24	h	A	S	LC50		31.19			Original publication	Beketov and Liess 2008a		Extended post treatment observation period - evidence of delayed effects
Thiacloprid		FORM	Insecta		Caddisfly	Notidobia ciliaris		LARVAE	24	h	A	S	LC50		6.78			Original publication	Beketov and Liess 2008a		Extended post treatment observation period - evidence of delayed effects
Thiacloprid		FORM	Insecta		Black fly	Simulium latigonium		LARVAE	24	h	A	S	LC50		5.47			Original publication	Beketov and Liess 2008a		Extended post treatment observation period - evidence of delayed effects
Thiacloprid		FORM	Insecta		Mosquito	Culex pipiens		LARVAE	24	h	A	S	LC50		5.76			Original publication	Beketov and Liess 2008a		Extended post treatment observation period - evidence of delayed effects
Thiacloprid		FORM	Insecta		Midge	Chironomus tepperi		LARVAE	24	h	A		LC50		1.58			Beketov and Liess 2014	Stevens et al. 2005		
Thiacloprid	Analytical grade	TECH	Crustacea	Amphipoda	Scud	Gammarus pulex			96	h	A	S	LC50		350	210-570		Original publication	Beketov and Liess 2008b		
Thiacloprid	Analytical grade	TECH	Insecta		Mayfly	Baetis rhodani		LARVAE	96	h	A	S	LC50		4.6	3.74-5.66		Original publication	Beketov and Liess 2008b		
Thiacloprid (Metabolite)	97.4	DEG	Crustacea	Amphipoda	Scud	Hyalella azteca	14-21	UNKNOWN	96	h	A	S	LC50		31180	20.37-77.	1.147	One liner 2005	BCA	1997	
Thiacloprid (Sulfonic Acid metabolite)	89.9	DEG	Crustacea	Branchiopoda	Water flea	Daphnia magna	1st in	LARVAE	48	h	A	S	LC50	>	96100	NA	NA	One Liner 2007		1995	
Thiamethoxam	98.6	TECH	Crustacea	Branchiopoda	Water flea	Daphnia magna	<24	LARVAE	48	h	A	S	EC50	>	106000	N.A.	N.A.	One liner 2007	NCP	1996	

							hr													
Thiamethoxam	99.2	TECH	Crustacea	Malacostraca	Opossum shrimp	Americamysis bahia	<24 hr	LARVAE	96	h	A	F	LC50		6900	5.8-8.4	3.8	One liner 2007	WLI	1997	
Thiamethoxam		TECH	Crustacea	Ostracoda	seed shrimp	Chaoborus sp.			48	h	A		EC50		180			EU 2006 review			
Thiamethoxam		TECH	Insecta			Cloeon sp.			48	h	A		EC50		14			EU 2006 review			
Thiamethoxam	WG25	FORM	Crustacea	Branchiopoda	Water flea	Daphnia magna			48	h	A		EC50	>	25000	N.A.	N.A.	EU 2006 review			
Thiamethoxam	98.6	FORM	Crustacea	Branchiopoda	Water flea	Daphnia magna			48	h	A		EC50		27300	N.A.	N.A.	EU 2006 review			
Thiamethoxam		TECH	Crustacea	Branchiopoda	Water flea	Daphnia magna			21	d	C		NOEC		100000			EU 2006 review			
Thiamethoxam		TECH	Insecta		Midge	Chironomus riparius			30	d	C		NOEC (emergence)		10			EU 2006 review			PMRA 2007 gives the chronic EC50 as 11
Thiamethoxam		TECH	Insecta		Midge	Chironomus riparius				h	A		EC50		35			PMRA 2007			Given as acute endpoint for exposure period not stated
Thiamethoxam		TECH	Crustacea			Americamysis bahia			96	h	A		EC50		5400			PMRA 2007			Given as acute endpoint for exposure period not stated. Assumed to be 96 h based on US info from same test
Thiamethoxam CGA322704		DEG	Crustacea	Branchiopoda	Water flea	Daphnia magna			48	h	A		EC50	>	100000			EU 2006 review			
Thiamethoxam CGA322704		DEG	Insecta		Midge	Chironomus riparius			28	d	C		NOEC (emergence)		0.67			EU 2006 review			
Thiamethoxam CGA355190		DEG	Crustacea	Branchiopoda	Water flea	Daphnia magna			48	h	A		EC50	>	100000			EU 2006 review			
Thiamethoxam NOA407475		DEG	Crustacea	Branchiopoda	Water flea	Daphnia magna			48	h	A		EC50		82900			EU 2006 review			
Thiamethoxam NOA407475		DEG	Insecta		Midge	Chironomus riparius			28	d	C		NOEC (emergence & development)	>	1000						

Thiamethoxam NOA459602	99	DEG	Crustacea	Branchiopoda	Water flea	Daphnia magna			48	h	A		EC50	>	120000			EU 2006 review			
Thiamethoxam NOA459602		DEG	Insecta		Midge	Chironomus riparius			28	d	C		NOEC (development)		50000						

Altricial chicks, wikimedia.org

Submitter Details

First Name: **Graeme**
Last Name: **Sawyer**
Street: **10 Birch St**
Suburb: **Johnsonville**
City: **Wellington**
Country: **New Zealand**
PostCode: **6037**
Daytime Phone: **(04) 9387007**
Mobile: **027 444 1748**
eMail: **Graeme.Sawyer007@gmail.com**

Trade competition and adverse effects:
○ I could ○ I could not
gain an advantage in trade competition through this submission
○ I am ○ I am not
directly affected by an effect of the subject matter of the submission that :
a. adversely affects the environment, and
b. does not relate to the trade competition or the effects of trade competitions.

Wishes to be heard:
◉ Yes
○ I do NOT wish to speak in support of my submission and ask that the following submission be fully considered.

Preferred hearing location:
○ Oral Hearings - Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

Hearing Needs:

Correspondence to:
◉ Submitter
○ Agent
○ Both

Submission

1. Overall, do you support or oppose the general direction of Our Natural Capital?

○ Strongly oppose ○ Oppose ◉ Neither support nor oppose ○ Support ○ Strongly support

Why do you say this?
Its sign of how well WCC does on many aspects of biodiversity that I cant oppose this plan, - I support the good things in the document, which are very many, so please forgive me if I devote my comments soley to where I think it can be improved. . I think the documents structure - having strategies and action plans in the same document - is flawed. the result is unwieldy, and way too long. I suspect you will receive few submissions because few will have the energy to read it all! Many Strategies are great, but the paucity of meaningful action plans is quite disappointing. Failure to mitigate the negative ecological effects of intensification of suburbs by integrating higher

minimum requirements for greenspaces is a big problem. This may be mostly a failing of other council plans (urban development plans, etc), but there is insufficient in this plan to push other parts of council to mitigate that intensification with measures that will maximise biodiversity.

2. Do you support the Guiding Principles, Goals and Outcomes?

○ Strongly oppose ○ Oppose ○ Neither support nor oppose ◉ Support ○ Strongly support

Why do you say this?
They are great, but so high level!

3. Do you think we have identified the biggest issues facing indigenous biodiversity in Wellington?

○ Yes ◉ No

Your comments
WCC undoubtedly does lots of things really well in this space, but where it has failed in recent years is making such hard line distinctions between amenity planting and 'ecological' planting. If Wellington is to be a unique and individual place, it should be more bold about featuring its INDIGENOUS biodiversity more prominently. Its great that WCC doesn't plant european trees everywhere, but its a disgrace that it does plants pohutukawas everywhere and treats that as 'OK' simply because they are 'native' and easy to grow with minimal effort. This is downright perverse, when they are 300km south of their natural range, hybridise readily with our precious (and now very scarce) Rata, and spread like weeds everywhere! The net effect of this on Indigenous biodiversity is negative, and substantial. Its not OK- and this plan does nothing at all to stop that. As the city grows, and more planting becomes 'amenity' planting, so this will continue - and the only way to stop that is by clearly specifying in this document that a much higher level of Endemic biodiversity is required. Huge areas of reserve are covered in pest plants with no specific plan to 'restore'.

4. Do you think we have identified the right priorities in order to achieve our desired outcomes for biodiversity in Wellington?

○ Yes ○ No

Your comments
I think there is too much emphasis on 'Protect' - if its not currently 'of ecological significance', then it has scarce chance of becoming so under this plan, as there is just too little emphasis on 'Action' to 'Restore:

5. Do you think we have identified the right organisations to partner with to achieve our objectives?

◉ Yes ○ No

Your comments

6. Do you think we have the right indicators and targets to measure our performance by?

○ Yes ◉ No

Your comments
.....again, because there is insufficient detail here to know what will actually be measured. I suspect there will only be resource available to measure a very narrow cross-section of the total, and such measurements are very susceptible to error (ie not being truly representative of the whole).

---

7. Do you agree with our direction for the tiered support for community groups?

○ Yes ◉ No

Your comments
Because it will likely result in areas with good to excellent biodiversity getting higher levels of resource than areas of very low biodiversity that have less community groups active in working on them. This will exacerbate the current 'imbalance - there is more to gain in the long term by ensuring all reserve land (and as much other unused land as possible) is re-populated with at least 'nursery' species like Kanuka, so its even possible to plant canopy species in decades to come. by establishing situation where makes no reference to the resource It seems very odd that the report trumpets the increase in community planting groups on one hand, then on the other introduces a plan that might discourage 'startups' because they tick too few boxes to justify the level of support they might need.....

---

8. Is there anything you feel has not been adequately covered by the draft plan?

◉ Yes ○ No

Your comments
as above, but mostly Action Plans - without more and more detailed ones, much of the the fine sentiment of the strategy will never be implemented..... Review of 'Responsible Pet Ownership' gets a cursory mention, but the damage done by cats is so clar it warrants stronger wording: cats kill untold hundreds of thousands thousands of our native fauna..... Licensing of cats needs to be directly flagged as a happen, so more responsible pet ownership can be incentivised

---

9. Do you have additional comments? (please attach additional pages via the 'Supporting Information' tab)

◉ Yes ○ No

Your comments
Simple targets - even at low levels - for increasing plant biodiversity by planting heritage endemic canopy trees where their is no prospect of self seeding - would be such a good 'action point'; this would give focus to community planting groups, and provide a truly meaningful criteria for sele[illegible]

'priority: groups to support - ie, provide the resource where it will do the most good. Dont be afraid to plant nursery species in corners of public parks to help establish canopy natives: Don't assume the public wants instant gratification from amenity planting - simply communicate that this corner of the park is destined to be rata/rimu forest and will take 200 years to mature - people will understand, and they will love you for having the vision to create something meaningful for future generations, in a place where they will see it most often.

Attached Documents

File
Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

Submitter Details

First Name: **Mike**
Last Name: **Orchard**
Street: **34 Puru Crescent**
Suburb: **Lyall Bay**
City: **Wellington**
Country: **New Zealand**
PostCode: **6022**
Mobile: **021570443**
eMail: **mikeorch@clear.net.nz**

Trade competition and adverse effects:
○ I could ○ I could not
gain an advantage in trade competition through this submission
○ I am ○ I am not
directly affected by an effect of the subject matter of the submission that :
a. adversely affects the environment, and
b. does not relate to the trade competition or the effects of trade competitions.

Wishes to be heard:
◉ Yes
○ I do NOT wish to speak in support of my submission and ask that the following submission be fully considered.

Preferred hearing location:
○ Oral Hearings - Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

Hearing Needs:

Correspondence to:
◉ Submitter
○ Agent
○ Both

Submission

1. Overall, do you support or oppose the general direction of Our Natural Capital?

○ Strongly oppose ○ Oppose ○ Neither support nor oppose ◉ Support ○ Strongly support

Why do you say this?
The general principles are good

---

2. Do you support the Guiding Principles, Goals and Outcomes?

○ Strongly oppose ○ Oppose ◉ Neither support nor oppose ○ Support ○ Strongly support

Why do you say this?
The guiding principles are worthy but perhaps too numerous and somewhat disconnected from the Goals and Outcomes. They are too wordy and the 'we' statements are not consistent with the body of the text in places.

---

3. Do you think we have identified the biggest issues facing indigenous biodiversity in Wellington?

◉ Yes ○ No

Your comments
Yes but they are buried in a document that is complex in structure and terminology and short on achievable and measurable outcomes.

---

4. Do you think we have identified the right priorities in order to achieve our desired outcomes for biodiversity in Wellington?

◉ Yes ○ No

Your comments
However the ranking of priorities and assignation of associated time-frames is lacking in clarity. Does 'ongoing' mean to continue as before and based on performance to date. How does 'Long' differ from 'ongoing'? The ranking is useful but doesn't appear to relate to time-frame in any way? Funding - how does 'existing' or 'expand' relate to how successful these programmes may have been to date? What proportion of funding is rates/grants/volunteer support?

---

5. Do you think we have identified the right organisations to partner with to achieve our objectives?

◉ Yes ○ No

Your comments
In a general sense yes but coordination with other territorial authorities is light and the evolution/development of the volunteer organisations is not addressed strongly.

---

6. Do you think we have the right indicators and targets to measure our performance by?

○ Yes ◉ No

Your comments
Mostly yes, but there are too many measures and they are too large to measure repetitively. Measures need to be smart and achievable. Change in native species depends on baseline data that needs to be available across many sites. Suggest a more targeted focus on pest animal/plant measures and key native species counts such as birds, reptiles, fish, specific invertebrates .Their increase usually is proportional to ecosystem health. Numbers of plants planted needs to be adjusted by survival rates - survival appears low in some areas. One training programme seem

inadequate without clarification. More emphasis on training, public education and support. 'Restoration/pest control programme in place' is too vague - how big/comprehensive? What is current status?

