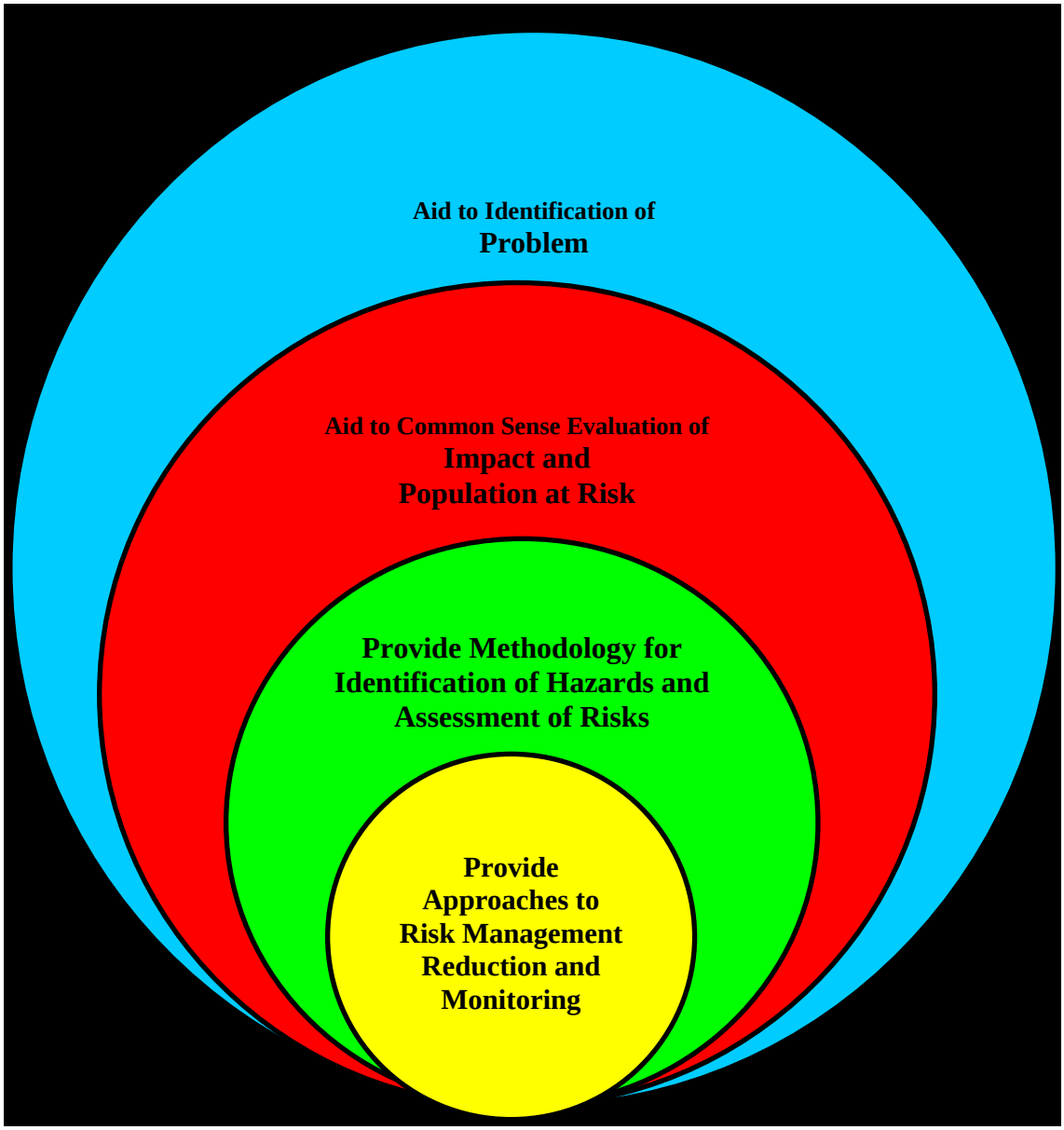
DISEASE RISK ANALYSIS TOOL DEVELOPMENT WORKSHOP REPORT

AUCKLAND ZOO 4-7 April, 2011



Workshop Collaborators

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Cover credit: Richard Kock and Workshop Participants

A contribution of the IUCN/SSC's Conservation Breeding Specialist Group (CBSG)

CBSG. 2011. Disease Risk Analysis Tool Development Workshop Report. IUCN/SSC Conservation Breeding Specialist Group: Apple Valley, MN.

To order additional copies of *Disease Risk Analysis Tool Development Workshop Report* contact the CBSG office: office@cbsg.org, 001-952-997-9800, www.cbsg.org.

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1. Acknowledgements

This workshop was made possible through the generosity of our sponsors: Auckland Zoo, Landcare Research, the New Zealand Department of Conservation and the IUCN-SSC Conservation Breeding Specialist Group. We thank them for their financial support and for their belief in our vision to deliver a resource of value to biodiversity conservation.

We also acknowledge and appreciate the enthusiastic support of the Chairs of four of the IUCN-SSC's Specialist Groups and their assistance in promoting this project through their networks: Bob Lacy (CBSG), Fredric Launay (RSG), Richard Kock and Billy Karesh (WHSG) and Piero Genovesi (ISSG).

We are indebted to the organisations and families of all those who attended the virtual sessions and/or the Auckland workshop for their support in enabling them to participate. A full list of participants and their affiliations is provided in Appendix 1 of this report.

Finally, we thank the 290 respondents to the DRA Needs Analysis survey who provided much valuable information on the current uses and needs of these tools.

2. Executive Summary and Actions

Background

A collaborative project to create a 'toolkit' to help conservation managers make informed decisions about disease risks associated with wildlife translocations was initiated twenty years ago by Dr. Ulie Seal, founder and first chairman of the IUCN-SSC Conservation Breeding Specialist Group (CBSG). This culminated in the publication of "Animal Movements and Disease Risk: A Workbook" in 2002..

Since then major advances in risk assessment tools and technologies have emerged in the wake of an explosion of interest in wildlife disease by individuals and organisations whose focus is not only conservation but encompasses concerns for the health of people and domestic animals as well as international trade. For wildlife conservationists the concerns have extended to include disease risks to wildlife populations *in situ* in addition to those associated with translocations. Consequently the need for a full revision of the CBSG's Workbook was considered timely and, given the complexity of the topic, a collaborative, global approach essential.

Understanding the needs and building the team

To enable an understanding of the audience for this revised resource and their needs, the CBSG instigated a collaborative partnership with three other specialist groups of the IUCN'[1]s Species Survival Commission (SSC) with a shared interest in disease: namely Wildlife Health (WHSG), Reintroduction (RSG) and Invasive Species (ISSG). Through these combined networks we were able to enlist participation of an initial 37 people from Australasia, Europe and North and South America.

Using internet tools and CBSG facilitation processes to meet in a virtual environment over the course of a month, this group initiated a systematic review of the existing DRA Workbook, drafted a project vision, mission and framework for the new DRA resource and began compilation of a bibliography and glossary. The group also developed a needs analysis survey and, through its links to multiple networks received 290 responses from individuals working in 47 countries on five continents. This pre-work enabled Auckland workshop participants to hit the ground running.

Workshop

Twenty-three people traveled from as far away as England and North and South America to spend three-and-a-half days together in intense conversation at the New Zealand Centre for Conservation Medicine (NZCCM), Auckland Zoo. This group represented twenty organisations and a wide range of expertise (see box). It is believed to be the first time four specialist groups of the IUCN-SSC have collaborated on a single project. Sponsored by

[1] International Union for the Conservation of Nature – the World Conservation Union

Auckland Zoo, Landcare Research, the New Zealand Department of Conservation (DOC) and CBSG, the workshop programme included both whole group and smaller working group sessions and enough time for participants to share information and get to know each other. Facilitated by workshop organisers, Richard Jakob-Hoff, Caroline Lees, Phil Miller and Dominic Travis, the participants' combined rating of the value of this event was 4.8 out of a possible five.

Range of Expertise of Workshop Participants

- Adult education
- Biosecurity
- Conservation biology
- Conservation medicine
- Disease surveillance
- Ecology
- Ecosystem health
- Epidemiology
- Facilitation
- Horticultural science
- Laboratory diagnostics
- Parasitology
- Pathology
- Population genetics
- Reintroduction biology
- Risk analysis
- System modelling
- Veterinary science
- Wildlife population management

The workshop programme was developed around three progressive themes:

1. Where have we been, where are we now? The history of the project was described, different perspectives on the use and processes of risk analysis shared, the results of the needs analysis survey reviewed, a keynote synopsis delivered on the application of risk analysis to wildlife disease across a broad spectrum of scenarios and the results of the CBSG Workbook review reported.

2. Where are we going? The vision and goals were further refined, the draft new structure for the resource discussed and topics and broad content for each section developed

3. Moving Forward. A number of participants demonstrated the use of a range of DRA tools using case studies; adult learning principles were considered as preparation for the training resources to be developed in parallel with the new DRA publication and an action planning session was completed.

Outcomes

1. The following Vision and Mission for the project were agreed:

   Vision: Ensuring healthy ecosystems through better decision making

   Mission: To develop and promote an open access set of processes and tools, endorsed by IUCN, that address disease threats to biodiversity conservation.

2. The framework and broad content of a new on-line and hard copy *Guide to Wildlife Disease Risk Analysis* [2](DRA) was developed, topics from the existing CBSG Workbook mapped (where appropriate) to the new framework, a timeline for completion by mid-December 2011 agreed to and tasks assigned to do the work over the coming months (see Table 1).

3. An editorial team, led by Richard Jakob-Hoff (Auckland Zoo/CBSG Australasia), and comprised of Caroline Lees (CBSG Australasia), Phil Miller (CBSG), Dominic Travis,

[2] Consensus on this name for the new resource was obtained via a post-workshop e-mail survey of participants.

(University of Minnesota), Richard Kock (Royal Veterinary College/WHSG) and Stuart MacDiarmid (NZ Ministry of Agriculture and Forestry), were tasked with collating the contributions of multiple authors while ensuring a logical flow of topics, consistent language appropriate to the wide range of potential users (with minimal use of jargon) and a user-friendly format.

It has become clear that there is a need to standardise, wherever possible, approaches to DRA applied to wildlife health with those applied to human and livestock health. Editors of the *Guide to Wildlife Disease Risk Analysis* will ensure, as far as possible, that its terminology and structure are consistent and in keeping with international best practice across these sectors.

Table 1. Actions

The following table is a compilation of the actions identified during the workshop. They are presented in chronological order of deadline and prefaced by one of the following labels:

[PRINCIPLES] – these actions relate to the section on DRA Principles in the new *Guide*.
[TOOLS] – these actions relate to the section on DRA Tools in the new *Guide*.
[PARTICIPATION] - these actions relate to the section on DRA Participation in the new *Guide*.
[STRATEGIES FOR UPTAKE] – these actions relate to discussions about uptake of the *Guide*.
[GENERAL] – these actions emerged during other plenary sessions.

More information can be found in the corresponding working group reports and plenary session notes.