7. Do you agree with our direction for the tiered support for community groups?

○ Yes ◉ No

Your comments
Yes in a general sense. Learning from the success of current NFP community groups needs to be shared and applied to future support/recognition. The limits on plants groups can be granted suggests encouraging more groups. I would suggest current successful groups don't need limits as they well understand their capacity/limitations.

8. Is there anything you feel has not been adequately covered by the draft plan?

◉ Yes ○ No

Your comments
Funding is limited by the limitations on rates increases. What additional initiatives are being put in place to seek government, corporate, community trust or institutional funding? What has actually been achieved to date under previous strategies? Many of the measures rely on adequate baseline research - how soon will this be available if it is not already? Crowdsourced data collection needs to be developed quickly. Zealandia success in enhancing urban avian biodiversity needs to be considered and applied to plant biodiversity policy re seed source development. There is an opportunity to utilise mainland island thinking to parts of the coast - eg Terawhiti Coastline, Miramar peninsula

9. Do you have additional comments? (please attach additional pages via the 'Supporting Information' tab)

◉ Yes ○ No

Your comments
See attached

Attached Documents

File
BiodiversityStrategySubmission2015
Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

Submission - Wellington's Draft Biodiversity Strategy and Action Plan 2014

Excuse the poor formatting and editing of the following. I have put this together rather hurriedly late in the period for consultation.

I support the general concepts of the Strategy as in my questionnaire answers. This is a significant improvement on the predecessor documents.

My more detailed submission to this public consultation process can be summarised into a number of key observations as follows:

1. The document is too large and complicated. A better summary could be provided for many sections which would make navigation and relationships between the parts simpler. The historical and background information needs to be more concise. The achievements to date and targets need to be displayed in graphics.
2. The duplication of biodiversity resources and the differences in operational expenditure, policies and strategies between adjacent Local Authorities (LA), The Greater Wellington Regional Council and the Department of Conservation (DOC) is of ongoing concern. The boundaries between each LA (and other LAs) and DOC conservation estate are nominal in many cases and do not result in efficient or effective management of animal or plant pests. Adjacent councils and DOC have differing pest management strategies ranges of habitats and baseline biodiversity.
3. Historically, pest tree control has been sporadic and piecemeal in Wellington City (as for many LAs). Major modification of habitat has occurred and is still a real concern with respect to wilding conifers (radiata pine, macrocarpa) and other pest trees (e.g. sycamore, flowering cherry, holly, eucalypts and karo). Although the historical intent was good in carrying out plantings of these species the unintended legacy is a proliferation of seedlings and saplings that will cause continued pest tree domination of regenerating forest habitat in reserves. However, some notable and historic or emergent pest trees (often conifers) provide interim roosting and food habitat for native birds so complete eradication is not suggested in the short term.
4. I have concerns about the number and nature of metrics intended to be used to judge performance against biodiversity goals. The replanting programme appears valuable when measured by numbers of native trees planted or pest animals controlled and the number of volunteers and groups undertaking this work. However, it would be more useful to monitor success and efficacy of the planting and pest control programmes.
5. For all the goals listed there don't appear to be any simple aspirational goals that inspire volunteers. By way of example, complete control of karo on coastal scarps between Point Dorset and Moa Point. Perhaps these exist in the operational plans?
6. Total indigenous species increase is an expensive measure for the multitudes of reserves. Does the baseline data already exist? Where is it available?
7. The role of gorse as a somewhat imperfect nurse plant for indigenous species is well accepted despite its impact on medium term biodiversity which means most sites are best left to do their thing rather than clearing and replanting. Enrichment of manuka and kanuka seed sources may be useful around the fringes of these sites where sources don't exist upwind of the reserves.

8. The coastal landscape is one of the great natural assets of Wellington. Many coastal pest plants need to be actively controlled – *Rhamnus alaternus* is one coastal pest plant that needs attention before it becomes dominant on South Coast sites, as karo has done. The RPMS is somewhat unhelpful in determining plant species to prioritise – the local threat of each pest plant identified differs across the region and by habitat. Wellington City does not have many wetland sites so wetland pest plants are not a major threat. It is laudible that native dune plants (eg pingao, spinifex) have been restored to the coast but coastal gravel beaches, shrublands and scarp communities need further protection - pest and predator control included. These communities define the coastal areas of Wellington.
9. Fire is a major threat to biodiversity – particularly where it is repeated in pine, wattle, eucalypt, gorse and broom dominated areas. Banning fireworks may be one of the best strategies for urban biodiversity enhancement.
10. I see that the intent is to plant more podocarps, canopy and emergent tree species – this is an expensive choice as it must be coupled with careful site selection and improved post planting maintenance programming. I have seen many plantings of Northern Rata, for example, that have simply been overcome by weeds or have succumbed to no watering. It may be best to develop dense plantings on a small number of suitable sites that function as seed banks/sources for these desirable medium to long term species. Some of the plant selection for sites has been unwise. Post planting maintenance must improve for the first two years after planting.
11. Pest plant and animal control has been undertaken very effectively in some key reserves often where WCC resources are adequately managed and based nearby (eg. Otari and adjacent areas) and in other cases where effectively run community organisations have been sustained (eg Oku St Reserve and Ngaio Gorge). However, there is a proliferation of deferred maintenance relating to many public reserves that requires funding, programming, implementation and ongoing maintenance/monitoring. For example, Mt Victoria is in places infested with pest trees (seedling and sapling conifers, elaeagnus) and invasive climbers (eg. snake feather, Japanese honeysuckle). Karo is clearly an ongoing concern near Houghton Bay, Te Raekaihau and similar coastal areas.
12. Some otherwise innocuous exotic trees provide food sources for native birds in the low season (eg Banksia, some eucalypts). Control of these species in the short term may involve eradication of wildings until indigenous cover is re-established. Growth of some of these trees in gardens is beneficial.
13. Some of the maps are superfluous. The locations of community groups is interesting but has no qualitative significance. Surely membership numbers would be more useful. The significant ecological sites map appears to be wanting with regard to rocky coast, for example. Non-urban sites seems to be the dominant feature – some of this is reserve land.
14. Crowdsourcing data on biodiversity surely is aspirational at this stage? Existing baseline data and data illustrating the success of past strategies needs to be published for the public to have any sense that the strategy will achieve its very optimistic outcomes
15. The increase in Tui and other native birds throughout Wellington has been great centred on Zealandia. Little spotted kiwi at Zealandia and others are not southern North Island species and some of the other bird species will not survive outside Zealandia without considerably more effort put into predator control. The Rimutaka Forest Trust North Island brown kiwi population East of Wainuiomata is an example of what can be done by well organised community groups and should be supported by all in the Region if restoration is truly on the agenda.

16. Accepting the need for more intensive possum, stoat and rat control: domestic animal also need more controls -cat (and some dog for ground birds) predation of birds, reptiles and invertebrates remains problematic for biodiversity. What is the WCC position on this regarding its reserve assets, control policies, green capital aspirations?
17. The action plan mentions the efficacy of Site Led and Species Led programmes but shies away from prioritising/rating current known sites and species. The site of matagouri plants near Moa Point doesn't appear to be actively managed (because it's on Airways land?). Perhaps new plantings on WCC reserve sites would better serve this species in the wild. Likewise a known site of *Melicytus obovatus* on Watts peninsula is on "non-urban land" that is vulnerable.
18. There are useful initiatives to encourage education of the general public re planting indigenous species, this needs to be coupled with education around the impact of pest plants spreading from private property onto WCC reserves and other private property. *Senecio angulatus, Clematis vitalba, Dipogon lignosus* to name a few. Proactive and effective control of these species on both public *and* private land would indeed benefit biodiversity.
19. The use of improving LIDAR technology and other data collection methods including drones is supported to improve quick assessment of action priorities for pest control, species protection and enhancement. Bioblitz type events could also be used to accelerate data collection and involve community groups.
20. Zealandia is a demonstration of how animal biodiversity can be managed through predator exclusion. Similar innovative thinking needs to be applied to providing seed sources for plants that have also become scarce or locally extinct due to land clearance for agriculture, subsequent soil erosion, animal browsing and other impacts. Restoration, if it is to achieved on any scale must utilise natural processes as well as targeted intervention in the form of sustained and effective replanting and pest control.
21. Public consultation appears to be lacking when the only opportunity for engagement with Council was one day at Otari in the Northern suburbs. Anyone else wanting to engage needs to be prepared to speak to their submission which is a challenging scenario for some people.

Submitter Details

First Name: **Barbara**
Last Name: **Fill**
Organisation: **Island Bay Coast Care and Oku Reserve Group**
Street: **Island Bay**
Suburb:
City:
Country:
PostCode: **6023**
Daytime Phone: **+6443837996**
Mobile: **+6443837996**
eMail: **barb.fill@xtra.co.nz**

Trade competition and adverse effects:
○ I could ○ I could not
gain an advantage in trade competition through this submission
○ I am ○ I am not
directly affected by an effect of the subject matter of the submission that :
a. adversely affects the environment, and
b. does not relate to the trade competition or the effects of trade competitions.

Wishes to be heard:
○ Yes
◉ I do NOT wish to speak in support of my submission and ask that the following submission be fully considered.

Preferred hearing location:
○ Oral Hearings - Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

Hearing Needs: NB I am away at the time of the hearing otherwise I would have liked to have spoken

Correspondence to:
◉ Submitter
○ Agent
○ Both

Submission

1. Overall, do you support or oppose the general direction of Our Natural Capital?

○ Strongly oppose ○ Oppose ◉ Neither support nor oppose ○ Support ○ Strongly support

Why do you say this?

---

2. Do you support the Guiding Principles, Goals and Outcomes?

Strongly oppose Oppose Neither support nor oppose Support Strongly support

Why do you say this?
There are major inconsistencies between the principles and plans of action in particular how these pertain to a tiered community support base.

3. Do you think we have identified the biggest issues facing indigenous biodiversity in Wellington?

Yes No

Your comments
The key issue is sustainability of ecosystem.s without adequate financial and other resourcing this cannot be achieved.

4. Do you think we have identified the right priorities in order to achieve our desired outcomes for biodiversity in Wellington?

Yes No

Your comments
The priorities as proposed in particular one and two are counter intuitive. It is not a matter of stronger recognition in the role that people play in biodiversity conservation as witnessed by the over 100 groups currently working on restoration projects but a matter of how best to resource them . Ranking them to determine what resources to provide them with is a a means to curtail a limited budget. There is no provision for weed eradication for instance. It would be better to look at ways to enhance community involvement in these projects by increasing the amount of Council resources to be made available to these groups.

5. Do you think we have identified the right organisations to partner with to achieve our objectives?

Yes No

Your comments
Key partners should also include all the community groups who are currently involved in restoration projects many of whom already have signed partnership agreements with the Council!

6. Do you think we have the right indicators and targets to measure our performance by?

Yes No

Your comments

7. Do you agree with our direction for the tiered support for community groups?

○ Yes ◉ No

Your comments
There are major concerns with this: No provision for funding or weed control on all the sites NB advice is NOT funding. No indication of what a catchment area covers and therefore the flow on of how groups within catchments are to be identified Onerous administration and other expectations being put onto the community groups in order to free up limited Council officer time and resources in managing the increasing number of groups. More discussion needs to take place around these matters with the groups.

8. Is there anything you feel has not been adequately covered by the draft plan?

○ Yes ○ No

Your comments
Increases in operation funding for the Strategy are key to its success. A more positive and strategic approach to managing the burgeoning costs of the restoration groups is also required. Holding a series of hui with the groups in the proposed catchment areas (when these have been identified) may be more appropriate. A key issue facing a lot of groups is ageing volunteers strategies to encourage more and younger volunteers would be more beneficial and encouraging than looking at ways to minimise Council help.

9. Do you have additional comments? (please attach additional pages via the 'Supporting Information' tab)

○ Yes ○ No

Your comments

Attached Documents

File
Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

Submitter Details

First Name: **Alison**
Last Name: **Valentine**
Street: **29 Highbury Crescent**
Suburb: **Highbury**
City: **Wellington**
Country: **New Zealand**
PostCode: **6012**
Daytime Phone: **021714322**
eMail: **alisonvn@yahoo.co.nz**

Trade competition and adverse effects:
○ I could ○ I could not
gain an advantage in trade competition through this submission
○ I am ○ I am not
directly affected by an effect of the subject matter of the submission that :
a. adversely affects the environment, and
b. does not relate to the trade competition or the effects of trade competitions.

Wishes to be heard:
○ Yes
◉ I do NOT wish to speak in support of my submission and ask that the following submission be fully considered.

Preferred hearing location:
○ Oral Hearings - Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

Hearing Needs:

Correspondence to:
◉ Submitter
○ Agent
○ Both

Submission

1. Overall, do you support or oppose the general direction of Our Natural Capital?

○ Strongly oppose ○ Oppose ○ Neither support nor oppose ○ Support ◉ Strongly support

Why do you say this?

---

2. Do you support the Guiding Principles, Goals and Outcomes?

○ Strongly oppose ○ Oppose ○ Neither support nor oppose ○ Support ◉ Strongly support

Why do you say this?

3. Do you think we have identified the biggest issues facing indigenous biodiversity in Wellington?

(•) Yes ( ) No

Your comments
I have not had time to read the plan but I hope that the impact of cars has been considered - I see many pukekos and some kereru dead on our Wellington roads. Also the need to continue to control introduced pests and provide funding for this

4. Do you think we have identified the right priorities in order to achieve our desired outcomes for biodiversity in Wellington?