No.	Action	Who	When
1	**[TOOLS] Complete Matrix Structures:** write a brief description explaining the purpose and content of Matrices A & B, and the work needed to complete them, and create DRAFT matrices with example rows, for review by the group.	CL & PM	By end of workshop
2	**[PRINCIPLES]** Take back to Billy Karesh the proposal that WHSG takes responsibility for preparing an IUCN Guideline which would serve the purpose envisaged for the **INTRO/JUSTIFICATION** section of the document. o this work to be done in collaboration with other agencies e.g. CBSG, ISSG, the wider community, and in particular in collaboration with the editorial team for the Guide (Contact = Richard Jakob-Hoff) so that the language and content dove-tails with everything else in the document. o this work to proceed in parallel with development of the rest of the document.	RK	ASAP

No.	Action	Who	When
3	**[GENERAL]** All collaborators to be acknowledged as "authors" on all products emerging from this process.	Editorial group	Ongoing
4	**[GENERAL]** Work according to agreed publication time-lines (see Time-lines section).	ALL	Ongoing
5	**[TOOLS] Complete Tool Template:** write a generic tool description template (for tool intros section) (Mary and Tony – by early next week).	MVA, TS, KI & BR	By mid-April
6	**[GENERAL] Create work areas for Working Groups on the DRA Web-site (and/or CBSG Portal):** to allow posting of documents and tracking of progress with Guide. DRA web-site may be replaced at some point by the CBSG portal – PM to discuss with ISIS.	CL & PM	Mid-April
7	**[TOOLS] Complete list of generic DRA questions:** take the DRA questions from the Needs Survey results, see which are already covered by Group 2.'s list, create generic versions of the ones that aren't and add those generic versions to the Group 2 list.	DTo	By April 30
8	**[TOOLS] Categorise DRA questions:** map ALL questions to the Disease Risk Analysis component headings identified.	DTo & LS	By April 30
9	**[GENERAL]** Write and circulate Guidelines for Authors	RJH	May 2
10	**[GENERAL]** Glossary – to be taken forward by a smaller group in 2 virtual sessions – one to divide up the draft glossary for individual contributions, one to review and agree on a working glossary.	DTr DTo SMD BR CL	May 2
11	**[GENERAL]** Explore wiki technology through ISIS, as a way to facilitate group editing and version recall.	PM	May 2
12	**[TOOLS] Identify tools:** create a list of good/appropriate tools.	All workshop and virtual workshop participants	By May 8
13	**[TOOLS] Write Tool Descriptions:** wider group to complete templates for each tool considered for inclusion.	All workshop and virtual workshop participants	By May 31
14	**[TOOLS] Identify/write case studies**: wider group to write or identify case studies exemplifying the use of specific tools and the analysis of specific DRA questions.	All workshop and virtual workshop participants	By May 31

No.	Action	Who	When
15	**[GENERAL] Produce check-lists:** for each step in the Risk Analysis process so that Guide users can evaluate how well they have completed each step.	Groups 1 & 2	By May 31
16	**[STRATEGIES] Establish a Strategies Group** to develop the strategic and communications plan and pull in the necessary expertise required for plan implementation	Editorial Group	By May 31
17	**[PARTICIPATION] Effective Communication** – source authors for this section and agree on July 31 deadline	RJH	By May 31
18	**[PARTICIPATION] Evaluation** – write brief for this section and seek input of Maggie Jakob-Hoff to write introduction to processes and benefits of evaluation to DRA projects	RJH	By May 31
19	**[GENERAL]** Kate to offer the DOC DRA decision tool for peer review by the workshop group, via the DRA Toolkit web-site.	KM	June 1
20	**[TOOLS] Complete Matrices:** adding in all tools and case studies provided by the wider DRA group.	CL & PM with Group2	By June 15.
21	**[PARTICIPATION] Finding and forming the team** Write intro and invite members of the wider team to take on writing the other topics.	RJH & RPGL	By June 15
22	**[PARTICIPATION] Developing a collaborative team –** write intro and locate and select case studies of successful trans-disciplinary teams; invite members of the wider team to take on writing the topics.	RJH & RPGL	By June 15
23	**[TOOLS] Pull together document:** and organise final review by Group 2.	CL & PM	By July 31
24	**[PRINCIPLES I] Strategic Context (Intro and justification)**	RK and DTr	By July 31
25	**[PRINCIPLES II] A. Problem formulation**	CH	By July 31
26	**[PRINCIPLES II] B. Hazard identification**	KW	By July 31
27	**[PRINCIPLES II] C. Risk assessment**	SM	By July 31
28	**[PRINCIPLES II] D. Risk characterization and evaluation**	IL	By July 31
29	**[PRINCIPLES II] E. Risk Management**	DTr	By July 31
30	**[PRINCIPLES III]** Invasive species example	MD	By July 31
31	**[PRINCIPLES III]** Biodiversity and changing species composition	RK	By July 31
32	**[PRINCIPLES III]** Animal movements Import risk assessment Reintroduction	SM DTr and SU	By July 31
33	**[PRINCIPLES III]** Climate change	CH	By July 31
34	**[PRINCIPLES III]** Agriculture/land use	DTr and TBA	By July 31

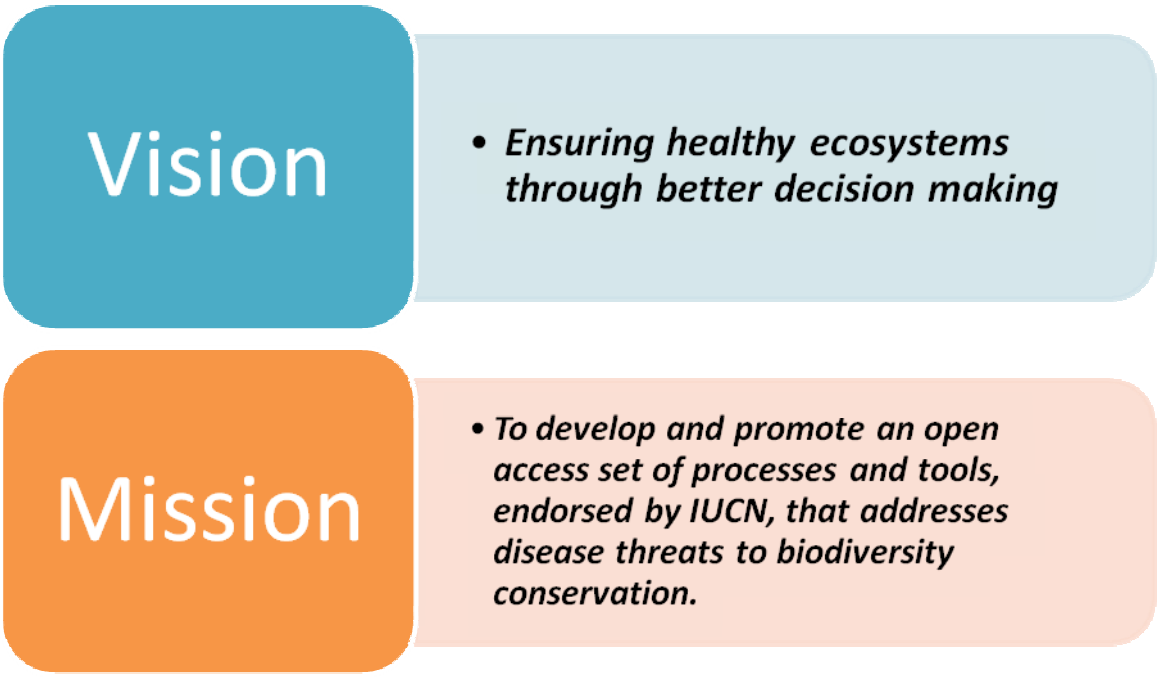
No.	Action	Who	When
35	**[PRINCIPLES III]** Socio-behavioural – poaching and bushmeat	TBD	By July 31
36	**[PRINCIPLES III]** Examples of when DRA was used and didn't work, did work, and wasn't used and should have been	TBD	By July 31
37	**[TOOLS] Write Introduction:** taking into account material covered in rough drafts of other Chapters.	LS	By July 31
38	**[PARTICIPATION] Write introduction** – incorporating points made in Group 3 report	RJH	By July 31
39	**[PARTICIPATION]** Finding team members	TBD	By July 31
40	**[PARTICIPATION]** Team processes	TBD	By July 31
41	**[PARTICIPATION]** Team composition and roles – including matrices on skill sets vs different disciplines and skill sets vs a range of DRA scenarios	B J & RB	By July 31
42	**[PARTICIPATION]** Applying facilitation processes to trans-disciplinary teams	TBD	By July 31
43	**[PARTICIPATION]** Stakeholder consultation	BJ	By July 31
44	**[PARTICIPATION]** Evaluation and maintaining the collaborative momentum	TBD	By July 31
45	**[PARTICIPATION] Collate all contributions** and identify overlaps and gaps before passing on to Editorial Group	RJH	By July 31
46	**[STRATEGIES] Lead the development of a strategic plan** for the marketing, distribution and training of the new Guide. To incorporate Marketing and lobbying activities, funding and publications. Canvas interest from the wider DRA group and others with relevant expertise in assisting.	AR RB SP	By July 31
47	**[STRATEGIES] Educational activities** – work with the Strategies group to develop strategies for development of on-line and face to face training resources and opportunities for training.	KW & CH	By July 31

TBD = to be determined

3. Vision and Mission

Visioning Group: Richard Kock, Verné Dove, Bruce Rideout, Steve Unwin.

The following vision and mission, developed by the visioning group with regular input from other participants, were endorsed on the final day of the Auckland workshop:



4. Agreed *Guide* Outline

The following outline for the *Guide* was agreed by workshop participants.

Table 2. *Guide* Outline

SECTION I: Guiding Principles of Disease Risk Analysis	
	Assigned to:
GLOSSARY	DTr, SMD, CL, DTo, BR
PART I – Strategic Context (Intro and justification)	RK and DT
PART II - Guiding Principles of Disease Risk Analysis	
• A. Problem formulation	CH
• B. Hazard identification	KW
• C. Risk assessment	SM
• D. Risk characterization and evaluation	IL
• E. Risk Management	DT
PART III - Examples	
• Invasive species example	MD
• Biodiversity and changing species composition	RK
• Animal movements • Import risk assessment • Reintroduction	SM, DTr/S. Unwin
• Climate change	CH
• Agriculture/land use	DTr+ TBA
• Socio-behavioural – poaching and bushmeat	TBA
• Examples of when DRA was used and didn't work, did work, and wasn't used and should have been	TBA
SECTION II: Tools for Disease Risk Analysis	
	Assigned to:
PART I - Introduction/orientation	LS
PART II - Tools matrices • Tools Matrix A: Processes and Situations • Tools Matrix B: Questions and Case-studies	PM, CL, DRA Group
PART III - Tools introductions	PM, CL, DRA Group
Section III: Creating, Facilitating and Participating in a DRA Team	
	Assigned to:
Introduction & justification	RJH
Finding and forming the team • Team composition and roles	RJH, RPGL B J & RB

• Team processes	TBD
Developing a collaborative team • Facilitating trans- disciplinary teams • Stakeholder consultation • Evaluating and maintaining collaborative momentum	 TBD BJ TBD
Effective communication • Who, when, what and how to communicate	RJH
Evaluation • Applying adaptive management and peer review processes	RJH
APPENDICES	

5. Author and Editor Guidelines for: *Guide to Wildlife Disease Risk Analysis*

Full details are on the dedicated website:
https://sites.google.com/site/buildingaguidetowildlifedra/home

Please read these before starting to write and check them again before submitting your work. They are provided to assist contributors and ensure, as much as possible, a consistent format and language.

Editorial group

- Richard Jakob-Hoff (Lead Editor)
- Phil Miller
- Dominic Travis
- Caroline Lees
- Richard Kock
- Stuart MacDiarmid

Section editors

- Richard Kock: IUCN Guidelines for Wildlife Disease Risk Analysis (Strategic context and justification)
- Dominic Travis: Guiding Principles of Risk Analysis
- Phil Miller and Caroline Lees: Risk Analysis Tools and their Application to Disease
- Richard Jakob-Hoff: Creating, Facilitating and Participating in a DRA Team

Writing and editorial process

The following writing and editorial process will be followed:

1. Writing topic assigned by section editor and accepted by lead author[3].
2. Lead author generates first draft and submits to section editor by due date (see timelines on p.22 of this report).
3. Section editor reads for appropriateness and clarity of content.
4. Any issues arising (including duplications and/or conflicts with other sections, parts and topics) discussed and resolved between section editor and lead author.

[3] The lead author for a topic is appointed by the relevant Section Editor and may select up to two co-authors to assist in the writing of that topic. The lead authors liaise directly with their Section editor to agree on content and deadlines.

5. Section editor integrates and edits authors' submissions to relevant section and up-loads to Website at https://sites.google.com/site/buildingaguidetowildlifedra/home
6. Wider collaborative DRA group notified of upload by section editor and invited to review and post comments
7. Editorial group reviews each section for flow and consistency of information and significant gaps and considers input from wider DRA group. Needs for case studies, gaps and figures or other ancillary information. Input collated by lead editor.
8. Virtual meeting with wider DRA group is held to discuss any issues arising
9. Lead editor integrates all sections and edits for continuity of style, content and language. Returns to section editors for re-distribution to authors with editorial comment and advice for amendments to next draft. This draft posted on website for further review and comment by wider DRA group.
10. The process repeats itself for the next draft.

When writing

- Keep in mind the **vision and mission** of this project (as printed on p.11 above) and how your text is contributing to these.
- Without 'dumbing down your text, write as far as possible, for a lay audience. Do not assume the reader will have a background in risk analysis or wildlife biology. Eg 'stochastic' could be replaced by 'random'; 'demography' could be replaced by 'population characteristics'.
- If you have to use technical terms, ensure they are in the glossary with a clear definition based on that published by the relevant international standard setting body (e.g. OIE).
- Ensure any terms that may have an ambiguous meaning and are not yet listed in the glossary on the website, are referred to Caroline Lees and Dominic Travis for inclusion.
- Please check and consider the "Compilation of Plenary Discussions" on p. 40 of this report that relate to the section you are writing.

Format

The *Guide* will be divided into the following descending hierarchy of headings:

Section (Heading 1)

Part (Heading 2)

Topic. (Heading 3)

In general, avoid any fancy formatting as that will create complications for the editors.

Note: the editorial team will be working in Word for Windows – please let section editors know if you are working in Mac

General style

In terms of general style, conciseness in writing helps the reader, but clarity is most important. Short sentences and paragraphs make reading easier. You should aim for consistency within your article in matters such as hyphenation and spelling.

Avoid use of capitals except for names or beginnings of sentences.

All acronyms and abbreviations should be clearly explained when they first appear in the text, and all units used should be consistent throughout the article.

Use tables only to improve conciseness or where the information cannot be given satisfactorily in other ways such as by histograms or graphs. Tables should be numbered serially and referred to in the text by number (Table 1, etc). Each table should have an explanatory caption which should be as concise as possible.

UK English will be used as the standard for this document. If English is not your first language, you should ask an English speaking colleague to read through your article or at least apply a UK English spellchecker to your work before submitting it.

A note on copyright

If you wish to illustrate your work using material for which you do not own the copyright then you must seek permission from the copyright holder. It is the author's responsibility to obtain copyright permissions and the editorial group are unable to undertake this on your behalf. We strongly advise you to obtain permission to use the material prior to submitting your work. A copy of the appropriate written authority should be provided with your submission.
Full details on the website (see below).

Acknowledgement of authors

It is important to define the order of authors up front. The lead authors of a topic will agree with up to two co-authors who will be cited as co-authors and in what order; the order should reflect the relative proportion of work done. To be named as a co-author a person will need to have a made a significant contribution. Other meaningful contributors can be cited in the acknowledgements. Editors will retain the flexibility to increase the number of co-authors per topic on a case-by-case basis.

Author affiliation and assignment of copyright forms

These forms are self-explanatory and attached overleaf. All authors are required to complete, sign and return them to Richard Jakob-Hoff either by fax +64 9 360 3939 or mail to NZCCM, Auckland Zoo, Private Bag, Grey Lynn, Auckland, New Zealand, 1245.

Further details

Further guidelines on copyright, citations, figures, captions, supplementary data, naming of files and video clips and animations can be found on the website at:
https://sites.google.com/site/buildingaguidetowildlifedra/author-and-editorial-guidelines

Guideline revision

These guidelines may be revised by the editorial group from time to time as issues arise. All authors will be notified of any such changes and the reasons for them.

AUTHOR AFFILIATION FORM

Guide to Wildlife Disease Risk Analysis

(Please type or print clearly)

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3.3.3 Include the Article (all or part) on web sites of the Institution (including its repository) where a Named Author worked when research for the Article was carried out; and
3.3.4 Include the Article (all or part) on third party web sites including e-print servers, but not on other publisher's web sites.

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In signing this Agreement the Author represents and warrants that the Article is the original work of the Named Authors, it has not been published previously in any form (other than as permitted under clause 3.2.2 which fact has been notified to IUCN in writing), all Named Authors have participated sufficiently in the conception and writing of the Article and have received the final version of the Article, agree to its submission and take responsibility for it.

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All Named Authors assert their moral rights.

Author's signature . . . . . Date . . . . . .

6. Editorial Working Agreement for: Guide to Wildlife Disease Risk Analysis

Richard Jakob-Hoff, Phil Miller, Dominic Travis, Caroline Lees, Richard Kock and Stuart MacDiarmid have agreed to:

1. Work collaboratively together towards the achievement of the agreed Vision and Mission as printed above.

2. Complete all assigned tasks to the best of our ability and within the agreed timeframe

3. Assign writing tasks to appropriate authors and provide a point of contact and support for these writers.

4. Follow the agreed writing and editing process as outlined in the Author Guidelines

5. Participate in scheduled virtual meetings with each other and notify the group if there is a scheduling conflict with other responsibilities

6. Assume good intentions on the part of all group members.

7. Resolve differences of opinion on editorial issues at the time they arise. If consensus is not attainable, defer final decision to the Lead Editor (RJH).

8. Ensure the final copy includes appropriate acknowledgement of all contributors.

9. Ensure, as far as possible, all copyright permissions have been obtained.

7. Time-line for completion

The following time-line describes milestones and actions proposed to ensure delivery of a final DRA Guide manuscript, by the end of March, 2012.

Date	*Milestone*
April 4 – 7 April, 2011	DRA Workshop, Auckland
May 1	Full outline completed (Ed team) Guidelines for authors distributed to members with glossary
July 31	Topic materials to section editors (DT, PM, CL, RJH, SMD, RK) w/o thematic case studies. Draft IUCN Guidelines on DRA to group for review (RK to lead)
August 1	Draft manuscript on DRA work for publication in appropriate scientific journal (LS to lead)
August 15	Submitted sections compiled, edited and out for review by all contributors
October 1	Forward reviewed sections to RJH for integration and editing
October 15	First integrated draft of *Guide* compiled by RJH and circulated for review by all collaborators
October 31	Comments on first draft to RJH for incorporation
November 15	Second draft of *Guide* out for review
December 15	Comments on second draft to RJH
March 31, 2012	Deadline for final edited copy (with artwork etc) for publication

8. Working Group 1 Report

Principles

Editor: Dominic Travis

Participants: Richard Kock, Carly Holyoake, Ian Langstaff, Stuart MacDiarmid, Maj De Poorter, Craig Pritchard, Lee Skerratt, Kris Warren

Outline of Manual

I. Vision and Mission of project – R. Kock working group

II. Strategic Context: Guideline (Intro and Justification)

Richard Kock will lead the creation of a guideline document on behalf of the IUCN Wildlife Health Specialist Group. This will be a stand alone document but will also be incorporated as the justification for and introduction to the 'Guide'. The document development will include appropriate stakeholders: WHO, OIE, FAO and IUCN stakeholders (including several from this workshop). The writing will be geared toward policy makers and major international stakeholders. The level of writing will be aimed at non biologist – lay public and the structure of the document will be as follows:

A. Strategic context
B. Ecological context
    a. "Russian doll picture" will be used to show the concept
C. Guiding principle
    a. transdisciplinary approach
    b. structure picture
    c. in situ, translocation, other….
    d. Risk communication starts with stakeholder group and communication plan from beginning
        i. Style context important
    e. Summary of risk analysis process - picture

Goals of the document:

- Call for science-based policy on WL issues
- Call for Risk Analysis standards and the need for the CBSG Guidelines
- Process should include risk of/to the system itself
- Includes ecology, population biology and specific disease issues and conservation/land use issues
- Needs to represent the conservation perspective – provides a compliment to other groups like OIE etc.
- Advocate for more holistic approach than is commonly taken today
- Highlight concerns about WL disease used as trade barrier
- Like to see alignment with OIE Code to add another body evaluating the WL situation from another angle

The document will include a summary of issues to outline the scope of the problem and include such things as:

- Ecohealth perspective – disease is only one risk to the population
    - Disease can be an actual indicator of ecosystem health
- "health" – broad definition will be used
- "disease" vs infectious
    - broad categories of disease description
- environmental toxicology issues
- endocrine disruption
- sublethal effects on immuno and reproductive function
- other co-factors for 'health' that may be indirect/subtle
- health results should not be looked at in isolation and should encompass long-term approach

Specific examples could be called out in text boxes and include:

- Those covered in Keesing Nature paper – minimize loss of biodiversity and intact ecosystems in reducing the prevalence of emerging infectious diseases
- Landuse
- HIV
- Influenza
- SARS
- Lyme
- Bushmeat
- Markets
- Animal movements
    - translocation
    - Invasive spp
    - Reintroductions
    - Pet trade

This section will be rounded out with a brief discussion on how to approach these issues:

- What are the options
    - Ian's diagram/paradigm – what information, data or infrastructure do you have and what is needed (gap analysis). What implications do the current infrastructure and/or available data have for the quality – uncertainty of solutions
- Surveillance?
- DRA team, skillsets, process to use (layering principles – Russian Doll)
- Matching the question to the process – scope needs to be clear
- Must include the ecological 'big picture' perspective
- Decision trees for problem formulation
- What do you do with info -→ management
- Cost-benefit issues

Guideline characteristics:

- Attractive
- Visual diagram/graphics
- Examples
- Translated into numerous languages through IUCN

III. Guiding Principals of Risk Analysis "Disease Risk Analysis"

This section is meant to outline a brief, user-friendly introduction to Risk Analysis for the beginning participant. Each section will ideally be approximately two pages with the addition of examples that run throughout the process. The following sections will be generated:

A. Disease-related problem definition/formulation section (Draft: Carly Holyoake): this section will present guidelines on proper problem formulation.
    a. Paragraph description of problem (big picture risk analysis question)
    b. Draw a picture of the problem – pathway assessment
    c. Define the question to be modeled – this is very important in that model outputs should specifically answer the question
    d. Some discussion on the need/benefit to initially characterize the issue into categories such as known vs. unknown; exotic vs. endemic etc.
B. Hazard Identification (Draft: Kris Warren)
    a. List Hazards
        i. Preliminary list of possible diseases that could be considered given the question from part A
    b. Initial screen - filter – narrowing the list of those to be modeled
        i. Criteria for inclusion/exclusion -→ Ranking of hazards
        ii. The use of expert opinion during the process (structured, formal, transparent process)
            1. There are formal expert elicitation techniques that add scientific validity to the process
        iii. The benefits of Multi-disciplinary team formulation – at the start
            1. Creating the stakeholder group
C. Risk Assessment adapted from OIE framework (Draft: Stuart Macdiarmid)
    a. Reiterate the need to properly define the question
    b. Definition of "model"
        i. Likelihood X consequence = Risk
            1. Descriptive
            2. Transparent
            3. Referenced
            4. Uncertainty
            5. Data (qual vs quant)
D. Risk Characterization and Evaluation: the decision making process (Draft: Ian Langstaff)
    a. Presentation of results for appropriate audience
    b. How results guide the formulation of management options
        i. Known
            1. Exotic
            2. Endemic
            3. Non infectious - Environmetal and other factors
        ii. Unknown
            1. Environmental
            2. Spontaneous
    c. Qualifying information
        i. Data quality and uncertainty
        ii. Identify data gaps and thus research needs
        iii. Identify critical control points (CCP) in pathway

E. Risk Management (Draft: Dominic Travis)
    a. Covering the idea that prevention and control options should be included in the scenarios covered in the model, or through manipulation of the CCP variables.
        i. Sensitivity analysis
        ii. Cost-benefit
    b. Surveillance recommendations and needs
    c. Expertise and skill set needed
    d. Information management (electronic or paper based)
    e. Monitoring and updating plan (given that it is an iterative process)
F. Examples
    a. Invasive spp example (Draft: Maj De Poorter)
    b. Biodiversity and changing spp. composition (Draft: Richard Kock)
    c. Animal movements
        i. Import risk assessment (Draft: Stuart MacDiarmid)
        ii. Reintroduction (Draft: Dominic Travis with Steve Unwin)
    d. Climate change (Draft: Carly Holyoake)
    e. Agriculture/land use
    f. Socio-behavioral – poaching and bushmeat
    g. Socio-behavioral – poaching

examples of when DRA was used and didn't work, did work, and wasn't used and should have been

9. Working Group 2 Report

Disease risk analysis tools

Group members: *Caroline Lees (recorder), Kate McInnes, Phil Miller (facilitator), Bruce Rideout, Tony Sainsbury, Lee Skerratt, Dan Tompkins, Mary Van Andel.*

General focus

The group agreed that the following should be included in this chapter:

1. A description of the essential elements or steps in risk analysis (though this may be adequately covered by group 1 – the groups needs to keep track of this to avoid duplication).
2. A tool or tools for choosing the right/best tool(s) for the right situation – ideally access to tools would be able to be approached from a number of different angles and starting points.
3. A list and description of available tools (filtered so that only "good" or "appropriate" ones are included).
4. A series of case studies to demonstrate tool application to specific questions/situations (throughout as examples and possibly also in an appendix).
5. A gap analysis to guide new tool creation.

Chapter structure summary

Three broad chapter sections were proposed:

Section 1. Introduction/orientation

- Brief summary of some sort (for those who missed the previous section)

Section 2. Tools Matrices

- One or two matrices that facilitate swift and directed access to the resources (tools, case studies etc) available in or through the Guide.

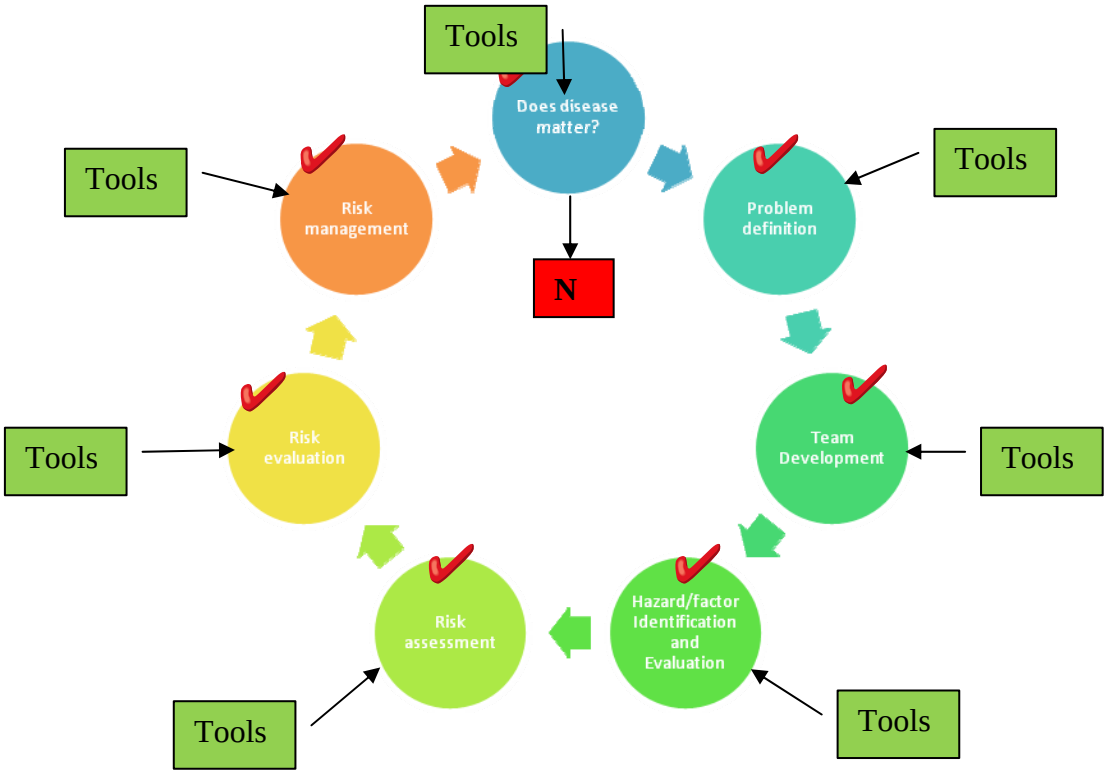
Section 3. Tool Introductions

- A list of tools and a summary of relevant information for each.

Section 1. Introduction

The group agreed that this section should be done last, once the other content of the chapter has been developed and once the other DRA Guide chapters are available for review so that there is no unnecessary duplication.

The section is likely to provide reference to the following Disease Risk Analysis cycle, agreed on DAY 4 of the workshop:



Section 2. Tools Matrices

i) Proposed Matrices

Matrix A: Tool/Approach Matrix

This matrix is designed to point the user quickly and easily to a suite of tools that are best suited for specific elements of the standard Risk Analysis Framework. Those people who are designing a formal risk analysis from first principles will be able to see the different applications of various tools, and will also be able to see the comparative flexibility of certain tools that can be applied to multiple elements of the Framework. When more than one tool is suitable for a given Risk Analysis element, the matrix also provides a basic mechanism for comparison of tools according to the characteristics listed on the right-hand portion of the matrix. Using these characteristics, a user can choose the tool(s) that fit their specific requirements around data availability, budgetary constraints, and ease of use.

Matrix A (sample): Tool/Approach Matrix

	Disease Risk Analysis Application					Suitability in Situations which are:		
Tool	*PD*	*HI*	*HE*	*RA*	*RM*	*Data Poor*	*Resource Poor*	*etc*
A						High	High	
B								
C						Low	Low	
D								
E								
F								
Etc.								

PD=Problem Definition; HI=Hazard/Factor Identification; HE=Hazard/Factor Evaluation; RA=Risk Assessment; RM=Risk Management

NOTE: Some of this terminology is not standard (ie 'Factor', 'Hazard Evaluation') and will need to be clarified and standardized.

Matrix B: To help people access the DRA process from a different angle (column headings correspond to Matrix A. row headings)

This matrix is meant to complement Matrix A. Here, the tools are compared and contrasted on the basis of what type of broad question they are best suited to answer. The questions are listed in the far left column of the matrix, and are roughly sorted according to their relevance to the specific elements of the standard Risk Analysis Framework (Problem Identification, Hazard Identification, etc.). The system of alphabetical designation of the tools as column headings is equivalent to that used in Matrix A. The entries in each matrix cell will point the user to a specific case study that is described within the body of the Guide, either as a very brief summary with accompanying reference or as a more comprehensively worked example. This matrix is meant to accompany the information in Matrix A, and should be helpful for those people who have a specific need and want to see practical application of various risk analysis tools to a case study that is similar to their own project.

Matrix B (sample): To help people access the DRA process from a different angle (column headings correspond to Matrix A. row headings)

	Tools					
Question/ Application	A	B	C	D	E	F
1	Case study					
2						
3						
4						

Completing these matrices will require:

- Listing and categorising tools or tool types.

- Identifying DRA situations in which specific tools are likely to be particularly useful/not useful.
- Identifying a set of generic questions to cover the kinds of DRA problems users might be interested in.
- Grouping these questions under the pertinent steps in the DRA process.
- Gathering/developing appropriate case-studies that illustrate how similar questions have been addressed.

The group made a start on these during the workshop and progress is described below.

ii) Listing and categorising tools or tool types

Tools were brainstormed and categorised under general headings equating to steps in the disease risk analysis process. The group agreed that it would be useful to have a check-list for each of these steps, so that users can evaluate how well they have completed each step. Also, that there should be a checklist at the start of each component which says "Are you ready to enter this step in the Process?" with accompanying guidance on how to establish "readiness".

1) Problem Description Tools

- Problem description check-list (to be developed)
- System diagramming (e.g. Pencil & Paper, STELLA)
- DELPHI as a means of honing problem identification?
- Others?

(Notes: the PD needs to consider the practical scope of analysis and there should be a "Reality check" by peer review)

2) Hazard/ Factor Identification Tools

- Hazard/Factor Identification check-list (to be developed).
- Pathogen/parasite list in context of central question (you never know when a parasite is about to become a pathogen).
- Literature search.
- Evaluation tools to assess quality of information in the literature (e.g. equivalent of Cochrane collaboration in human medicine).
- ROUGH ASSESSMENT WORKSHEET as a tool for a first cut at translating "good" information from the literature to the specific context.
- Higher level screening tools
    - screening tests
    - confirmation tests
    - historic population data
    - quarantine (as a way to avoid clinical testing and eliminate specific hazards)

(Notes: need to resolve terminology – parasite/pathogen/agent etc.)

3) Hazard/Factor Evaluation Tools

- Hazard/Factor Identification check-list (to be developed)
- Quantitative models to support/explore hazard/factor hypotheses and identify high priority “factors”or “hazards”.

4) Risk Assessment Tools

- Risk assessment check-list (to be developed)

Risk Assessment Tool Categories:

- Qualitative
- Semi-quantitative
- Quantitative
- Cost-Benefit (likelihood X consequence)
- Multi-species

5) Risk Management Tools

- Risk Management check-list (to be developed).

Note - to include tools for:

- *Identifying potential management actions:*
- *Selecting appropriate management actions:*
- *Implementing actions (including monitoring and feedback)*

6) Risk Communication Tools

- Risk Communication check-list (to be developed).
- Visualisation tools.
- “Emotional manipulation” as a means of communicating message.

(Note: important to identify the target audience and design for that)

iii) Identifying and categorising generic questions

To help allow different people to access the tools through different routes, the team brainstormed the types of questions that people might come to the DRA Guide with. These would provide a short-cut to relevant case-studies via Matrix B. The questions from the Needs Survey are to be incorporated into this list (see actions).

- What is the risk of a pandemic to biodiversity? (at the taxon or ecosystem level)
- What diagnostic test shall I use?
- Should I translocate/introduce/reintroduce
- How many individuals should I test?
- Is there a disease risk to the viability of my wild/captive population?
- What is the risk of anthropogenic spread of this parasite/pathogen?