(•) Yes ( ) No

Your comments

5. Do you think we have identified the right organisations to partner with to achieve our objectives?

( ) Yes ( ) No

Your comments

6. Do you think we have the right indicators and targets to measure our performance by?

(•) Yes ( ) No

Your comments

7. Do you agree with our direction for the tiered support for community groups?

(•) Yes ( ) No

Your comments
It is important for community groups to have read access to funding, especially where they are fulfilling roles that arguably should be provided by local/regional authorities

8. Is there anything you feel has not been adequately covered by the draft plan?

Yes No

Your comments
Unsure - see above

9. Do you have additional comments? (please attach additional pages via the 'Supporting Information' tab)

Yes No

Your comments

Attached Documents

File
Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

Submission on Draft Biodiversity and Action Plan – Our Natural Capital

Karin Mahlfeld
5 Imlay Crescent
Ngaio
Wellington 6035

Natasha Evans
2 Claire Street
Ngaio
Wellington 6035

March 2015

Thank you for the opportunity to make a submission on the draft plan. We are making a submission as a community organisation we are in the process of setting up.

Considerable work has gone into the development of the draft plan by council staff and we would like to make a few comments on the draft, which we hope council staff will find constructive.

It is obviously necessary for the council to prioritise effort and resources. Prioritising effort and resources will result in protecting the most rapidly retreating ecosystems and species and maintaining and improving the highest priority ecosystems and habitats. It would be helpful to know the sites, the threats and actions and how the community and science/research can align with the council's objectives to have the best outcomes. Biosecurity should have a very high priority.

In addition to having the action plan structured into the focus areas "protect, restore, connect and research", it would be helpful to have these focus areas lined up for the different habitats (i.e., lowland and coastal forest, scrub and shrublands, coastal scrub, coastal fringe, offshore islands, wetlands, streams (**including springs and seepages**, urban area, harbour and coastal waters.) This would give Wellingtonians a clearer understanding of what the council wants to achieve for these different habitats and how the council plans to go about it.

We think a lot can be achieved by establishing a physical community science and learning hub, which could align its focus with the Council's research needs while at the same time engage the public in citizen science projects. A science hub would build conservation capability in communities through training and promote conservation of Wellington's biodiversity as well as develop a better understanding of the value of ecosystem services. By talking to members of various community restoration groups, we found out that the ability to access current information and technical support is a critical component in increasing community participation. It is important for community groups to be able to access current 'best' practice as a base for what they do. Many volunteers felt that the best way to achieve this, is through face to face meetups on a more regular basis.

We suggest the council supports a pilot where the community science hub will train community groups to collect, monitor, identify and curate freshwater invertebrates and how to derive a macroinvertebrate community index (MCI) for monitoring the health of streams in the Wellington region.

Community groups also require expert help with other monitoring techniques, such as pitfall trapping. The council wants to use butterflies and moths as an indicator group. The community science hub could provide technical expertise, local reference collections, and training. By getting masters students to do some of the Council's research, the Council is only providing a very small group with funding and the knowledge and engagement with the community isn't being facilitated.

In addition, university students will typically only be performing research over a short period, and their work will not develop the research and science capacity in the community.

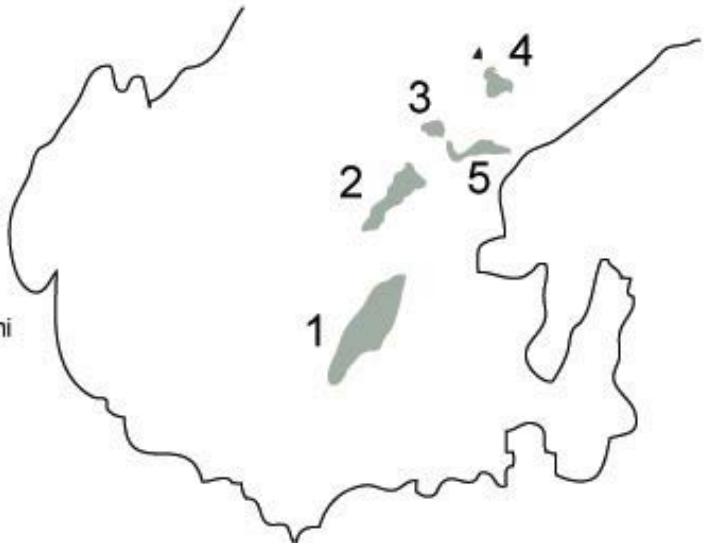
We would like to make an oral submission as well in order to outline how a community science hub would complement the Council's biodiversity strategy and action plan.

Appendix 1: Noteworthy occurrences of micro-landsnails

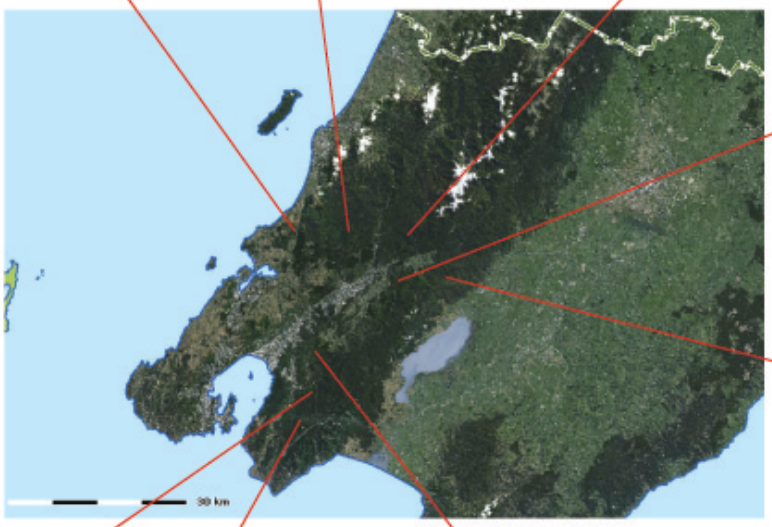
Noteworthy species occurrences and local endemics:

1, Belmont/Dry Creek: Allodiscus tesselatus
Allodiscus wairarapa
Charopidae sp. 37
Charopidae sp. 42
2, Waiwhetu: Climocella maculata
charopid aff. lucetta n. sp.
Flammoconcha compressivoluta
Punctidae sp. 102
3, East Harbour: Charopidae sp. 38
Paralaoma miserabilis

1, Zealandia: Paralaoma servile
2, Wilton Reserve: Allodiscus tessellatus
Climocella maculata
3, Huntleigh Park
4, Khandallah Park: Allodiscus tessellatus
Flammoconcha compressivoluta
Punctidae sp. 102
Cavellioropa moussoni
5, Trelissick Park: Climocella maculata
Flammulina chiron
Punctidae sp. 102
Paralaoma servile



Noteworthy species occurrences and local endemics:



Battle Hill & QE Park:
Paracharopa chrysaugeia
Phenacohelix giveni
Paralaoma servile
Charopidae sp. 37

Akatarawa:
Punctidae sp. 96
Beilania "small triticum" n. sp.
Charopidae sp. 226
Charopidae sp. 43

Kaitoke:
Allodiscus erua

Pukaratahi:
Paralaoma "axialis" n. sp.
Flammoconcha compressivoluta
Otoconcha dimidiata

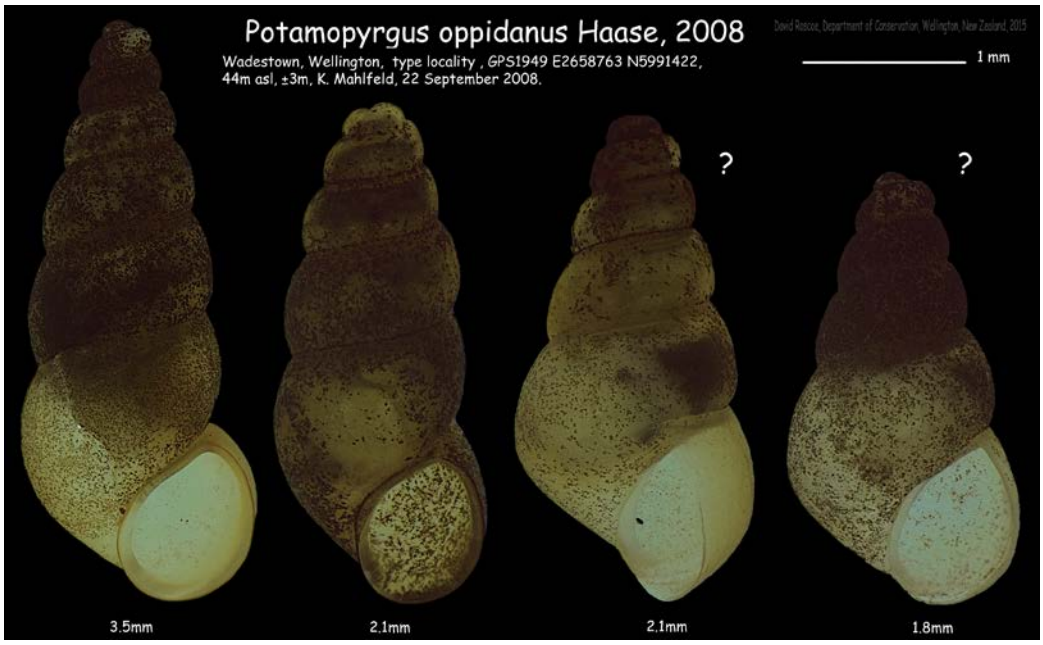
Rimutaka road summit:
Allodiscus conopeus
Charopidae sp. 11
Charopa pilsbryi
Charopidae sp. 41
Otoconcha dimidiata
Charopidae sp. 226

Wainuiomata Water Reserve:
Punctidae sp. 96
Allodiscus n. sp. climoi-group
Allodiscus erua
Beilania "small triticum" n. sp.
Charopidae sp. 38
Charopidae sp. 42
Charopidae sp. 41

Orongorongo:
Charopa
pilsbryi

Whakanui track:
Charopidae sp. 226
Paralaoma miserabilis

Appendix 2: Image of *Potamopyrgus oppidanus* Haase, 2008 a nationally critical freshwater mollusc only known from Wadestown, Wellington.



Appendix 3: Threatened Lepidoptera in the Wellington area (from B.H. Patrick and J.S. Dugdale (2000) Conservation status of the New Zealand Lepidoptera. Science for Conservation 136, Department of Conservation, Wellington.)

Austrocidaria lithurga (Meyrick, 1911: 71) (Geometridae). Makara WELLINGTON: Wellington [BMNH]. Range: WN, MC
mM&D score:B (26/50). P&D category: D
Host(s): divaricating small-leaved Coprosma spp. (Rubiaceae) are probable hosts. A member of the open shrubland community, rarely collected.

Chersadaula ochrogaster Meyrick, 1923:165. (Oecophoridae s.s.). Breaker Bay, WELLINGTON: Wellington [BMNH].
mM&D score: Unevaluated. P&D cateogory: C
This coastal species has not been re-collected to our knowledge. The larva is detritivorous in coastal rocky sites.

Circoxena ditrocha Meyrick, 1916:419 (Cosmopterigidae of authors). Wainuiomata WELLINGTON: Tararua [BMNH]. Range: AK,WN, NN, MC, DN,FD (Hudson 1928, 1939).
mM&D score: C (21/50). P&D category: D.
Host/niche unknown; possibly a seed-borer. Specimens rarely collected, not commonly encountered.

Elachista eurychora (Meyrick, 1919: 352) (Elachistidae). Paekakariki WELLINGTON: Cook Strait/Foxton [BMNH]. Range: WN.
mM&D score: C (22/50). P&D category: E
Host: almost certainly a grass (Poaceae), but the Type locality (dunes, Paekakariki) is now greatly modified.

Erechthias lychnopa Meyrick, 1927: 702 (Tineidae). Sinclair Head, in forest WELLINGTON: Cook Strait [BMNH]. Range: WN.
mM&D score: B (26/50). P&D category: C.
Niche: most likely dead wood. Although distinctive in appearance, this species has not been encountered elsewhere.

Graphania omicron (Hudson, 1898: 22) (Noctuidae). Karori WELLINGTON:Wellington [TYPE NOT FOUND IN MONZ]. WN.

mM&D score: A (29/50). P&D category: C
Hosts not known and known only from Type locality. As well, the Type is missing. Rediscovery at the largely grossly altered Type locality (Karori), and an assessment of this species. relationship to the.Aletia. inconstans group are needed.

Helastia siris Hawthorne, 1897: 283 (Geometridae). Cape Terawhiti WELLINGTON: Wellington [MONZ]. Range: WN (Craw 1987).
mM&D score: B (27/50). Not listed in Molloy & Davis 1994. P&D category: D
Hosts and biology unknown. With H. expolita and H. triphragma, forms a distinctive group characteristic of eastern dry/coastal shrub/grasslands.

Izatha rigescens Meyrick, 1929:490 (Oecophoridae s.l.). Wellington WELLINGTON [BMNH]
mM&D score: Unevaluated. P&D category: C.
Only known from the Type specimen. The larva is likely to feed in dead wood.

Notoreas .Castlepoint. (Geometridae). Castlepoint WELLINGTON: Eastern Wairarapa [BPNZ]. Range: WA.
mM&D score: A (32/50). Listed in Molloy & Davis 1994: 61, Category I. P&D category:F
Host: Pimelea prostrata (Thymeleaceae). This population is regarded as distinctive, and being found only within the legally protected area at Castlepoint, is considered to be at risk as the host plants have no large source of recruitment.
72. Notoreas .Wellington. (Geometridae). Titahi Bay WELLINGTON: Wellington [BPNZ; NZAC]. Range: WA,WN.
mM&D score: B (27/50). Listed in Molloy & Davis 1994: 61, as Notoreas n.sp. 2. P&D category: G
Host: Pimelea .urvilleana. (Thymeleaceae). Specimens were collected by G.V. Hudson and R.M. Sunley, two pioneer lepidopterists.

Pyrgotis transfixa (Meyrick, 1924: 203) (Tortricidae). Karori WELLINGTON: Wellington [BMNH]. Range: WN.
mM&D score: C (22/50). Not listed in Molloy & Davis 1994. P&D category: D
Hostplant and biology unknown. This species is known from two localities around Wellington City; it was regularly but uncommonly caught to light in the (bush-clad) Orongorongo Valley by M.J. Meads in recent years.

Thambotricha vates Meyrick, 1922: 270 (Epermeniidae). Wellington WELLINGTON: Wellington [BMNH]. Range: ND, TK, WN, NN.
mM&D score: B (24/50). P&D category: D
Hostplant and biology unknown. This species is rarely encountered and never in large numbers. It is New Zealand.s only epermeniid, and is thought by some specialists to be the sister-taxon of all other epermeniids.

Have your say

Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

January 2015

Absolutely Positively **Wellington** City Council
Me Heke Ki Pōneke

Section one

We are keen to hear your thoughts on how to manage our indigenous biodiversity. This is a summary of what we have planned, and we want to know if we are on the right track. If you are interested, we encourage you to read the full document.

You can comment on the Draft Plan by completing a submission form or writing down your comments and sending them to us.

- **Visiting our website:** Wellington.govt.nz/have-your-say
- **Email:** ournaturalcapital@wcc.govt.nz
- **Post:** FREEPOST
  Our Natural Capital, Parks, Sport & Recreation (REPL01)
  Wellington City Council
  PO Box 2199
  Wellington 6140
- **Fax:** 04 801 3155

You may also like to make an oral submission in support of your written submission. To do this please let us know and provide your contact details. Oral submissions will be held on **Thursday 19 March 2015** so if you wish to make an oral submission, please keep this date free. Please contact the Wellington City Council on 499 4444 for more information.

Enter your name and contact details

☒ Mr ☐ Mrs ☐ Ms ☐ Miss ☐ Dr

First name*: Martin

Last name*: Payne

Street address*: 160 Washington Ave, Brooklyn, Wellington 6021

Phone/mobile: (04) 389 8995

Email: martin.p@clear.net.nz

* Mandatory fields

Making a submission

I am making feedback ☐ as an individual ☒ on behalf of an organisation

Name of organisation: Friends of Owhiro Stream

I would like to make an oral submission to the City Councillors on Thursday 19 March 2015 ☒ Yes ☐ No
If yes please provide a phone number above so that a submission time on the above date can be arranged.

Submissions close 5 pm on Friday 6 March 2015.

Privacy statement
All submissions (including name and contact details) are published and made available to elected members of the Council and the public. Personal information supplied will be used for the administration and reporting back to elected members of the Council and the public as part of the consultation process. All information collected will be held by Wellington City Council, 101 Wakefield Street, Wellington. Submitters have the right to access and correct personal information.

This submission is made on behalf of Friends of Owhiro Stream (FOOS).

FOOS background.

Friends of Owhiro Stream have been working for the last ten years to protect and restore the Owhiro Stream. This stream forms the main freshwater input into the Taputeranga marine reserve and is one of few urban streams that survive in Wellington City today. In the last decade, we have planted around 20,000 plants and removed many tonnes of rubbish and weeds from this neglected urban stream environment.

Advocacy for this environment is also a strong component of our activity and has involved: continuous interaction with local and regional councils, resource consents submissions, engagement with schools and local community groups.

Our intent is not just the physical restoration of a stream but also to restore, within the community, the sense that streams are an important and functional part of our urban environment. We hope our work encourages people to enjoy and care for the natural environment which is such a strong part of the Wellington identity.

Wellington Biodiversity Strategy and Action Plan (2014)

Friends of Owhiro Stream strongly support the development and implementation of the Wellington Biodiversity Strategy and Action Plan (2014). Strong recognition for the natural environment is essential if Wellington City is going to achieve its goals for a liveable and sustainable city.

We consider the biggest pressures on indigenous biodiversity in Wellington to be urban development and infrastructure. As a group working to restore an urban stream to health, we recognize the large and negative impact of stormwater management on streams and coastal marine areas. To address this issue, we are particularly interested in the Integrated Catchment Management Planning (ICMP) process, an opportunity to let the community reconsider the ways we build and maintain our city. We would hope this process would guide urban development so that the natural environment would not be sacrificed.

From a freshwater stream perspective, protecting the few remaining stream left in the city is critical. Without these streams, the natural and dynamic link between land and the sea is lost. Functional ecosytems of native plants, insects, fish and birds depend on quality water to thrive. Without a network of waterways, these ecosytems are a shadow of what they could be. For this reason we advocate for no further loss of natural streams in the city and consider the protection of headwaters and valley floor corridors of upmost importance.

We see it as essential that the actions contemplated in this plan are adequately resourced and that all divisions of Wellington City Council fully participate in protecting and restoring environments for Wellington's indigenous biodiversity to thrive. The framework created by this document seems comprehensive and well aligned with international, national, regional and local policy.

Working with the community is essential if the biodiversity objectives are to be achieved. Opportunities for improving the network of natural ecosystem exist, not just on land owned by the city council but also on land owned by public and private institutions and private landowners. Working closely with Mana Whenua and other Maori groups need to be given priority in re-establishing the city's relationship with the land and the water.

As a community based urban stream restoration organization we appreciate the support we receive from the Wellington City Council, particularly the practical support from Park Rangers and guidance from the Biodiversity team in the Parks and Gardens division. At a political level, we have appreciated the willingness of the Mayor and Councillors to listen to our concerns and work with us to find practical solutions. Continued provision of WCC support for community restoration efforts, will both enhance the effectiveness of volunteer's work and also encourages further opportunities for Wellingtonians to engage with nature.

Thank you for the opportunity to submit on this plan.

Yours environmentally,

Martin Payne
For Friends of Owhiro Stream

Below we have included a number of specific comments on the text of the BS&AP2014, referenced by page number and section:

P13
Areas with outstanding values should include the highest quality stream sections including the NW headwaters of the Owhiro Stream and the middle reaches of the Kaiwharawhara Stream through Otari-Wilton's Bush.

P17
Guiding Principles need to include acknowledgement of the green AND the blue parts of our Natural Capital.

Our City context:

> "complex mixture of species and terrestrial and aquatic habitats across…"

People's connection with nature:

> "All Wellingtonians engage with green and blue nature at some point…"

We recognize the impact that urban infrastructure has on the natural environment and would like a greater emphasis to be placed on this Council activity in the text.

Direction and leadership:

> "incorporating indigenous biodiversity in sustainable urban and infrastructure development….The Council and council-owned companies will provide leadership that reflects these values…"

P18
Outcomes: to include "No further loss of natural streams."

Goals to restore biodiversity: Simplify to "Aquatic ecosystem health across the city is improved". This would make it consistent with the wording of Goal 2.2 on p25 of the Action Plan. Could this goal be extended to apply to coastal as well as freshwater aquatic environments?

P19
Wildlife Safe Wellington: Positive concept but could be widened to include stream wildlife e.g. awareness of stream critters and fish, avoid stream pollution etc.

P20
Blue Belt: We strongly support this concept but are concerned that freshwater streams are not strongly enough represented in the objectives in this section. We would suggest "harbour and coast" be replaced by "freshwater streams, harbour and coast".

P21
Goal 1.1: Needs to specifically recognise importance of headwaters and valley floor protection in preserving or enhancing freshwater stream health.

Goal 1.1.2 b: Add "with special recognition of undeveloped stream headwaters and floodplain areas"

P23

1.4.3: For all actions under this objective, we strongly advocate for a catchment based focus.

1.4.3a: Assist Wellington Water and stakeholders to complete…

1.4.3e: Work with GWRC, and within Council and Council-owned organisations to retain all streams…

1.4.3k: ….streams that should be kept in their natural state or restored from their current state…

P26

2.3.3: Aquatic species should be specified, otherwise people will assume this refer just to birds and terrestrial species

2.4.1: Recognise aquatic habitats specifically here. This may warrant a separate action, for example, recognise natural stream sections as important habitat connectors and identify key sections for restoration and management for this purpose.

P29

3.3.3a Work with all Council business units and Council-owned organisations…

P77

Appendix 3

We would like a list of native fish and other aquatic species to be added to this section.

Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

Submission

Dr Paul Blaschke (individual)

34 Pearce St, Wellington 6021

paul@blaschkerutherford.co.nz 04 3898545 027 2462848

Would like to make oral submission

General comment

I am very positive about this draft Biodiversity Strategy and Action Plan (BSAP). Some very good features include:

1. It is comprehensive, recognises strengths and weaknesses of the current situation, combines big ideas with lots of detail required to make the big ideas work.
2. It is mainly well-written and interesting.
3. There is good alignment of Our Natural Capital with other Council strategies and policies and international, national, regional and local frameworks.
4. The two Concept Plans are excellent as concepts (but could be developed much further).
5. The main part of the BSAP is very well backed up by factual material in the back end of the draft, especially in Chapters 12 and 13 (Wellington's Biodiversity and Context for Goals, Objectives and Actions). Some of this material is very interesting, vivid even, and highlights could usefully be brought further forward. This may help attract public and councillor support for resourcing of this ambitious plan (see further comments below).

Having said that, there are of course many areas where improvements could be made. I summarise some main themes of feedback in the next few paragraphs.

<u>Types of biodiversity that need more emphasis</u>

1. Freshwater biodiversity (I am aware that this area is covered in detail by the submission from Friends of Owhiro Stream so have only made high-level comments here)
2. Soil biodiversity – this so fundamental, especially for ecosystem services, and consistently under-recognised. This may be an area for further research

It is always difficult to know how to arrange the freshwater biodiversity and habitats within a biodiversity strategy: a) as a separate section (eg with separate goals); b) part of the land system (logical because Wellington's FW system is so reduced, almost all small streams); or c) part of the Blue Belt (logical because of the directness of the Blue Belt concept and because of stream-sea connections). No doubt the project team has considered the pros and cons of these options but in the current draft it is difficult to see where this thinking has lead in terms of the BSAP. There are quite a few places where freshwater issues are mentioned, but sometimes they are mixed in with coastal/harbour issues in referring to aquatic species/habitats, and other times referred to as freshwater issues in somewhat random places.

Biodiversity protection outcomes (p18).

There is a significant problem with the goal of "no reduction in areas with the potential for future restoration". This is a significantly open-ended outcome because so many areas may be seen by some as having the potential for future restoration (even areas that are currently not open space). To be a realistic outcome this goal needs to be somehow restricted.

Resourcing the BSAP:

It's difficult for submitters to comment meaningfully on the council processes that will determine how resources are allocated to the BSAP. However, this plan strikes me as being very ambitious! It is pleasing that there is good public support for green/open space management, and in general, support across different levels of council for the BSAP because of its contribution to the overall strategic framework. However, it is difficult to see adequate funding for many of the more ambitious objectives and actions, especially the essential but big-ticket and unspectacular aspects involving statutory protection or regulation, collaboration with infrastructure provision, etc, etc. So I believe that further thought needs to be given to how to convey the key messages in the BSAP to the public and decision-makers so that resources are allocated and priorities are set for some of the bigger and less spectacular goals as well as the sometimes easier and cheaper 'feel-good' ones. Some of the partnership objectives (eg within goal 3.4) may be able to be re-shaped with this aim in mind.

Predator control (goals 1.2 and 1.3):

This is an important set of goals that will get good public support. But they need more attention to the integration of public and private land control. There may be the potential for development of guidelines for pest (and weed) control on private land.

Catchment approach:

Important aspects of the Protect and Restore goals could be more effectively conceived and implemented through an explicit catchment-based approach. This applies particularly to Goals 1.4.3, 2.1 and 2.2. Various parts of the Council and Wellington Water have made important progress in recognising catchment characteristics that influence environmental management, and perhaps more of this understanding could be brought into refining the catchment basis of these goals and priority actions within them.

Restoration (Goal2):

In general terms, the approach to restoration is sound. More emphasis could be given to social aspects of restoration by community groups, although this is covered to some extent under Goal 3. Also I felt that there should be more emphasis on the linkages of stream restoration programmes (Obj 2.2.1) with catchment-based management of land use effects on aquatic ecosystems.

I am aware that there is a lot of discussion about the details of eco-sourcing policy and guidelines within restoration programmes. It is important not to get too caught up in the details of eco-sourcing guidelines, within the high level of the BSAP. The challenges for biodiversity management within a city are much broader than this! My recent paper on the vegetation of the Owhiro Stream catchment may be of some use as a reference on a pragmatic approach to restoration and rehabilitation in a Wellington catchment-based context. (Blaschke P 2012: Vegetation in Owhiro Stream catchment, Wellington South Coast. Wellington Botanical Society Bulletin 54, 70-94).

More attention is needed on the need for podocarps and large trees in vegetation programmes where suitable potential habitat exists. This need is clearly signalled in the section on "restoring missing species" (p53) but insufficiently brought into the Action Plan.

The key role of Wellington Botanical Gardens, Otari-Wilton Bush and protected park areas with a forest canopy (introduced and native species) in the Inner and Outer Town Belts, merits greater attention, e.g. threatened species populations at WBG and OWB, benchmark studies of species and environments in Inner and Outer Town Belt, strategy for podocarp / large tree planting in Inner and Outer Town Belt, etc

Connection with nature

Contribution of private gardens to BSAP goals: Private gardens (including shared gardens and small apartment gardens etc) are some of the key areas where people encounter biodiversity and nature, and have the opportunity to engage with many of the "Connect" goals, but they are given little attention in the BSAP. The actions in Goals 3.1. and 3.2 should all be examined for their potential application to private gardens, and appropriate mechanisms (eg through education and extension programmes) for such application.

More work with pet owners especially dog walkers. We know that dog walkers are likely to be around the total number of visits to open and green spaces, yet there are hardly any specific references to this key group, except as people who need 'behaviour change' (action 3.3.1(c)). How could the Action Plan relate to dog walkers' use of green space – for education, as observers of open space (in all weathers!), for accumulation of social capital, as potential volunteers, etc, etc.

Greetings, Tēnā koutou.