- How do I describe a problem adequately?
- Is there a risk to non-target species of movement/presence of species X?
- How do I do a cost-benefit analysis?
- How do I adequately communicate the results of my DRA?
- Is there a risk to human health?
- How do I set up a surveillance/screening programme
- How do I set up an outbreak investigation?[4]
- How do I identify the relevant hazards or factors and place them in the proper context?
- Will environmental change X cause a change in disease risk in species Y
- How will management action X change disease risk in species Y?
- What is an acceptable disease risk?[5]
- How do I measure outcomes of risk mitigation/disease management?
- How do you identify all of the avenues of risk?
- How do I know when to consult a specific expert?
- How do I find an expert?

Discussion of how to categorise these questions:
The group initially considered constructing a decision-tree from these questions but they did not obviously lend themselves to that kind of linear categorisation. A brief attempt was made to house the questions under the DRA step that they are most aligned. This also proved difficult though it was agreed that another attempt at this post-workshop might be valuable (see actions). There followed a process of housing these questions under the component or components of the risk analysis process that they are relevant to – the results of this initial effort are given below. Work to continue on this (see actions):

Section 3. Tool introductions

It was agreed that it would be valuable to standardise the information presented. The group began work on a Tool Description Template for use in creating the library of "Tool Introductions". The following preliminary categories of information were proposed:

- What it is – literature reference
- Expertise – "minimum requirements"
- When to use it
- Cost
- Data Requirements
- Case Study Link
- How to use it (distilled)
- Strengths/weaknesses

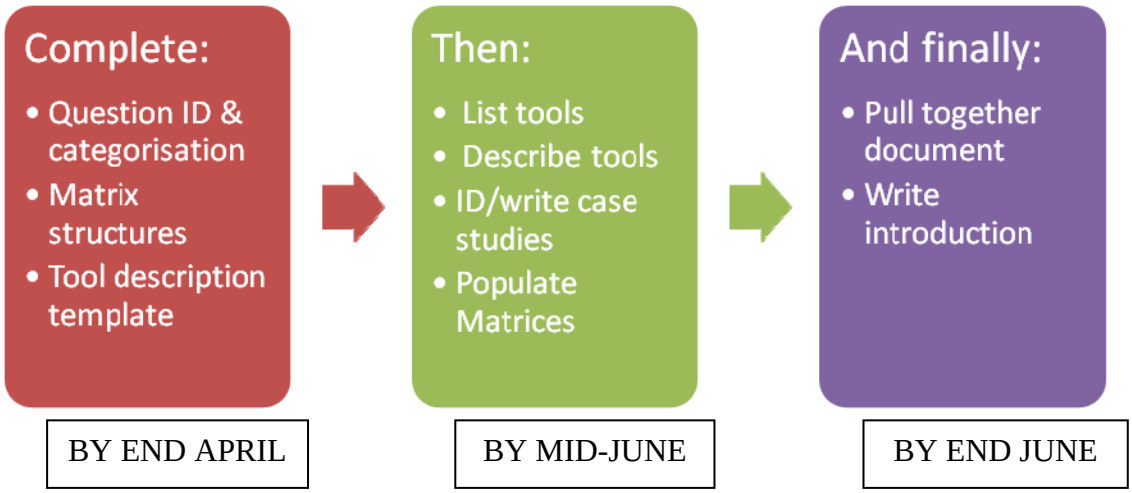
[4] Neither this or the one above are risk analysis questions. Books have been written on these disciplines and these should be referenced in the *Guide*.

[5] Note this is a political question. See the OIE Terrestrial Animal Health Code (referenced in the glossary) for a definition.

Work to continue on this – see actions.

Required actions

The following flow of activities and distribution of actions was proposed for completing Chapter



Detailed Actions:

No.	Action	Who?	By when?	Notes
1.	**Complete list of generic DRA questions:** take the DRA questions from the Needs Survey results, see which are already covered by Group 2.'s list, create generic versions of the ones that aren't and add those generic versions to the Group 2 list.	DT	By April 30	
2.	**Categorise DRA questions:** map ALL questions to the Disease Risk Analysis component headings identified.	DT & LS	By April 30	
3.	**Complete Matrix Structures:** write a brief description explaining the purpose and content of Matrices A & B, and the work needed to complete them, and create DRAFT matrices with example rows, for review by the group.	CL & PM	By end of workshop	Descriptions and Excel matrices drafted ready for review by Group 2.
4.	**Complete Tool Template:** write a generic tool description template (for tool intros section) (Mary and Tony – by early next week).	MVA, TS, KI & BR	By mid-April	DRAFT template currently being reviewed by sub-group.

No.	Action	Who?	By when?	Notes
5.	**Identify tools:** create a list of good/appropriate tools.	All workshop and virtual workshop participants	By May 8	May require one or more virtual sessions.
6.	**Write Tool Descriptions:** wider group to complete templates for each tool considered for inclusion.	All workshop and virtual workshop participants	By May 31	May require virtual session to agree responsibility
7.	**Identify/write case studies**: wider group to write or identify case studies exemplifying the use of specific tools and the analysis of specific DRA questions.	All workshop and virtual workshop participants	By May 31	May require virtual session to agree responsibility and discuss appropriate case studies for inclusion.
8.	**Create work areas for Working Groups on the DRA Web-site (and or CBSG Portal):** to allow posting of documents and tracking of progress with Guide. DRA web-site may be replaced at some point by the CBSG portal – PM to discuss with ISIS.	CL & PM	Mid-April	PM
9.	**Produce check-lists:** for each step in the Risk Analysis process so that Guide users can evaluate how well they have completed each step.	Groups 1 & 2	By May 31	May require virtual session to agree responsibility and discuss appropriate case studies for inclusion.
10.	**Complete Matrices:** adding in all tools and case studies provided by the wider DRA group.	CL & PM with help of Group 2	By June 15.	
11.	**Pull together document:** and organise final review by Group 2.	CL & PM	By June 30	Review via virtual session before June 15
12.	**Write Introduction:** taking into account material covered in rough drafts of other Chapters.	LS	By June 30	For final submission of first Chapter 2 draft on July 1.

10. Working Group 3 Report

Creating, facilitating and participating in a DRA team

Group members: *Richard Jakob-Hoff (Facilitator), Andrea Reiss, Shyama Pagad, Rodrigo Pinho Gomez Lopez, Rosemary Barraclough, Bethany Jackson.*

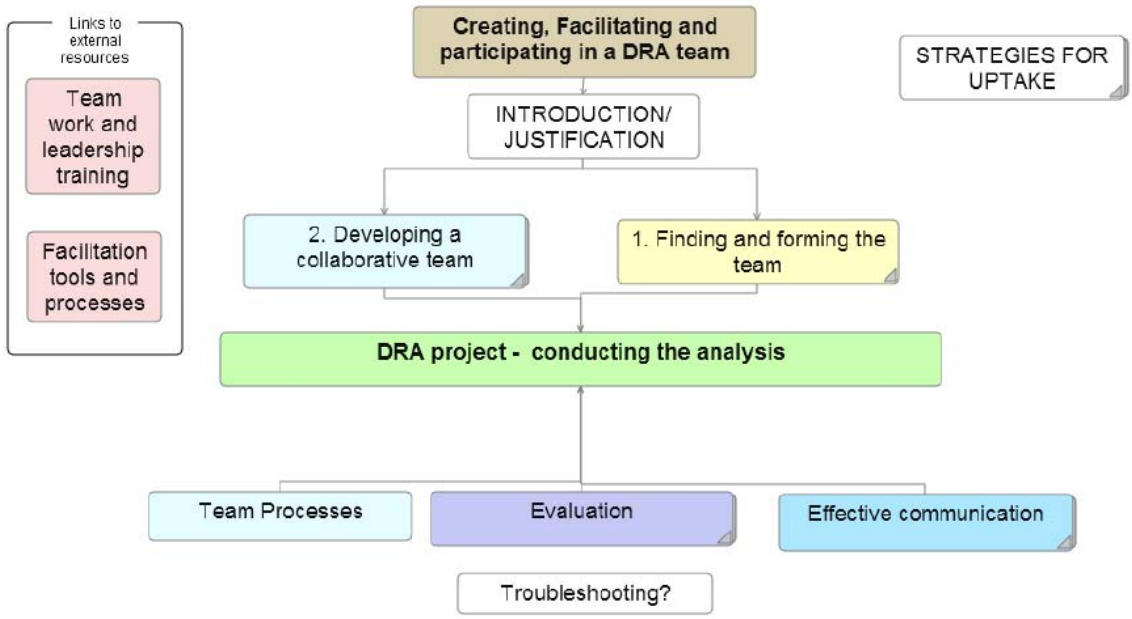


Figure 1: Overview of this Section: The introduction outlines the Section content and explains the justification for its inclusion. Major sub-sections address 1) the issues and methods of finding and forming a team specific to different DRA projects and 2) developing the team as a successful trans-disciplinary collaboration. The establishment of effective team processes, communication practices and a framework for on-going evaluation of the team against its goals underpin the success or failure of each DRA project. A trouble-shooting guide that addresses frequent team-related problems may be included (or there may be links to relevant guides on this topic). Links to external resources on team work and leadership training and facilitation tools and processes are provided.
Strategies for uptake of the DRA Guide are to be embodied as a communications strategy in which the audience, their interests and approporiate content and language need to be identified. Strategic categories identified included educational, publications, funding, marketing and lobbying. A process of feedback, evaluation and review of the strategy needs to be established from the outset.

Introduction and justification

The complex nature of wildlife disease scenarios, socially, technically and politically requires a collaborative team approach.

Failure to get the social composition and dynamics of DRA teams right and to ensure politicians and decision makers are supportive of recommendations arising from the team jeopardises the DRA process and outputs.

1. Finding and forming the team **LEADS: Richard, Rodrigo**

Addresses a spectrum of DRA development capabilities - from single individual to workshop

- How to find team members eg via a skills register database (to be developed by Shyama)
- Team Processes
    - Developing a team goal statement
    - Team communication processes:
        - Appropriate leadership and facilitation styles
        - Frequency and types of communication (eg meetings, reports, updates, publications etc)
        - Meeting etiquette: Clearly defined meeting purpose, goals, agenda, results and action plans

Team Composition and Roles

Identifying skills required for the team and clarifying roles

- Involvement of decision makers
- Broad categories of DRA scenarios mapped to skill requirements
- Team roles defined by situation: a matrix of scenario vs skill sets

<u>Scenarios:</u>

- Human/wildlife interactions
- Small population management
- Translocations
- Population decline
- Accidental introduction of invasive species
- Significant change in ecological circumstances, eg climate change, drought etc
- Sudden mass mortality
- Wildlife manipulations eg for research or veterinary care

<u>Skills:</u>

- List of skill sets and expertise associated with different disciplines
- List of professions relevant to wildlife DRAs eg ecologists, clinicians, pathologists, epidemiologists, policy makers, wildlife managers, recovery teams etc
- Taxon-specific experts

(See the skills listed for risk analysis by the OIE. Section 2.1., page 16 of the Handbook on Import Risk Analysis – Stuart MacD.).

2. Developing a Collaborative team **LEADS: Richard, Rodrigo**

Trans-disciplinary synergy in team – benefit of mixed group with differing skills sets; case studies of successful teams to illustrate this.