We would like to thank the Wellington City Council (WCC) for this opportunity to provide input to Wellington's Draft Biodiversity Strategy and Action Plan 2014, Our Natural Capital

This submission is on behalf of the Forest & Bird Wellington Branch members. Our Branch membership (approximately 2,000 people) resides in the geographic area that closely aligns with that of the Wellington City Council from the south coast to the Porirua Harbour, with a few living outside of this area. Our organisation has a history of advocacy on behalf of nature and supporting the Council initiatives that are advantageous to our natural world. Our members continue to make a substantial contribution to better outcomes for the fauna and flora of Wellington. Our observations in this submission are intended as constructive comment; we are as keen as the City Council to ensure our indigenous biodiversity survives and thrives in this urban environment. We would also like to submit orally.

General overview

1. We applaud the draft for the recognition being shown by WCC of the natural environment's impact on the well-being of its citizens and its importance to the City's economy; its point of difference and competitive advantage.

2. The assessment of the situation is comprehensive and uncontroversial and we commend the well meaning aspirational content of the document; it is very hard to argue with this wide range of good intentions for our indigenous life-forms. We do have a concern however that the response and actions are almost entirely non-binding. Where specific goals are mentioned, they are already covered by other plans. Otherwise, the actions are preponderantly about creating plans [1.1.1 c,d, 1.3.1 a], investigating [1.1.2 c], active involvement [1.2.1 b], developing guidelines [1.2.2 a], and establishing methodologies [1.2.2 c]. Instead of quantifiable targets, outcomes are often qualified by the proviso ‘where practicable’

3. Throughout the document the use of the word 'biodiversity' is inconsistent, leaving the reader unclear as to its meaning in the context in which it is being used. The definition of Biodiversity in the Glossary of terms (page 71) is unhelpful in this regard and whilst the explanation in 2.2 is good, it does not relate directly to its use in this document.

   Our proposal is that there be an entry in the Glossary which states that the term 'biodiversity' in this document means 'indigenous biodiversity' unless otherwise stated.

4. The guiding principles

   - We will acknowledge our city context,
   - We will weave biodiversity through our city's DNA,
   - We will recognise the significance of people’s connection with nature,
   - We will learn from the relationship between Maori and biodiversity
   - We will actively engage with research

   and the statements in the summary section reinforce the notion that the Council plans to include exotic species and natives not endemic to the region in its biodiversity strategy.

   The summary is preceded by the statement “The *emphasis* of Our Natural Capital is Wellington’s indigenous biodiversity. The term “Wellington’s biodiversity” means the indigenous biodiversity that occurs or occurred naturally in Wellington.”

   The second summary paragraph begins with the sentence “ The *main* aim of the strategy is to protect and restore our indigenous biodiversity....” and goes on to say Wellington “...will continue to contain a wide range of exotic and indigenous vegetation. We need to take into account the role of all species in contributing to our cultural identity. ...”

The first two principles above imply the continuation of exotic species in our public spaces. In the context of biodiversity and heritage we trust that these principles are referring to the habitat destruction, milling of indigenous forest trees and clearance by fire of native bush and draining of wetland, followed by planting of exotic species and non local natives. A story that needs to be told but not continued.

We agree that Wellington is already well endowed with a biodiversity comprised of exotic and native species not endemic to the region and includes endemic species, in small numbers but with others missing. This is well summarised in Section's 12 and 5 (Past) of the draft document and we suggest that this text be made the cornerstone document at the heart of Wellington Council planning.

It is one thing to recognise the current situation but, given our organisations purpose, we cannot support a plan that will continue with the status quo albeit in a modified form especially given the dire state of our natural heritage (natural habitat diversity and indigenous fauna and flora). In this context we question the statement on page 12 under the heading Present that says "The species that have survived or been reintroduced need to find a way to thrive in this urbanised environment." We contend that rather than expecting the species to adapt we should modify our practices to accommodate these species.

The City has made good progress in arresting the decline of local species and the focus of this document needs to be *entirely* devoted to this restorative process. We note of course Botanic Gardens and Otari-Wilton bush are special cases and have their own plans.

5. We observe that the desired outcomes of this document are affected in some way by the activities covered in the other Council documents shown on page 11 under the 'Wellington 2040' principal document. Because of this we propose that 'Natural Capital' be the core document that all others in this group of documents refer and adhere to. In this way its outcomes become the responsibility of the whole of the Wellington City Council. Responsibility to achieve the desired outcomes is then shared and is not just with the small group working directly in biodiversity.

6. We agree with a 5 year review but suggest it be in the form of a status report and an update of Section 10 -Action plan and possibly Section 11 Measuring performance. Five years is not long enough for the entirety of this plan to be completed, and looking at a history of 10 years is a more realistic timeframe for a comprehensive update which is more in-line with the Council's practice over recent years.

Other Observations

General

We support the use of Māori words but suggest it would be clearer if the English word and the Māori word were used with one in parenthesis and that the Māori terms be included in the glossary

We support the submission by Bob Stephens (a member of the Branch), it fits well with our collective views about this document.

Section 8 - Comments on Goals and Outcomes

Goals to protect biodiversity

Outcome:

..."As a result of our protection, there has been no further loss of species indigenous to Wellington and no further reduction in size of ecologically significant areas or areas with the potential for future restoration. There has been an increase in population size of threatened and/or locally significant species. "...

Comment – We suggest it would be clearer if this outcome were stated as an increase in population size of previously threatened and/or locally significant species or alternatively stated as a reduction in the number of threatened species. It is also important to indicate from when this turn-around has been apparent, and acknowledged that it began from a very low base.

"Locally significant species" is something of a fashion statement, i.e. this group's composition can be

influenced by promotion, so it is a not science-based term. On the other hand we acknowledge promotion is how to create interest in native biodiversity.

Goals to restore biodiversity

...."Aquatic ecosystem health across the city is maintained and/or improved"....

Comment - The goal is restoration so this objective should be improvement

Goals to connect people to biodiversity

Outcome

"Wellingtonians are connected to nature. They are knowledgeable and passionate about Wellington's biodiversity and want to live in a city of abundant nature that is in close proximity to them. They have become kaitiaki of the natural environment and take action to support its protection and restoration. ..."

Comment – We suggest Wellingtonians are passionate about the fauna and flora that make up the biodiversity not biodiversity per se.

Section 9 - Biodiversity Concept Plans

Comment: We are supportive of Wildlife Safe Wellington and pleased to see its inclusion and congratulate WCC for also including the Blue Belt concept and green corridors but note that there are very few actions to clean up the harbour of rubbish and to restore the marine biodiversity.

Section 10 .4 – Research

Comment: - We welcome the new initiatives for monitoring and suggest an additional action to record data on invasive plants

ournaturalcapital@wcc.govt.nz

Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan Submission

Overall, do you support or oppose the general direction of Our Natural Capital? Support – The city needs to incorporate biodiversity in all the Council's actions and activities. The strategy should be integrated with the other Council documents and actively implemented throughout Council. Nature underpins Society. Potentially all policy and projects should include a checklist requiring acknowledgement that the biodiversity plan has been considered and implemented (and how it has been implemented). The should Biodiversity Strategy and Action Plan connected to the district plan.

Do you support the Guiding Principles, Goals and Outcomes? Yes in general. The document throu has a strong emphasis on terrestrial biodiversity and only patchy acknowledgement of coastal biodiversity. The Blue Belt concept comes in as a add on later in the document. There should be and introduction and greater recognition of the marine nearshore environment and associated biodiversity. This an essential component of the wider environment of Wellington that underpins our society and people's well-being, health and economic advantage.

General comments:

- Provide a definition of biodiversity, ecosystems, and ecosystem services and economic benefits of ecosystem services. And list of biodiversity assests important to Wellington - acknowledge the economic value of biodiversity, including the business arising from recreation and the use of green space and waters, including tourism and other visitors to Wellington's Zealandia, Otari/Wilton Bush, Taputeranga Marine Reserve, Matiu Somes, etc.
- Provide a stronger focus on identified priorities, and identify responsibilities for actions and where possible timeframes and resources.
- Improve on 'Protection' and where possible identify where work can be undertaken to 'Restore' ecosystems.
- Identify the causes of any biodiversity decline/s in the urban, adjacent rural, fresh water, and coastal ecosystems. Look to how baselines can be monitored and trends reported on. How are ecosystems services being improved, determine healthy functioning ecosystems.
- Dentify more clearly how the council will manage the impact on the marine environment.
- Offer significant and practical support to others that work on the ground as well as for their advocacy associated with protecting indigenous biodiversity.
- Taputeranga Marine Reserve is not cited even though the reserve is a significant asset. Although the management of the reserve is not the responsibility of the council, it is heavily used and WCC is manages the parks, reserves (to the MHWS line), footpaths and roads etc next to the reserve. It is a core biodiversity asset for the city. Supporting, managing and improving the health and functioning of biodiversity & infrastructure assets neighbouring the reserve should be a priority.
- On-going pest control is important.
- Continued support will be made available to community groups that are improving habitats in freshwater, marine, and land based environments would be useful.

- Addresses the Blue Belt – link land. Freshwater and the coastal environments and include actions to continue the work at the wharves to restore inner harbour ecosystems and better supporting harbour clean ups.
- There appears to be a lack of regulation around removal of habitat. The strategy should aim to improve that gap.
- There needs to be more action planning for marine environment priorities. 2.1 There is an acknowledgement of the coast, but not the our harbour waters nor the south coast or Bering Head. The land/sea interface is not a barrier to biodiversity. Sea birds in particular commonly feed at sea and nest/forage on the land, blue penguins crossing roads at dusk back to nest etc.
- There is also the vital links between fresh water species such as eels and whitebait which also spend part of their lifecycle in the sea. As already stated, there needs to be a definition of biodiversity that covers both terrestrial and inshore marine.
- Section 9.2 Blue Belt – This section still has a terrestrial emphasis. More emphasis should be placed on whole ecosystems restoration.

Thank you for the opportunity to comment on Wellington's Draft Biodiversity Strategy and Action Plan.

Yours sincerely

Ann McCrone

13/1 tasman Street, Mt Cook, Wgtn 6021

Submitter Details

First Name: **Frank**
Last Name: **Cook**
Street: **15 Hargreaves St**
Suburb: **Mt Cook**
City: **Wellington**
Country: **New Zealand**
PostCode: **6021**
Daytime Phone: **0276496508**
Mobile: **0276496508**
eMail: **frank.c@clear.net.nz**

Trade competition and adverse effects:
○ I could ○ I could not
gain an advantage in trade competition through this submission
○ I am ○ I am not
directly affected by an effect of the subject matter of the submission that :
a. adversely affects the environment, and
b. does not relate to the trade competition or the effects of trade competitions.

Wishes to be heard:
○ Yes
◉ I do NOT wish to speak in support of my submission and ask that the following submission be fully considered.

Preferred hearing location:
○ Oral Hearings - Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

Hearing Needs:

Correspondence to:
◉ Submitter
○ Agent
○ Both

Submission

1. Overall, do you support or oppose the general direction of Our Natural Capital?

○ Strongly oppose ○ Oppose ○ Neither support nor oppose ○ Support ◉ Strongly support

Why do you say this?
The move to increase and support biodiversity and the accompanying plan is strongly supported

---

2. Do you support the Guiding Principles, Goals and Outcomes?

○ Strongly oppose ○ Oppose ○ Neither support nor oppose ○ Support ◉ Strongly support

Why do you say this?
As above

3. Do you think we have identified the biggest issues facing indigenous biodiversity in Wellington?

(•) Yes ( ) No

Your comments
I believe there are some improvements that could be made. There needs to be a greater emphasis on native fish in our streams. Only the bigger streams seem to get a mention but the plan should also include restoration and improvement of small stream habitat and ensure the underground streams provide a passage to the open for migrating fish. I also think greater use should be made of permeable media to reduce runoff and improve the health of the water table. This will be particularly important with longer droughts and heavier rainfall due to climate change.

4. Do you think we have identified the right priorities in order to achieve our desired outcomes for biodiversity in Wellington?

(•) Yes ( ) No

Your comments
Again by and large.I think there should be a greater focus on soil health and pollution reduction by minimizing the use of herbicides, pesticides and fungicides.The Council itself should set the example and promote other environmentally friendly methods.

5. Do you think we have identified the right organisations to partner with to achieve our objectives?

(•) Yes ( ) No

Your comments
The Regional Council as a partner is missed off in some places.

6. Do you think we have the right indicators and targets to measure our performance by?

(•) Yes ( ) No

Your comments
We need to ensure qualitative measures are included as well as quantitative ones.

7. Do you agree with our direction for the tiered support for community groups?

(•) Yes ( ) No

Your comments
Probably a good idea.

8. Is there anything you feel has not been adequately covered by the draft plan?

(•) Yes ( ) No

Your comments
Despite my comments above, I am very happy with the report and congratulate all those concerned with its preparation.

9. Do you have additional comments? (please attach additional pages via the 'Supporting Information' tab)

( ) Yes (•) No

Your comments

Attached Documents

File
Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

From: Rosamund
To: Myfanwy Emeny
Subject: Submission
Date: Monday, 9 March 2015 2:44:05 p.m.

Submission Draft Biodiversity Action Plan 2015

Myfanwy.Emeny@wcc.govt.nz

I make this submission as an individual.

I consider the 5 minutes allocated for an oral submission derisory and therefore do not wish to heard.

Introduction:

I have read all of the information provided and have re-read the September 2007 plan.

Submission:

I am supportive of the plan to restrict the poisoning of opportunity plants and the wholesale felling of trees deemed to be “unsafe” a term which appears to be code for anything not seen to be of local origin however erroneous that assumption might be.