Applying facilitation processes to trans-disciplinary teams

- Background/context of the team – deciding on values/vision/goals
- Working agreement
- Shared values and objectives
- Maintaining collaboration
- Embedding on-going evaluation of the collaborative process
- Commonly encountered issues of working in teams (links)
- Recognising the common problems with trans-disciplinary conservation projects

Stakeholder consultation

- Inclusive of local community, cultural needs, public opinion, political context
- Professional collaboration
- Cross-cultural sensitivity

Evaluating and maintaining the collaborative momentum

A process that is applied throughout the life of the team

3. Effective Communication **LEADS: TBD**

Identify those who need to know, when they need to know, and how they need to know (eg in what format – written, oral etc)

- Early forms of communication, public
- Issues of confidentiality, intellectual property, professional etiquette
- Forms of presentation (eg web-based, hard copy, report or linked to legislation etc)
- Linkage of DRA team to local decision making processes
- Early engagement of stakeholders and communities
- Result delivery
    - Tailoring output to the appropriate audience
    - Stakeholders and end-users

4. Evaluation **LEADS: Richard**

Application of adaptive management processes to team structure and project, based on common objectives/vision/needs

Peer review (See the discussion of peer review in the OIE Handbook on Import Risk Analysis, section 3.8.3, page 53. Stuart, MacD)

Regular evaluation of team

STRATEGIES FOR UPTAKE OF THE NEW *GUIDE*

Leads: Andrea, Rosemary, Shyama

This component was assigned to the Section 3 team for initial discussion and development. The notes developed during the adult learning session are also relevant and should be read in conjunction with this section.

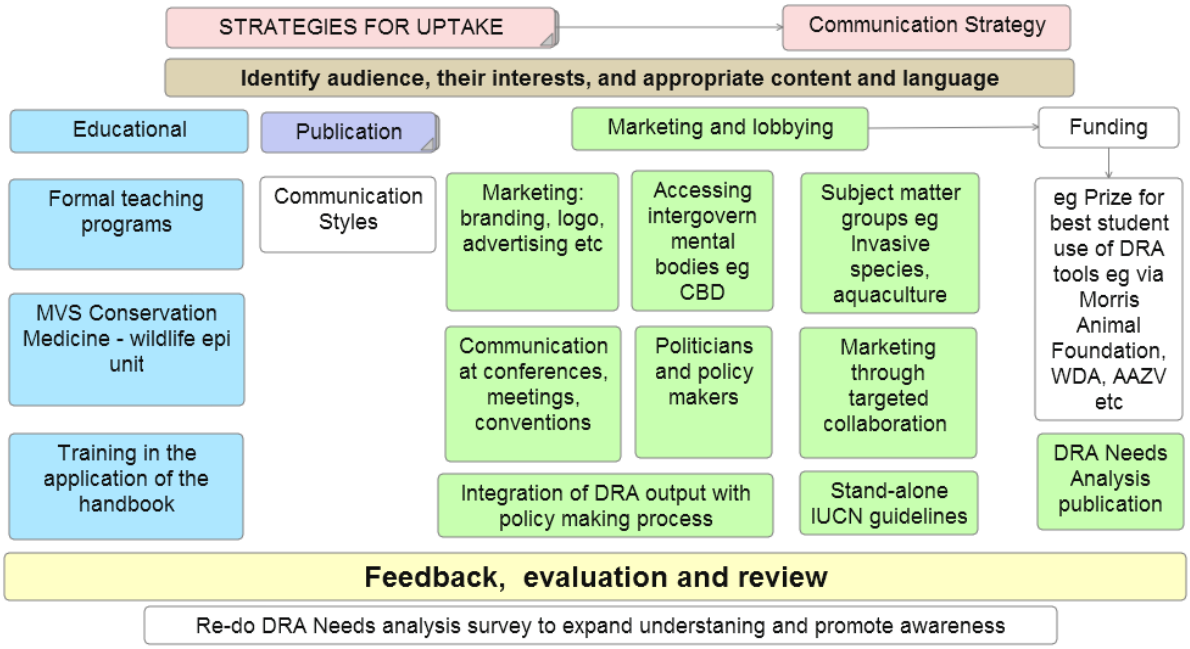


Figure 2: Overview of details provided below.

It is essential to identify the audience(s) and their interests and use appropriate content and language and communication styles.

Re-doing the initial DRA Needs analysis survey will help to more fully identify the audiences and also serve to expand understanding of what the *Guide* will provide and promote awareness

Educational activities **LEADS: Kris Warren, Carly Holyoak**

- Incorporate as a resource in formal teaching programs for instance the MVS in Conservation Medicine programme at Murdoch University, Perth, WA.
- Training in the application of the *Guide*

Marketing and Lobbying (see also Funding below)

- Marketing: branding, logo, advertising
- Accessing inter-governmental bodies eg CBD
- Subject-matter groups eg invasive species, aquaculture
- Communication at conferences, meetings, conventions
- Politicians and policy makers
- Marketing through targeted collaboration
- Integration of DRA output with policy making process
- Stand-alone IUCN guidelines
- Publication of the initial and subsequent DRA Needs Analysis

Establish methods for continuous feedback, evaluation and review of the *Guide*.

Funding
Eg Establishment of a prize for best student use of DRA tools eg via Morris Animal Foundation, WDA, AAZV etc

Publications
Electronic linking to other relevant websites and documents
Maximum use of visuals, avoiding text-heavy

Topics
Needs analysis survey report
Gap analysis
Stand-alone DRA guideline – 4 page journal article

Scientific peer-reviewed
EcoHealth
Eg J Zoo and Wild Animal Medicine
International Zoo Yearbook
J Wildlife Diseases
Biological Conservation
J Conservation Biology
Ecology
OIE
J Biological Invasions
Nature
Zoo Biology

Popular – non peer-reviewed
SSC Species
Science
Endangered Species
Web-based

11. Compilation of plenary discussions on outline and content for authors' reference

Consider for incorporation into broader project goals:

- Detailed mechanism for training @ multiple levels
- Multi-layered toolkit with different levels of complexity
- Effectively used in trans-disciplinary teams working on one health projects
- Workshop Goal: get a specific publication out about the tool/*Guide* to make sure that it gets broad public exposure.
- Develop DRA tools/process research strategy based on gap analysis for DRA tools – where do we need tools but don't have them? Where do we have tools that need to be or could be further refined?
- Need some cost-benefit considerations

DAY 2 Discussion of *Guide* structure:

- Need to consider 2 things – content and presentation. People may be put off by having to read a lot of text before diving in and using the tools – need to account for that.
- Also, good to reinforce the need to work as a team.
- There's a need to convince decision-makers of the need for this type of work.
- It might be useful to have a section on this as a stand-alone section written in Plain English, for use in persuading those not currently considering DRA in their work to think about using it.
- We can alter the order so that the meat (the tools and processes) come first and everything else becomes an appendix.
- One of the issues discussed in review of the first *Guide* was the lack of context or framework for the tools – need to think about this in the context of re-organising the tool.
- Might be a good idea to follow other workbook formats for widespread tools – these generally have a beginner, intermediate and advanced level section. This format will be familiar to people. Shyama provided the following link to some useful materials that mirror this – and which make good use of worked examples: http://www.issg.org/cii/Electronic%20references/pii/rk/rk%20V1.4.6/index.html (Resource Toolkit for Eradication of Rodents and Cats)
- In the intro/justification, make sure that risk analysis is translated qualitatively rather than in the context of more complex quantitative models – this may put people off.
- Need to keep considering this in the context of overall management of animal health.
- A graphic in the beginning would be good as long as it's simple – and should capture the entire system of disease risk assessment through monitoring and surveillance.

- It is important to capture all of the layers – from simple to complex. A key step would be to identify for people what they can do with the situation and data they have to use.
- Stuart – in his working environment there was no need to persuade decision-makers to apply DRA because there is a legislated requirement to apply a particular standard of qualitative risk assessment which operates across countries – so there are different situations and levers for getting these tools used.
- Surveillance is key – this is the basis for all sorts of DRA-related decision-making. But it is an enormous amount of work to get both risk assessment and surveillance done in a single effort.
- We need to get the umbrella right in the first instance – the conservation world is complex – application of these tools won't be as easy as it is in other areas and won't be dealt with through blanket legislation.

DAY 2 Discussion of guiding principles or concepts

A generalised approach to risk analysis was proposed for consideration:

- Problem Description
- Hazard Identification
- Risk Assessment

} Convergence – Understanding the Problem/Risk?

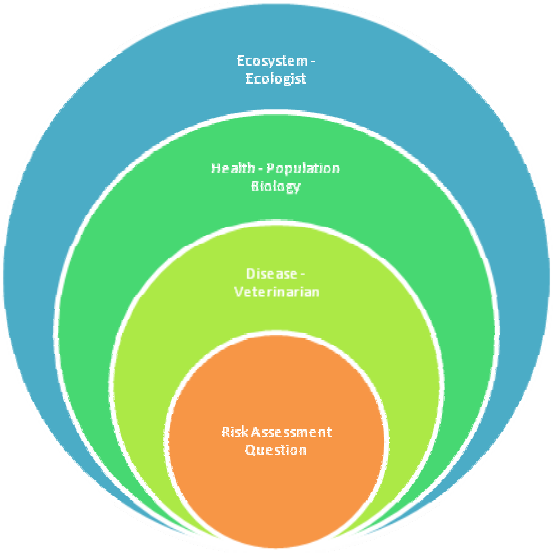
- Risk Management
- Risk Communication

Discussion:

- Different communities approach risk assessment in different ways. We need to build a common framework for developing the sections of the document.
- Ecologists do things in a less structured way than veterinarians but there could be some convergence on general building blocks. However, it may be that if we are trying to build a process which is easily taught and assimilated then the less structured approach taken by ecologists may not best serve the purpose.
- The approach presented is not a vet-specific approach but is the approach taken to risk analysis by a large number of sectors from engineering to business.
- It may be that the difference between ecologists and vets lodges principally in the area of problem formulation – ecologists are dealing with different questions and so this leads to different approaches to finding answers – these approaches are not necessarily incompatible with the proposed generalised framework proposed.
- It may be possible to converge ecologist/veterinary processes – for example ecologists would not usually include a Hazard Identification step, but they could converge on a process that encompassed all methods of Problem Identification (see above).

Day 2 Scope discussion

The figure below was developed to try to illustrate the system that we are wrestling with and the positions or priorities of the various players within it.



We need to agree on the scope of all of the things that we want to talk about in the *Guide*, whilst recognising that we will not be attempting to address all of them. This will help to ensure that what we do address is set in the right context.

It was agreed that reference should be made to all of the levels represented in the figure above, in the Guide. There was the following discussion over which zones should be addressed in detail:

- We need to involve everybody in this because we are dealing with a trans-disciplinary issue.
- By including Vortex and Outbreak aren't we explicitly intending to cover the Population Biology zone?
- We explicitly want to use this resource to consider *in situ* questions.
- Can we look at this in terms of the types of questions that we want to ask?
- Would be useful to present this diagram in the *Guide* as a conceptual framework but with the discipline titles removed (Population Biology, Ecology, Veterinarian).
- Important to stop DISEASE exploding into HEALTH.
- We should always be considering the impacts on the wider system, of actions directed towards one element of it – for example what might be the impacts on the larger system, of vaccinating a population?
- Context is a good term to use because we don't know how to predict accurately into the ecosystem zone, but we do need to have some awareness of the potential impacts on it.

DAY 3 Discussion of tools section:

- For the section on tools there are a number of judgement points were someone needs to decide what tool is best/whether a tool worked well or not etc. We might

want to set some criteria such as a sufficient amount of time having passed to enable a good evaluation of what worked or didn't.