Biodiversity is defined as the number and diversity of distinct living species within the world or a particular environment. Biodiversity is not encouraged by the eradication of any species. In a healthy biodiverse environment all that can survive the elements and terrain must be left. Flowering fauna is especially valuable at an attractant for insects that transfer pollen whilst feeding on nectar and in their turn becoming food for birds.

“Weed Spraying” – “Aerial Spraying” will destroy biodiversity and poison the environment by wind drift and by contaminating neighbouring plants and the surrounding soil. The poisoned soil then drift into the waterways poisoning fauna living on or nearby. Wellington City Council should abandon all spraying programmes in the interests of protecting biodiversity.

Controlling unwanted fauna is best done by hunting. Goats should be freely used to control unwanted vegetation.

Trees are not pests nor should they be eradicated. All trees, whether registered as historic or not should be protected from felling. To protect our biodiversity there must never be any more clear-felling in Wellington.

Trees provide habitat for fauna and host epiphyte flora, they shelter and shade whilst

purifying the air. Trees absorb water then transpire from their leaves. Trees when left are self mulching and benefit the fauna living in the undergrowth and fallen limbs provide welcome habitat. Wood from trees adds to the richness of our lives and give pleasure to all humans by just being.

Fear of tree-fall is often used as an excuse for wholesale felling. The dangers of landslip/slides subsequent to felling is greater that that caused by the spontaneous falling of an individual tree. If it takes 60 years for a tree to reach maturity it is fatuous when suggesting the clear-felled sites will be replanted, the ugliness will last until whatever is planted reaches maturity. Biodiversity is not served by clear-felling or removing healthy stands of trees.

I am alarmed at the coded language used throughout the plan as an attempt to hide the intention to fell trees and remove opportunity plants. It also allows appears to allow for indiscriminate poisoning of flora and as a consequence of fauna, land and waterways.

Eco friendly solutions to encouraging biodiversity are to be encouraged. Eg: Planting orchards and surrounding them with fruiting hedges and planting willows along riverbanks both retains banks and provides habitat for fauna.

I note that there are 4 interdependent Priorities listed.

It appears that there are plans to create categories ("Tiering") of "volunteers" with a group considered "deserving" (Matai) and another less deserving (Kowhai) and finally a group (Nikau) even less deserving. I am appalled at this apparent categorisation and its implications for the many and various individual and groups of volunteer workers around the City. All Volunteer workers should be welcomed and supported with their request being met as appropriate. The language of commerce ie: "capacity building" has no place in volunteer activities though some might wish to attend workshops, training days one would hope that that degree of involvement would be paid from the money saved from abandoning any spray programme.

I understand that in the UK there is a category of "volunteer worker" who is designated an "Expert by Experience" and is then paid an emolument for their work. Ideally Wellington City Council will actually hire some more staff to do some of the more arduous work. I note that the work of volunteers on Makara Bike Park has been supplemented by heavy machinery. Volunteers work should be regarded as supplementary, not core.

There are many ways to formally recognise the work of the community. Each community should be asked to nominate their preferred "recognition".

I support a greater emphasis being placed on research and monitoring (13.4.3). Research "partnerships" are commendable as long as they are not partnerships with commercial

organizations wishing to promote their product or their interpretation of data collected. It is unfortunate that the code terms “effective” and “efficient” are terms are being used, they are usually used to disguise a cut back of services and personnel. Neither term has anything to do with promoting biodiversity.

I believe that there should be separate consultation in regard to what the community might consider “engagement” in promoting and sustaining a culture of “urban ecology” and restoration. Doubtless the techniques involved in eliciting this information would be Socratic, traversing the gamut of who, what, where, when and how before reaching an agreed conclusion.

I would be happy to discuss any of the matters raised above.

Thank you for this opportunity,

Rosamund Averton

12/17 Brougham Street,
Mount Victoria,
Wellington 6011.

Phone: 3851 495.

Please note I visit my inbox approximately fortnightly so it is always best to telephone me. Thank you.

Have your say

Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

January 2015

Absolutely Positively **Wellington** City Council
Me Heke Ki Pōneke

Section one

We are keen to hear your thoughts on how to manage our indigenous biodiversity. This is a summary of what we have planned, and we want to know if we are on the right track. If you are interested, we encourage you to read the full document.

You can comment on the Draft Plan by completing a submission form or writing down your comments and sending them to us.

- **Visiting our website:** Wellington.govt.nz/have-your-say
- **Email:** ournaturalcapital@wcc.govt.nz
- **Post:** FREEPOST
  Our Natural Capital, Parks, Sport & Recreation (REPL01)
  Wellington City Council
  PO Box 2199
  Wellington 6140
- **Fax:** 04 801 3155

You may also like to make an oral submission in support of your written submission. To do this please let us know and provide your contact details. Oral submissions will be held on **Thursday 19 March 2015** so if you wish to make an oral submission, please keep this date free. Please contact the Wellington City Council on 499 4444 for more information.

Enter your name and contact details

☑ Mr ☐ Mrs ☐ Ms ☐ Miss ☐ Dr

First name*: DAVID

Last name*: MEYER

Street address*: 156 OHIRO RD BROOKLYN

Phone/mobile:

Email:

* Mandatory fields

Making a submission

I am making feedback ☑ as an individual ☐ on behalf of an organisation

Name of organisation:

I would like to make an oral submission to the City Councillors on Thursday 19 March 2015 ☐ Yes ☐ No
If yes please provide a phone number above so that a submission time on the above date can be arranged.

Submissions close 5 pm on Friday 6 March 2015.

Privacy statement
All submissions (including name and contact details) are published and made available to elected members of the Council and the public. Personal information supplied will be used for the administration and reporting back to elected members of the Council and the public as part of the consultation process. All information collected will be held by Wellington City Council, 101 Wakefield Street, Wellington. Submitters have the right to access and correct personal information.

CSWCC100049

Section two – questions

Our Natural Capital – Wellington's Draft Indigenous Biodiversity Strategy and Action Plan – Have your say

1. Overall, do you support or oppose the general direction of Our Natural Capital? (please circle)

1 strongly oppose 2 oppose 3 neither support nor oppose 4 support 5 strongly support

Why do you say this?

2. Do you support the Guiding Principles, Goals and Outcomes? (please circle)

1 strongly oppose 2 oppose 3 neither support nor oppose 4 support 5 strongly support

Why do you say this?

3. Do you think we have identified the biggest issues facing indigenous biodiversity in Wellington? Yes ☐ No ☐

Your comments

4. Do you think we have identified the right priorities in order to achieve our desired outcomes for biodiversity in Wellington? Yes ☐ No ☐

Your comments

5. Do you think we have identified the right organisations to partner with to achieve our objectives? Yes ☐ No ☐

Your comments

6. Do you think we have the right indicators and targets to measure our performance by? Yes ☐ No ☐

Your comments

7. Do you agree with our direction for the tiered support for community groups? Yes ☐ No ☐

Your comments

8. Is there anything you feel has not been adequately covered by the draft plan? Yes ☐ No ☐

Your comments

9. Do you have additional comments? (Please attach additional pages if you need to)

SORRY, BUT I ONLY FOUND OUT ABOUT THIS SURVEY YESTERDAY. QUICKLY, I WOULD LIKE TO SAY I SUPPORT THIS STRATEGY. ONE THING I WOULD LIKE TO SEE IS MORE COUNCIL RESOURCES DEDICATED TO PEST CONTROL (ANIMAL AND PLANT) AND PLANTING. ONE OF THE MAIN AREAS THE COUNCIL CAN ASSIST IS PROVIDING STAFF TO COORDINATE THE MANY WILLING VOLUNTEERS IN OUR COMMUNITY. WITH MORE AND MORE PEOPLE ENTERING RETIREMENT, THERE ARE NOW MORE PEOPLE THAN EVER WANTING TO HELP IMPROVE OUR NATURAL ENVIRONMENT. THE COUNCIL CAN GREATLY ASSIST BY PROVIDING INFO ON WHAT AND HOW, AND BY DIRECTING AND COORDINATING.

THANK YOU.

Have your say

Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

January 2015

Absolutely Positively **Wellington** City Council
Me Heke Ki Pōneke

Section one

We are keen to hear your thoughts on how to manage our indigenous biodiversity. This is a summary of what we have planned, and we want to know if we are on the right track. If you are interested, we encourage you to read the full document.

You can comment on the Draft Plan by completing a submission form or writing down your comments and sending them to us.

- **Visiting our website:** Wellington.govt.nz/have-your-say
- **Email:** ournaturalcapital@wcc.govt.nz
- **Post:** FREEPOST
  Our Natural Capital, Parks, Sport & Recreation (REPL01)
  Wellington City Council
  PO Box 2199
  Wellington 6140
- **Fax:** 04 801 3155

You may also like to make an oral submission in support of your written submission. To do this please let us know and provide your contact details. Oral submissions will be held on **Thursday 19 March 2015** so if you wish to make an oral submission, please keep this date free. Please contact the Wellington City Council on 499 4444 for more information.

Enter your name and contact details

☑ Mr ☐ Mrs ☐ Ms ☐ Miss ☐ Dr

First name* PETER ENDERBY

Last name* BUXTON

Street address* 106 WELD ST., WADESTOWN, WELLINGTON 6012

Phone/mobile (04) 4723456

Email pebuxton@xtra.co.nz

* Mandatory fields

Making a submission

I am making feedback ☑ as an individual ☐ on behalf of an organisation

Name of organisation

I would like to make an oral submission to the City Councillors on Thursday 19 March 2015 ☑ Yes ☐ No
If yes please provide a phone number above so that a submission time on the above date can be arranged.

Submissions close 5 pm on Friday 6 March 2015.

Privacy statement
All submissions (including name and contact details) are published and made available to elected members of the Council and the public. Personal information supplied will be used for the administration and reporting back to elected members of the Council and the public as part of the consultation process. All information collected will be held by Wellington City Council, 101 Wakefield Street, Wellington. Submitters have the right to access and correct personal information.

CSWCC100049

Section two - questions

Our Natural Capital - Wellington's Draft Indigenous Biodiversity Strategy and Action Plan - Have your say

1. Overall, do you support or oppose the general direction of Our Natural Capital? (please circle)

1 strongly oppose | 2 oppose | 3 neither support nor oppose | 4 support | (5 strongly support)

Why do you say this?

As a volunteer Host, Guide and Trust Board Member I am aware of the damage done in ignorance to Wellington's Flora, Streams and Fauna by Residents, even in the Western and Central Northern Suburbs. This could be ameliorated by education, promotions which show residents the biodiversity assets their behaviour is putting at risk and explaining to new immigrants that public reserves are not in existence for them to plunder (taking Fungi, plants, dumping rubbish)

2. Do you support the Guiding Principles, Goals and Outcomes? (please circle)

1 strongly oppose | 2 oppose | 3 neither support nor oppose | 4 support | (5 strongly support)

Why do you say this?

The Guiding Principles and Goals, Outcomes are in accordance with accepted International Best Practice and should achieve progress towards the Goals. Some priorities need to be adjusted. There is no listing of the resources experts with direct experience estimate will be needed to achieve the Wish List this Biodiversity Strategy envisages and no time line of actions needed to achieve the outcomes

3. Do you think we have identified the biggest issues facing indigenous biodiversity in Wellington? Yes ☑ No ☐

Your comments

The priorities for tackling the issues needs further review. Should WCC efforts only be concerned with Endemic Species - Indigenous Plants?

4. Do you think we have identified the right priorities in order to achieve our desired outcomes for biodiversity in Wellington? Yes ☐ No ☑

Your comments

To many resources have been squandered and veiled from the Public view. Council did not consult with those already well experienced in restoration and managing indigenous biodiversity, allowed themselves to be deceived by Consultants without a track record and by vociferous but not knowledgeable enthusiasts. There is insufficient coordination and cooperation between Tourist Operators.

5. Do you think we have identified the right organisations to partner with to achieve our objectives? Yes ☐ No ☑ not fully.

Your comments Organisations like Otari Wiltons Bush, Te Papa and The Wellington Botanical Society have a huge amount of knowledge and at least 15 years hands-on experience of native forest restoration thus should be added to the list of organisations with whom WCC Partners. There are other Groups in the Wellington Region eg. Nga Manu Trust, Tramping and Fishing Clubs.

6. Do you think we have the right indicators and targets to measure our performance by? Yes ☐ No ☐ not entirely.

Your comments We should be tracing the Wellington Storm water drain system and identify places at junctions local moniters could access. The Te Mahanga and Kaiwharawhara Streams are sometimes polluted with Detergent (Car Washing Fundraisers) paint (painting contractors with Asian Workers) oil (garages) are some culprits as well as our Defective Sewerage System where common chambers for Storm and Sewerage Pipes allow overflows between these. Volunteer Moniters need to know where the pipe discharging pollutants goes to.

7. Do you agree with our direction for the tiered support for community groups? Yes ☑ No ☐

Your comments We need to distinguish between purely volunteer groups and those like Zelandia which are commercial operations. WCC need systems which would allow Commercial Sponsors a security of continuing tenure while they contribute. Certain users are given too much exclusivity of Public Assets - review WCC leasing. Other Commercial Operators get far too much access to Eco Sites without any contribution to these.

8. Is there anything you feel has not been adequately covered by the draft plan? Yes ☑ No ☐

Your comments

The Plan is too vague. Definite Projects with costs, benefits and time lines are needed with annual reports on their progress.

9. Do you have additional comments? (Please attach additional pages if you need to)

There is no point in planting 45,000 native eco-sourced trees if no arrangements are made to support these with initial watering and later weeding in particular. Long term monitoring is needed to determine which environments and elevations favour known plant species. When new reservoirs and pipes where installed on Te Ahumairangi (Tinakori) Hill some watering points would have enabled volunteers to save hundreds of Rata Trees Planted. Weeding is now needed. The restoration of the clear felled Town Belt here needs some infrastructure and volunteers to make it successful. There needs to be regular Coordination Meetings between WCC Departments, CCB's, and Local organisations as well as with large Landowners and Orgnisations (Railways - On Track, Transit N.Z. etc.)