- There are layers of tools – so there may be some very specific tools relating to diagnostics which could require a matrix of their own. For now the group is focused on a slightly broader categorisation of tools.
- Decision trees are really valuable – could we do this for the example questions? Group 2 had considered this but the questions posed did not fit the decision-tree process easily.
- We are still not all talking the same language – we talk about risk assessment in much of the document, but in section 2 we talk about rummaging around in a toolbox. Group 2 is addressing this by organising the tools around the agreed risk analysis framework, encouraging people at each step to make sure that they are following the process thoroughly.

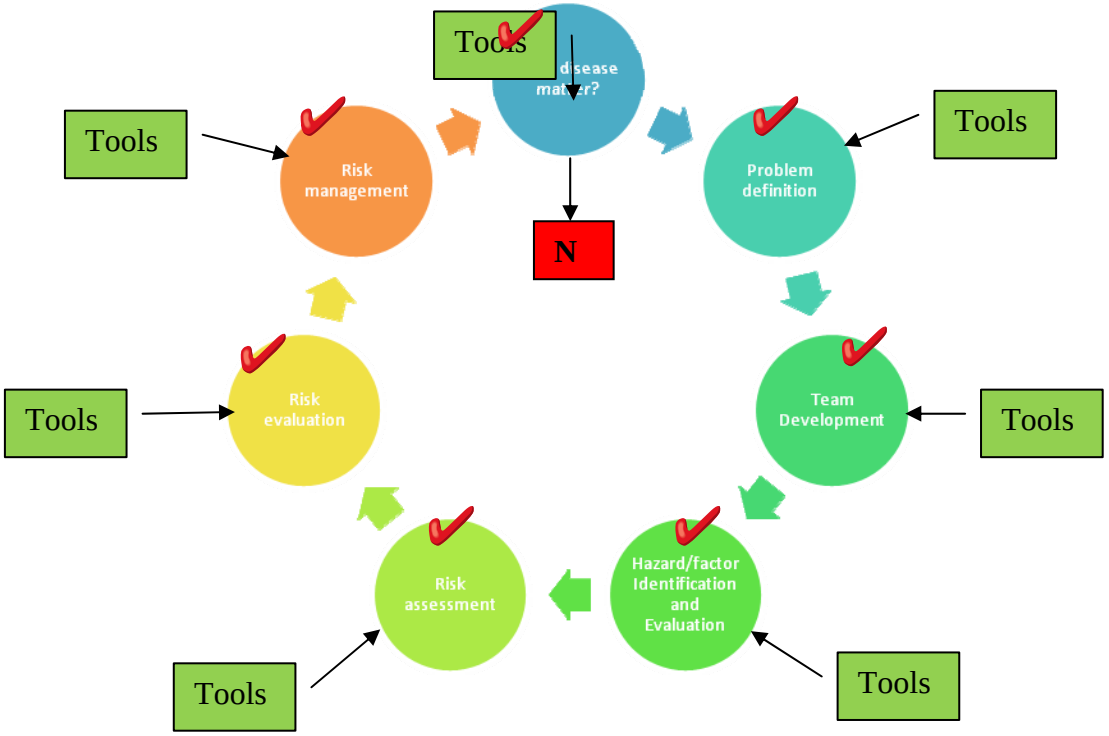
DAY 4 Discussion of section on creating, facilitating and participating in a DRA

Following Group 3's presentation there was some discussion of changing the structure of the product to accommodate some of the thinking – for example:

Glossary

I. Vision/Mission
II. Manifesto
III. Setting the stage (how to prepare for the process)
IV. Introduction to the process
V. Tools section.
VI. Appendices (epidemiology background, sampling)

We need to make sure that we capture clearly both the "Russian Doll" component or context – simple to complex – and also the sequential steps in the process. Ideally this will be illustrated in a graphical/visual way (e.g. figure below).



- Once we have all of the component parts (the tools) we can play with different ways to provide access to them – this can differ depending on the medium being used to access the *Guide* (e.g. paper vs. web).
- GAPS – we need to assess the gaps in tools.
- We need to be aware of general conservation-relevant resources – e.g. those produced by the IUCN – also we need to take account of indigenous issues.
- Lots of resources don't show up in the literature search – we need to be aware of where the resource reservoirs are and how to tap them.
- We could consider icons to indicate level of tool complexity.

12. Presentations and related discussions

Presentations were given throughout the workshop. This section provides a summary of each presentation given and of the related plenary discussion. Accompanying PowerPoint slides can be viewed (in PDF format) through the DRA Toolkit Web-site: https://sites.google.com/site/cbsgdratoolkitreview/

DAY 1: April 4, 2011

CBSG perspective on DRA activities
Phil Miller

The Conservation Breeding Specialist Group, of the IUCN's Species Survival Commission (SSC), has a diverse set of skills that range from traditional conservation biology (small population management) to an understanding of small group dynamics and the human collaborative process. When combined, these skills allow us to design and facilitate conservation planning workshop processes for a broad diversity of stakeholders involved in decision-making for endangered species management. We strive to work closely with our SSC colleagues, arranged in more than 100 primarily taxon-based Specialist Groups, including our sibling interdisciplinary groups that focus on issues related to wildlife health, reintroduction, invasive species, and sustainable use.

Our greatest challenge is to get people to exchange information in productive ways in order to effect positive change for biodiversity. An important tool for this process that we have developed is called the Population and Habitat Viability Assessment, or PHVA workshop. The PHVA is explicitly designed around the assembly and analysis of published and unpublished scientific information, combined with rigorous risk analysis, to help stakeholders make informed decisions around wildlife and ecosystem management. In addition, we foster the creation of action-oriented networks of stakeholders following the PHVA workshop so that new scientific information is properly disseminated, policy change is encouraged, resources are committed for more efficient management activities, and communication of stakeholder issues and needs is more effectively maintained. These goals are achieved through explicit attention to the interplay between content and process so that workshop attendees become active participants in the analytical and action planning phases of the meeting. Tools such as computer simulation modeling have been shown to be very effective in facilitating communication and understanding of complex issues and processes among stakeholders with divergent interests and areas of expertise.

These same core elements have been applied for more than a decade to our strategic focus on developing a resource for wildlife disease risk analysis to be used by the global wildlife conservation medicine community. Dating back to 1992, CBSG has been working to gather together experts in zoo and wildlife veterinary medicine, disease ecology, and population management to develop a set of tools for realistic and rigorous assessment of risk disease

introduction and/or transmission – originally in the context of animal movement programs such as translocation or reintroduction. By facilitating communication and information exchange among experts – from a few people in the United States to nearly 100 in Japan – CBSG has gained valuable experience in providing assistance to the wildlife conservation community. We hope to utilize this experience in the development of a new Disease Risk Analysis Guide, and to learn from experts such as yourselves throughout the journey.

IUCN WHSG history and perspectives
Richard Kock

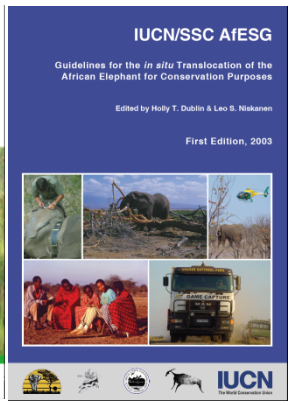
Western civilisation, through the application of science and technology, stimulated major shifts in human behaviour, population and impact over the past two centuries. Paradoxically this is undermining biodiversity, human well being and threatening life itself. If we wish to resolve this, a new globally accepted development paradigm is needed, which is fundamentally different to current consumptive models.

IUCN is a global institution well positioned to promote this necessary change. It is unique in representing, government and non-governmental organisations, as well as comprising a substantial, committed, voluntary network of conservation scientists and professionals. IUCN is at the forefront of efforts to stop the unsustainable use and wanton destruction of natural resources and is a guardian of biodiversity. It achieves many of its aims through providing scientific advice and support to authorities and agencies mandated with protection of the environment and species. The development of the DRA reference and toolkit is an example of specific and practical guidance given. Its aim is to reduce risks to biodiversity from disease at a time when populations are under unnatural stress and highly vulnerable to spill over of infection from livestock and through anthropogenic impacts.

The DRA reference is a joint effort of several groups of the Species Survival Commission of the IUCN and one of these is the Wildlife Health Specialist Group (WHSG). Formerly known as the veterinary specialist group, set up nearly thirty years ago, WHSG includes most of the recognised wildlife health and disease experts with an interest in conservation and has a global reach.

IUCN SSC WHSG Membership representation by country

The group provides expert advice on health and disease, endorsed by IUCN and UNEP, and therefore has considerable weight at National, Regional and International levels and is recognised for its expertise by the main human and animal health agencies (WHO, FAO, OIE). Its membership provides intellectual capital, focused on encouraging new ways of thinking about wildlife health and disease especially where it impacts or, is impacted by, conservation methodologies, human/domestic animal or agricultural activities and health interventions. One of the goals of the co-chairs of the group is to increase the representation of expert colleagues outside of developed "western" social and economic systems, where much of biodiversity remains, but is highly threatened from growing human populations, exploitation and rapid development. This has now largely been achieved with a strong network, website and database www.iucn whsg.org .
A number of technical guidelines have been produced with major WHSG input including on: wildlife quarantine, necropsy procedures, African and Asian rhino and elephant reintroduction guidelines, and on species conservation strategies.



IUCN/SSC/Invasive Species Specialist Group (ISSG).
Maj de Poorter

(See powerpoint presentation on DRA website)

Discussion:
Q. To what extent are we shutting the door after the horse has bolted?
A. This depends on the level of commitment that responsible agencies/national/regional authorities are willing or able to make. If a country or region wants to deal with invasives proactively there are mechanisms and approaches that can be applied, and which are being applied to good effect in countries like Australia, New Zealand, Israel, Japan and, increasingly, Europe. Other countries, such as the US, stand out as prioritising competing interests such as trade and commerce.

Toward optimisation of parasite management in translocations
Doug Armstrong

Explanatory notes for each slide as follows:

1. Title Slide. I interpret "disease risk assessment" to be the process by which management

actions relevant to parasite management are decided. Not "dis-ease" in its literal sense, i.e. reflecting symptoms of individual animals.

2. Vision. The most important part of this vision is the bottom line, i.e. conflict arising from different "perspectives" mean different parties focusing on parts of the problem. Conflict may also arise from different values, but this only becomes clear once the whole management problem is defined and transparent decision frameworks put in place.

3. Key Questions in Reintroduction Biology. It isn't straight forward defining what the "whole problem" is, but our 10 key questions shown here are attempt to flag issues the issues that should be considered in any translocation. At least 4 of the key questions are directly related to parasite management, and these are the ones with boxes around them. The whole problem may of course be bigger than just translocation concerns, e.g. there may also be human health concerns.

4. Decision Making Options. In my experience the disease risk component of translocation decisions is done largely by animal health authorities without reference to the rest of the management problem. This is not ideal for at least 3 reasons: a) the decisions are unlikely to approach optimality regardless of the expertise of the authorities involved; b) the logic is not transparent to most parties; and c) the situation puts undue pressure and responsibility on the authorities asked to make the decisions. Scoring systems and decision trees are intended to be simple transparent schemes that allow the whole problem to be considered. However, they do not result in optimal decisions unless very carefully constructed. The better approach is "structured decision making" (SDM) where the decision is deliberately structured to evaluate maximum net benefits under different options.

5. Structure Decision Making. SDM involves anticipating outcomes, assigning utilities, and estimating probabilities of different outcomes occurring. This last component is often called "risk analysis". The most obvious decision is to selection the action with the highest average utility, as shown in the first equation below. However, this is not the only decision criterion; for example, people may prefer a risk averse criterion. The equation at the model shows the idea of accounting for uncertainty using a model averaging approach. Although the equation here shows discrete models, the process could instead involve considering a continuous distribution of parameter values.