Have your say

Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

January 2015

Absolutely Positively **Wellington** City Council
Me Heke Ki Pōneke

Section one

We are keen to hear your thoughts on how to manage our indigenous biodiversity. This is a summary of what we have planned, and we want to know if we are on the right track. If you are interested, we encourage you to read the full document.

You can comment on the Draft Plan by completing a submission form or writing down your comments and sending them to us.

- **Visiting our website:** Wellington.govt.nz/have-your-say
- **Email:** ournaturalcapital@wcc.govt.nz
- **Post:** FREEPOST
  Our Natural Capital, Parks, Sport & Recreation (REPL01)
  Wellington City Council
  PO Box 2199
  Wellington 6140
- **Fax:** 04 801 3155

You may also like to make an oral submission in support of your written submission. To do this please let us know and provide your contact details. Oral submissions will be held on **Thursday 19 March 2015** so if you wish to make an oral submission, please keep this date free. Please contact the Wellington City Council on 499 4444 for more information.

Enter your name and contact details

☐ Mr ☐ Mrs ☑ Ms ☐ Miss ☐ Dr

First name* Siobhan

Last name* Leachman

Street address* 67 Washington Ave, Brooklyn

Phone/mobile 04 389 0826

Email Siobhan_Leachman@yahoo.co.nz

* Mandatory fields

Making a submission

I am making feedback ☑ as an individual ☐ on behalf of an organisation

Name of organisation

I would like to make an oral submission to the City Councillors on Thursday 19 March 2015 ☑ Yes ☐ No
If yes please provide a phone number above so that a submission time on the above date can be arranged.

Submissions close 5 pm on Friday 6 March 2015.

Privacy statement
All submissions (including name and contact details) are published and made available to elected members of the Council and the public. Personal information supplied will be used for the administration and reporting back to elected members of the Council and the public as part of the consultation process. All information collected will be held by Wellington City Council, 101 Wakefield Street, Wellington. Submitters have the right to access and correct personal information.

I would like the City Council to continue its exemplary work on controlling possums in and around Wellington but to put more emphasis, both in terms of money and person power, in controlling, and if possible eradicating, other predators such as rats, feral cats, stoats, ferrets and weasels. I would like the Council to include in the Plan a strategy to lay predator trap lines in and around the Town Belt and the various Wellington City Council parks and gardens in the city.

At present the draft plan appears to outline a good approach enabling the Council to support volunteer groups in laying traps in and around the City. However it does not appear to give an overarching strategy to ensure that these pests are targeted in a cohesive way. I would like to see the draft plan improved to give a unified strategy for the Wellington wide trapping of these types of predators.

I believe a more cohesive strategy is needed by the Council to ensure that invasive pests are at least reduced and if possible eradicated; and to protect Wellington's native species particularly birds and reptiles.

Eventually I would like native species such as the Saddleback to be able to nest, breed and be seen in my local park – Central Park. Without this type of strategy I doubt this will ever be likely.

Along with the Council taking steps such as laying and maintaining trap lines, I would also encourage the Council to work in partnership with such as organisations as Enhancing the Halo, Victoria University (with its Identify Invasive Mammals project), as well as community groups such as Katch 22. I want the Council to ensure information on these types of predators is collected, analysed and to lead or assist in the efforts to eradicate them as efficiently and effectively as possible.

I would also encourage the City Council and its staff make use of websites and citizen science projects such as NZnaturewatch.nz.org to help identify pests and areas of concern as well as help raise awareness and educate Wellingtonians on Wellington's biodiversity.

I am making this submission purely as a result of stumbling across an observation of stoats being observed in Central Park which was logged on the NZnaturewatch.org.nz website by one of your employees.

Finally I would also like the draft plan to outline in more detail the role the City Council could play in achieving the wider goal of having a predator free New Zealand. I think the draft plan could be improved by providing more information on the action the Council will take to assist in a more strategic and connected effort in national predator management. I believe it would be helpful if the plan outlined goals concerning data sharing (for example the making and sharing of maps of ongoing predator control areas) as well as strategies for encouraging more efficient management of resources between larger agencies such as the Conservation Department and the Greater Wellington Regional Council.

Yours sincerely

Siobhan Leachman

Have your say

Our Natural Capital - Wellington's Draft Biodiversity Strategy and Action Plan

January 2015

Absolutely Positively **Wellington** City Council
Me Heke Ki Pōneke

Section one

We are keen to hear your thoughts on how to manage our indigenous biodiversity. This is a summary of what we have planned, and we want to know if we are on the right track. If you are interested, we encourage you to read the full document.

You can comment on the Draft Plan by completing a submission form or writing down your comments and sending them to us.

- **Visiting our website:** Wellington.govt.nz/have-your-say
- **Email:** ournaturalcapital@wcc.govt.nz
- **Post:** FREEPOST
  Our Natural Capital, Parks, Sport & Recreation (REPL01)
  Wellington City Council
  PO Box 2199
  Wellington 6140
- **Fax:** 04 801 3155

You may also like to make an oral submission in support of your written submission. To do this please let us know and provide your contact details. Oral submissions will be held on **Thursday 19 March 2015** so if you wish to make an oral submission, please keep this date free. Please contact the Wellington City Council on 499 4444 for more information.

Enter your name and contact details

☐ Mr ☐ Mrs ☐ Ms ☑ Miss ☐ Dr

First name* Jessmayer

Last name* Wakefield

Street address* 21/7 Duncan Tce

Phone/mobile

Email

* Mandatory fields

Making a submission

I am making feedback ☑ as an individual ☐ on behalf of an organisation

Name of organisation

I would like to make an oral submission to the City Councillors on Thursday 19 March 2015 ☐ Yes ☑ No
If yes please provide a phone number above so that a submission time on the above date can be arranged.

Submissions close 5 pm on Friday 6 March 2015.

Privacy statement
All submissions (including name and contact details) are published and made available to elected members of the Council and the public. Personal information supplied will be used for the administration and reporting back to elected members of the Council and the public as part of the consultation process. All information collected will be held by Wellington City Council, 101 Wakefield Street, Wellington. Submitters have the right to access and correct personal information.

CSWCC100049

Section two - questions

Our Natural Capital - Wellington's Draft Indigenous Biodiversity Strategy and Action Plan - Have your say

1. Overall, do you support or oppose the general direction of Our Natural Capital? (please circle)

1 strongly oppose 2 oppose 3 neither support nor oppose (4 support) 5 strongly support

Why do you say this?

help animals the enviornment peoples health and wellbeing

2. Do you support the Guiding Principles, Goals and Outcomes? (please circle)

1 strongly oppose 2 oppose 3 neither support nor oppose 4 support 5 strongly support

Why do you say this?

Protect the planet

3. Do you think we have identified the biggest issues facing indigenous biodiversity in Wellington? Yes ☑ No ☐

Your comments

most of them

4. Do you think we have identified the right priorities in order to achieve our desired outcomes for biodiversity in Wellington? Yes ☑ No ☐

Your comments

5. Do you think we have identified the right organisations to partner with to achieve our objectives? Yes ☐ No ☑

Your comments

6. Do you think we have the right indicators and targets to measure our performance by? Yes ☑ No ☐

Your comments

7. Do you agree with our direction for the tiered support for community groups? Yes ☑ No ☐

Your comments

8. Is there anything you feel has not been adequately covered by the draft plan? Yes ☑ No ☐

Your comments

animal welfare abuse
enviorment care
supporting more people

9. Do you have additional comments? (Please attach additional pages if you need to)

Have your say

Our Natural Capital – Wellington's Draft Biodiversity Strategy and Action Plan

January 2015

Absolutely Positively **Wellington** City Council
Me Heke Ki Pōneke

Section one

We are keen to hear your thoughts on how to manage our indigenous biodiversity. This is a summary of what we have planned, and we want to know if we are on the right track. If you are interested, we encourage you to read the full document.

You can comment on the Draft Plan by completing a submission form or writing down your comments and sending them to us.

- **Visiting our website:** Wellington.govt.nz/have-your-say
- **Email:** ournaturalcapital@wcc.govt.nz
- **Post:** FREEPOST
  Our Natural Capital, Parks, Sport & Recreation (REPL01)
  Wellington City Council
  PO Box 2199
  Wellington 6140
- **Fax:** 04 801 3155

You may also like to make an oral submission in support of your written submission. To do this please let us know and provide your contact details. Oral submissions will be held on **Thursday 19 March 2015** so if you wish to make an oral submission, please keep this date free. Please contact the Wellington City Council on 499 4444 for more information.

Enter your name and contact details

☐ Mr ☐ Mrs ☑ Ms ☐ Miss ☐ Dr

First name* Julia

Last name* Stace

Street address* 129 Aro St Aro Valley Wgtn

Phone/mobile 027 446 3447

Email jbwstace@gmail.com

* Mandatory fields

Making a submission

I am making feedback ☐ as an individual ☑ on behalf of an organisation

Name of organisation Aro Valley Community Council

I would like to make an oral submission to the City Councillors on Thursday 19 March 2015 ☐ Yes ☑ No
If yes please provide a phone number above so that a submission time on the above date can be arranged.

Submissions close 5 pm on Friday 6 March 2015.

Privacy statement
All submissions (including name and contact details) are published and made available to elected members of the Council and the public. Personal information supplied will be used for the administration and reporting back to elected members of the Council and the public as part of the consultation process. All information collected will be held by Wellington City Council, 101 Wakefield Street, Wellington. Submitters have the right to access and correct personal information.

CSWCC100049

Section two - questions

Our Natural Capital - Wellington's Draft Indigenous Biodiversity Strategy and Action Plan - Have your say

1. Overall, do you support or oppose the general direction of Our Natural Capital? (please circle)

1 strongly oppose 2 oppose 3 neither support nor oppose 4 support 5 strongly support

Why do you say this?

2. Do you support the Guiding Principles, Goals and Outcomes? (please circle)

1 strongly oppose 2 oppose 3 neither support nor oppose 4 support 5 strongly support

Why do you say this?

3. Do you think we have identified the biggest issues facing indigenous biodiversity in Wellington? Yes ☑ No ☐

Your comments

4. Do you think we have identified the right priorities in order to achieve our desired outcomes for biodiversity in Wellington? Yes ☑ No ☐

Your comments

5. Do you think we have identified the right organisations to partner with to achieve our objectives? Yes ☑ No ☐

Your comments

6. Do you think we have the right indicators and targets to measure our performance by? Yes ☑ No ☐

Your comments

7. Do you agree with our direction for the tiered support for community groups? Yes ☑ No ☐

Your comments

8. Is there anything you feel has not been adequately covered by the draft plan? Yes ☑ No ☐

Your comments

9. Do you have additional comments? (Please attach additional pages if you need to)

Aro Valley Restoration Group appreciates WCC ongoing support with annual allocation of plants Now ready for large trees eg. podocarps rimu, tree fuchsia, hinau, that were originally cover in some areas in Aro Valley are ready for "enrichment plantings".

From: Brent Tandy
To: Myfanwy Emeny
Subject: RE: Submission for WCC bio strategy
Date: Tuesday, 10 March 2015 3:26:14 p.m.

Hi Myfanwy,

Sorry that this is late….It's somewhat brief but the basic message is that we fully support the plan and did not see anything that concerned us. In fact the opposite. Its' comprehensive and well put together. Great to see who committed WCC is to Wellington is biodiversity. Below follows the submission format by and large.

We strongly support the concept of Nature Capital and the principles behind it.

The goals and outcome statements are commendable and we are in full support and will contribute where we can to this as a partner.

We are satisfied that the plan addresses the biggest issues facing biodiversity

The Goals, objectives and actions within the Action are very comprehensive and capture a vast array of biodiversity priorities for Wellington. The core functions within 1. Protect and 2. Restore are well prioritised and include expanded funding in key areas.

DOC is highlighted as one of the partner organisations. We support this partnership and are keen to continue and expand where possible.

We are not familiar with the City Biodiversity Index indicators and targets associated with it so we trust it is a suitable measure. There will perhaps be the need however for some more standardised monitoring for pest work such as RTC (residual trap catch) for possums for example to ensure that pest control is effective? This might already be in place anyway.

The criteria for assessing community groups is sound and the tiered support approach will possibly encourage groups to 'up their game' to seek further assistance.

Any questions just sing out.

Cheers, Brent

Brent Tandy
Senior Ranger Biodiversity Kaitiaki Matua(Matarautaki)
Kapiti Wellington District
Department of Conservation-*Te Papa Atawhai*
DDI: +64 4 819 7632 VPN: 8442

Poneke / Wellington Office
PO Box 5086 Lambton Quay Wellington 6145
181 Thorndon Quay Wellington 6011
T: +64 4 472 5821

Conservation for prosperity

J C Horne
28 Kaihuia Street
Northland
WELLINGTON 6012
Phone 475 7025
E-mail jchorne@paradise.net.nz

B Mitcalfe
15 Boundary Road
Kelburn
WELLINGTON 6012
Phone/fax 475 7149

5 March 2015

Myfanwy Emeny
Team leader, Biodiversity & Urban Ecology
Wellington City Council
PO Box 2199
WELLINGTON 6140

SUBMISSION:
Draft Wellington's Biodiversity Strategy and Action Plan 2014

Thank you for the opportunity to present this submission. If hearings are held, we would like to speak in support of it, and possibly make additional comments.

We welcome the decision to review the 2007 document, but believe that eight years is too long a period to wait for revision.

Recommendation
Funding be allocated in the annual planning process so that Our Natural Capital can be reviewed no later that 2019.

Introduction
Wellington's indigenous ecosystems, whether original forest, or regenerating forest, shrublands, wetlands, dunelands, streams and coast, are of considerable ecological importance. They are the prime contributors to the city's natural values. They face threats from pest animals, pest plants and other ecological weeds, incursions for roading, tracks and other development, and ill-advised plantings within numerous reserves.

Recommendation
To highlight throughout the document that it is Wellington's indigenous biodiversity strategy and action plan, place a 'footer' on each page, as follows:

Indigenous Biodiversity Strategy and Action Plan 2015

The draft covers 82 pages, compared with 38 pages in the 2007 *Biodiversity Action Plan*. There are passages which are not directly relevant to a strategy and action plan.

Recommendation
Edit the text for relevance, brevity and clarity, to ensure that readers in community groups working in Council reserves find it easy to understand and implement.

1. Summary – page 4
Recommendation
This should be shortened by providing only highlights of:

- *the vision, at present stated on page 17*
- *the Action Plan's four components*
- *the assistance that Council proposes be given to community groups working in the city's reserves.*

2 and 2.1. Introduction – page 5
Recommendation
Most of this section reads like boasting. It could be deleted, to good effect.

2.2. What is biodiversity? – pages 5 and 6

We support these statements.

Recommendation

Memoranda of Understanding (MOU) be agreed upon between Council and each community group working in Council reserves. An MOU should stipulate what work a community group can do, and cannot do, to protect indigenous biodiversity. An MOU would control planting and track-building activities, to avoid repetition of the widespread plantings of inappropriate species, and the damage caused to ecosystem values by track construction. An MOU should require compliance with Council's eco-sourcing guidelines. (see our comments on Appendix 5).

3. Māori and mana whenua relationship to biodiversity – page 8

We acknowledge this relationship.

7. Guiding principles – page 17

The paragraph on research should be expanded.

Recommendation

After 'introduced species' add 'of plants and animals'.
Reason: We consider that in suburban areas, pest plants and other ecological weeds pose even greater threats than pest animals in mature and regenerating indigenous ecosystems.

8. Goals and outcomes – page 18

Goals to protect biodiversity

Recommendation

Expand 3rd bullet point to: 'Pest animal and pest plant species are controlled … '.

10. Action Plan – pages 23 - 33

1.3.3.a - page 23

Recommendation

Expand to: 'Support the capacity of new and existing community groups to engage in pest animal and pest plant control.'

2.1.2 b, c, d – pages 24, 25

These actions will require the training of community groups, and control of their activities through agreed MOUs.

2.1.3 d – page 25

Recommendation

Landscape planting, particularly street trees, on sites contiguous with Council reserves, should be restricted to indigenous species found in those reserves.

2.4.2 b – page 26

Recommendation

This may involve Council training private landowners.

3.3.6 b– page 29

Recommendation

Council could also seek to involve National Radio's "Our Changing World" programme.

Appendix 5, pages 81-82.

Recommendation

The following modifications to Appendix 5 be adopted by Council. This should be an interim step, while awaiting the completion of the Department of Conservation's (DOC) work on establishing eco-sourcing guidelines for adoption throughout the country. DOC will start the work in April.

13.1.4.16 – page 51

Recommendation

Add a new final sentence: 'The emphasis should be on the development of walking tracks, because mountain-bike track construction has often been at the expense of gross destruction of indigenous vegetation and soil cover.'

13.3.6 Working with partners towards a shared vision for Wellington'

biodiversity – page 63

Ecological leadership

Recommendation

Implementing our recommended changes to the eco-sourcing guidelines (see below), plus Council strictly limiting the number of species that are allowed to be planted in each particular reserve, will help to reduce the planting of inappropriate species, a widespread problem in the past. Council should also require the removal of all inappropriate plantings in reserves, in an effort to eliminate past errors by community groups.

13.4.3 Levels of research – page 66

Intensive and targeted research

Recommendation

This research will require Council to provide dedicated funds in every annual plan, on an as-and-when required basis.

13.4.4 Levels of research – page 67

Para 5 – we strongly support this statement. Dr Geoff Park's invaluable 1999 paper, prepared for Council, did not record such sites, because it was based on the presence of primary forest species in the canopy. An example of a site that he did not record, because it lacks primary forest species in the canopy, is Centennial Reserve, Miramar.

13.4.4 Priority research areas – page 68

Restoration

Recommendation

Add a key question: Have the ecological appropriateness and origin of the sources of seed, and plant species used, been approved?

13.4.6 Monitoring and reporting – page 69

Recommendation

Monitoring and reporting are vital to this strategy and action plan, so Council must allocate funding in every annual plan.

Question: How and when will Council remedy the mistakes made by community groups by planting inappropriate species? Examples include Akama rosifolia in Rangitatau Reserve, Coprosma

linariifolia, Pseudopanax ferox and Rhabdothamnus solandri in Centennial Reserve, Meryta sinclarii in Oku Street Reserve, and Entelea arborescens in Polhill Reserve.

13.4.7 Guidelines – page 70
Points 15, 16, 20 in particular
Recommendation
Council will have to allocate funds in each annual plan to employ staff trained in the management of indigenous ecosystems and of volunteers in community groups.

14. Glossary – page 71
Recommendation
Add the definition of 'Ecological restoration', and also refer readers to the definition of 'Restoration' on page 73.

APPENDIX 2 – Tiered support for community groups working on Council land – page 76

Recommendation
Add a new first paragraph:
'Council will seek the advice of professional botanists/ecologists in the drafting of MOUs that will control the activities of community groups, to ensure that their activities are ecologically sound.'

Add a new second paragraph:
'When a community group's ecological restoration plan, to be appended to its MOU, has been approved by Council, and the group has undergone the required period of training, Council may make available appropriate plant species from Berhampore Nursery.'

APPENDIX 5 - Eco-sourcing guidelines – pages 81, 82

Recommendation
That Council adopt the modified guidelines below.

What?
Eco-sourcing is the propagation of native plants for revegetation or ecological restoration* from seed or cuttings taken from populations of locally occurring** native plants. Eco-sourced plants must be used in all revegetation projects and ecological restoration projects. Wellington city has been divided into two ecological

districts according to topographical, geological and climatic conditions, and biological features and processes. These districts are Wellington Ecological District and Cook Strait Ecological District. These districts determine where to collect seed from for your project.

***This recommended new entry in the glossary should state; "see also 'restoration'"; the existing entry should state: "see 'ecological restoration'".**
****locally occurring' should be defined in the glossary, because Wellington Ecological District 39.01 is c. 44 km x 18 km. An ecologically sound definition is: 'from within the indigenous ecosystem being worked in, or as close as possible to it in the same ecological district'.**

Why?

- Planting species known to occur naturally in Wellington Ecological District or Cook Strait Ecological District preserves the ecological integrity of the respective ecological district and your project..
- It maintains the unique local characteristics of native plants because many species can vary considerably throughout their range in the ecological district and elsewhere in New Zealand.
- Local plants are also better suited to local conditions and typically grow better than those sourced from elsewhere.

How?
The ecologically sound technique is to use only plants growing naturally in the indigenous plant community being worked in, or in a community as close as possible to it in the same ecological district. You can identify these species through plant checklists for the area. Greater Wellington Regional Council (GWRC) has a *Wellington Regional Native Plant Guide*. More comprehensive lists can be obtained from the Department of Conservation (DOC). The New Zealand Plant Conservation Network (NZPCN) also has plant checklists available to members (nzpcn.org.nz).

Seed should be collected from as many local native plants as close as possible to the revegetation site or ecological restoration site. This could be from within the same population, or as close as possible to it in the same ecological district.. If in doubt, seek professional advice from the Council, DOC or GWRC.

Choosing propagation material

Eco-sourcing usually involves seed in preference to cuttings. This ensures that the genetic diversity within each species is maintained as much as possible. Cuttings, being clones of a parent plant, limit the genetic diversity of species and should be used only where it is not possible to obtain seed of a species.

Seed should come from wild populations of plant species that are occurring naturally in a habitat as near-identical as possible to the habitat of your revegetation project or ecological restoration project, Avoid collecting from urbanised areas, including native trees in a garden setting, particularly those that have been planted. If nearby plants of the same species are known to be non-local, check they are not close enough to risk cross-pollination. Ideally, collect from sites where ecological processes (i.e., pollination, dispersal and succession) are functioning naturally.

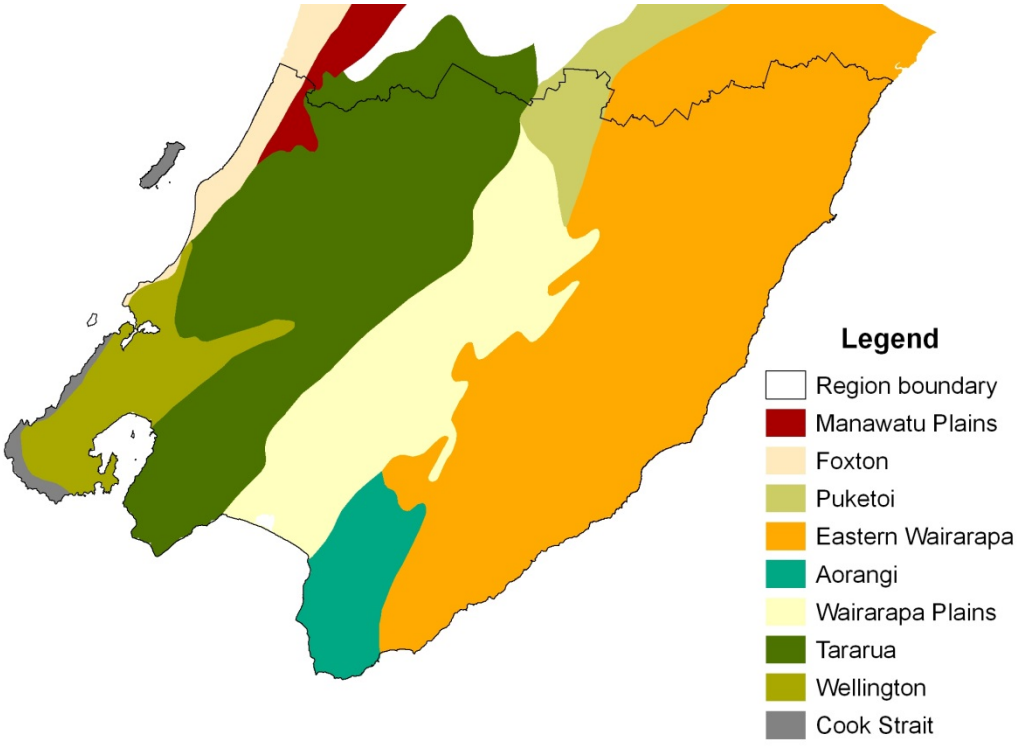
Seed should be selected from multiple plants at a range of locations (similar aspect, slope, moisture, soil type, etc.) within the source site, whether it is within the revegetation site, or ecological restoration site itself, or as close to it as possible in the same ecological district. Collect from different individuals each year. Collect only as much seed as you need, and take only a small amount of seed from each parent plant, leaving plenty behind for natural regeneration. If the plant you are propagating is uncommon, try to maintain genetic diversity by sourcing your seed from a number of similar sites nearby. When you are collecting, the higher the diversity (in individuals, communities, habitats, locations), the stronger the population will be in your project site.

You will need the landowner’s permission to collect seed and other plant material. Always obtain this before collection.

Remember that good record-keeping is essential. Use Council’s data-collection forms which are designed for electronic processing of the data you collect. .Label the seed when you collect it and continue labelling when you sow the seed and pot the plants up. Records must be kept of the species, location, date collected and habitat characteristics of the source. Council will tell you if you have to divide your revegetation site, or ecological restoration site, into areas to facilitate record-keeping of what you have planted where.

We recommend that that Fig 1 be replaced by a map showing solely Wellington Ecological District and Cook Strait Ecological District, with Wellington city's TLA boundary clearly shown. REASON: the other ecological districts in the region are irrelevant. We believe that Fig 1, showing all nine ecological districts in the region, may confuse community groups seeking to comply with the eco-sourcing guidelines.

Fig 1. This map shows the extent of the nine Ecological Districts that fall in the Wellington region. The black line marks the regional boundary.



Draft Biodiversity Strategy and Action Plan

Mrs Robin White

13 Makererua St, Ngaio, Wellington 6035

ngaiopa@gmail.com

I am making a submission on behalf of Ngaio Crofton Downs Residents Association. We do not wish to make an oral submission.

Questions:

1. Overall, do you support or oppose the general direction of Our Natural Capital

   5 Strongly support

2. Do you support the Guiding Principles, Goals and Outcomes

   5 Strongly support

3. Do you think we have identified the biggest issues facing indigenous biodiversity in Wellington

   Yes

4. Do you think we have identified the right priorities in order to achieve our desired outcomes for biodiversity in Wellington?
   Yes

5. Do you think we have identified the right organisations to partner with to achieve or objectives?
   Yes

6. Do you think we have the right indicators and targets to measure our performance by?

   Yes

7. Do you agree with our direction for the tiered support for community groups?
   Yes

8. Is there anything you feel has not been adequately covered by the draft plan?
   No

9. Do you have additional comments

We are impressed with the overall direction of the draft biodiversity plan. There are some points we particulary like:

- expanding the animal pest control programme and working with community groups to help meet your target
- educating land owners and developers about what they can do to protect natural values when subdividing or developing land
- connecting schools to their neighbouring natural areas
- helping individuals and households to take action to support biodiversity through trapping pests - promoting backyard trapping by providing information and facilitating the supply of equipment
- working with partners to reduce the impact of cats (domestic, stray, feral) We have populations of stray cats in the area – a threat to native wildlife.
- working with partners to run a behaviour change programme of the need to keep dogs on leashes near sensitive wildlife areas such as penguin habitat, especially during crucial periods like fledging. (We would like to expand this to reserves such as Huntleigh Park when native birds such as kaka are nesting.
- having a bat survey