6. Possible Actions. The next three slides break SDM into its components with reference to parasite management, but none of the slides is necessarily an exhaustive list. I think the possible parasite management strategies shown on the current slide will be clear and familiar to all workshop participants.

7. Utilities. Calculating utilities is complex, and is involves comparative valuation of quite different currencies. It is a useful exercise even when understanding of the system (reflected is models created) is extremely poor, as decisions may be highly sensitive to the values assigned.

8. Models. The modelling is the most challenging part of the exercise, as it involves integrating several types of research. It is likely to be extremely difficult with parasite management because few data are currently available to estimate many of the parameters and select among alternative models. In the first instance parts of the models will need to be largely based on expert opinion, but there should be an attempt to properly represent the uncertainty involved.

9. Adaptive management. AM is a mechanism for reducing uncertainty over time. It may be done through "active adaptive management", where the optimal management options are chosen based on information value as well as immediate optimisation of outcomes, or "passive adaptive management", where the value of information is not taken into account.

Discussion:

- *There is scepticism about the use of models where there are few data. However, it's usually possible to put parameters around these things and use this to see where reduction in uncertainty would improve things – this gives guidance on priorities for monitoring/research.*
- *Important to note that using the structured decision analysis framework presented, decisions can change depending on what utilities are used to evaluate the decision.*
- *Important to distinguish between disease (which may have an impact on population viability) and parasites (which don't necessarily).*

Wildlife disease management – treating the causes, not the symptoms. Dan Tompkins,

Slide 1: *Title*
Slides 2 – 4: *Demonstrating how parasites are a natural and abundant part of normal ecosystems.*
Slides 5 – 7: *Demonstrating how parasites likely increase the resilience of ecosystems to perturbations.*
Slides 8 – 10: *Demonstrating how wildlife normally carry parasites and pathogens with little or no adverse effects, particularly at the population scale.*
Slides 11-12: *But impacts DO occur. Schematic representation of how such impacts are generally caused by external drivers, and not the presence of parasites per se.*
Slide 13: *Demonstrating how treating a specific disease issue in wildlife is usually treating a symptom and not the cause of the issue.*
Slides 14 – 15: *Example of disease (squirrel poxvirus) impact on wildlife (UK native red squirrel) caused by the presence of an exotic reservoir host species (introduced grey squirrel).*
Slides 16 – 17: *Example of how bottlenecked species (Forbes parakeet) can have reduced measures of immune function compared to healthy species (red crowned parakeet).*
Slides 18 – 19: *Example of how interactions between parasites and agrochemicals (glyphosate) can cause disease issues in freshwater organisms (galaxiid fish).*
Slides 20 – 22: *Summary and conclusions.*
Slide 23: *Acknowledgements.*

Discussion:
Q. Has MHC been looked at in devils?
A. Yes but definitive work will take a while. The tumour cells themselves can lose the surface antigens that enable recognition by the host so this avenue of research may not provide sufficient answers.

- *We need to understand how virulent pathogens emerge. This is not usually spontaneous – the right conditions may need to be created in the first instance. A better understanding of this may help address cause.*
- *Agro-ecological systems are something that we need to focus on. Preservation of wildlife exclusively within protected areas may not be a viable long-term model. We need to be able to set up other, mixed systems in which wildlife can be sustained. The systems are more challenging in terms of disease management and disease risk assessment, but the tools we're developing could help with this.*

The OIE, international trade and risk analysis
Stuart MacDiarmid

The World Organisation for Animal Health (OIE) was founded in 1924 as a conduit to inform its members of epidemics of important livestock diseases. Currently with a membership of 178 countries and territories, the OIE has expanded its role to cover zoonoses and some important diseases of wildlife. In the 1990s the OIE developed a methodology for disease risk analysis based on the environmental methodology of Covello and Merhofer. Although the OIE's methodology was developed to inform trade decisions it is widely applicable to broader animal disease issues. The OIE risk analysis methodology has been applied to diseases of aquatic animals, in some wildlife situations, and even in at least one situation involving invasive species (red imported fire ants).

Discussion:
Q. When does a method move from qualitative to semi-quantitative to quantitative?
A. Some parts of a system may be able to be quantified but not all of them (at least not robustly). So, for example, it may be possible to quantify the likelihood of arrival of a pathogen in a particular country, but the subsequent impact may not be quantifiable – especially where the pathogen is novel to that environment so that there is no firm basis for prediction. This can reduce the value of the quantifiable aspects and it can be better to stick with qualitative arguments.

Report on the IUCN-SSC DRA tool needs analysis survey
Richard Jakob-Hoff

Background
An on-line survey was conducted prior to the workshop to assess the global needs and uses of wildlife disease risk analysis (DRA) tools. This was in recognition of the almost 10 years elapsed since the CBSG Workbook was published and the upsurge in interest in wildlife

disease and significant developments in risk analysis methodologies and technologies in the intervening years.
Specific aims of the survey were to: 1) Obtain relevant background information on respondents; 2) Understand respondents' interpretation and usage of risk analysis in relation to wildlife disease; 3) Understand respondents' current DRA needs and 4) Determine the educational and training needs of wildlife DRA stakeholders.
An on-line survey tools was used (http://www.surveygizmo.com/) over a two week period. Draft survey questions were refined during virtual DRA meetings and with input of a professional evaluator. Broad global coverage was attempted by asking DRA group participants to forward the survey through their networks and by including translations of the survey into French and Portuguese.

Results

- A total of 290 completed responses were received (260 English, 25 Portuguese and 5 French) from 40 countries with the majority (c70%) in Australasia, North and South America and Europe. Respondents primarily spoke six languages (English, German, French, Spanish, Portuguese and Indonesian) but 28 other languages were spoken by a variety of individuals. Twenty-seven different occupation categories were listed; 80% had worked with wildlife for >6 years and 40% had worked with risk analysis > 6 years.

- Respondents' key wildlife disease scenarios of interest were in relation to human/wildlife interaction (22%), domestic animal/wildlife interactions (19%), wildlife management *in situ* (18%) and wildlife translocations (17%). Wildlife disease concerns were primarily for impacts on wildlife (42%), humans (32%) and domestic animals (23%). Of those whose primary concern was for disease impacts on wildlife the taxa of main interest ranged in descending taxonomic order from mammals (34%) to invertebrates (5%).

- A broad range of interpretations of the term "Risk Analysis" were indicated and best summarised by this response: "It means that I must ask for clarification what the person I am talking to means by the term. The language around risk analysis/assessment is total confusion and absolutely not uniform".

- Over one third of respondents said they did not use specific DRA tools. Of those that did use 'tools' the most frequently used were the OIE risk assessment tools (38 users) and the CBSG worksheet tool (23 users). Most people used them once annually or less often.

Asked what DRA resources they would like, respondents listed a wide range of needs including:

- Easily accessible and easy to use with training back up
- Application to wide range of taxa and disease risk scenarios
- Clear, transparent and repeatable methodology
- Recognition of complexity and uncertainties involved
- Sound epidemiological basis
- 50% would like the tools as electronic web-based while equal numbers (20% each) wanted hard copy and CD/DVD versions.

Discussion:
Q. In light of the enormous range of identified needs, is it feasible to try to build a Guide that will deal with all of these varied needs?
A. It seems clear that a "one size fits all" approach will not be adequate to cater for all of the needs but we do need to build something that is inherently flexible.
Q. What proportion of the respondents were from the IUCN? To what extent have we really captured the audience in a representative way?
A. This is difficult to ascertain.

- *15% of respondents use DRA tools only once a year – we may need to focus on promoting the use DRA more regularly.*
- *There is problem with terminology – particularly with respect to risk analysis vs risk assessment – perhaps we need to be more inclusive to take in issues such as surveillance.*
- *What is emerging is a need for guidelines on DRA processes, which has been talked about, but also something more accessible that speaks to people about when and how DRA could or should be applied with regard to wildlife health.*
- *There is a big push for cheap and simple tools, but there is also a need for more complicated and less cheap tools because these situations are complex and there are users who can and want to address that. If making these more complex tools available they need to travel with access to the necessary expertise and resources so that they can apply them effectively.*
- *It's not necessarily the tool, it can be the application of the tool. It's possible to do a bad job no matter what tool is being used.*
- *If we have a suite of available tools ranging from simple to complex, we also need to give guidance on when it's useful to take a step up to the next level of complexity.*
- *It was suggested that the survey could be broadened to access more information, and also to provide information to respondents on the current project and envisaged Guide.*
- *It's important to keep in mind the groups of people out there who should be using these tools but aren't at present.*
- *When the Guide is circulated it should go with some sort of mechanism for tracking uptake and use, and for gathering feedback.*
- *BSE risk assessments predicted roughly a million cases in humans – considerable resources were expended on this. Only a few cases ever emerged, demonstrating the (potentially huge) margin of error in these assessments.*

Risk Analysis

Dominic Travis

The process of analyzing risk has been a part of the human condition throughout history; every day, each of us assesses risk in the course of normal activities. It was not until 1654 when French mathematicians Blaise Pascal and Luca Paccioli, exploring the issues of chance and uncertainty in gambling, developed what is now called the theory of probability, combining mathematics and rudimentary elements of today's concept of risk for the first time. In time, the theory of probability mathematics was further developed and refined by

those in other disciplines wishing to assess risk and forecast the future. In the late 20th century, mathematicians, engineers, economists and health care professionals began to standardize techniques for qualitatively or quantitatively assessing and predicting measures of risk in their respective fields. As a result, a collection of methods known as risk analysis has emerged to support rational decision-making in the face of uncertainty. Risk analysis is not science per se, it is a science-based process that is an organized and logical approach to identifying and using scientific information to support policy-making in the real world.

The term risk analysis refers to the overall process regardless of the format used or how individual sections are defined. Risk analysis usually consists of three or four interconnected phases: hazard identification, risk assessment, risk management and risk communication, sometimes hazard identification is included in the risk assessment phase, resulting in a three-part model. Each phase of the risk analysis process is focused on answering basic questions. The hazard identification phase attempts to answer 'what can go wrong' and 'how can it happen'? Risk assessment asks 'how likely is it that an unfavorable outcome, due to an identified hazard, will occur'? The goal of the risk assessment phase is to summarize the likelihood and consequences of an identified hazard occurring within the identified pathway. Valid risk assessments are based on a specific question, are transparent, fully disclose the assumptions made, and include a discussion of factors that add to the uncertainty surrounding conclusions. Risk management answers the questions 'what can be done to decrease the likelihood of a hazardous event' and 'what can be done to reduce the implications once it has happened'? Risk management is the phase aimed at identifying viable prevention strategies for identified hazards or minimizing the impact of a hazard once it has occurred. Finally, risk communication identifies who cares and is the often-overlooked practice of continuous communication to and among interested stakeholders throughout the risk analysis process.

When evaluating risk analysis methodologies, it is important to note that there are numerous disciplines engaged in conducting risk analyses, each discipline has it's own unique questions and problems. Risk assessment formats are modeled to meet the specific needs of the particular discipline, however, most formats have begun to converge and generally follow the generic risk analysis framework outlined above. This allows risk analysts to use multiple methods within the same paradigm, depending upon the nature of the problem they are trying to solve. This technique is especially useful in health care fields where multiple government agencies often collaborate on problems of mutual interest. One limitation to this approach, however, is the lack of standardized terminology. Although there have been efforts to standardize the terminology used among health care disciplines, risk analysis language is still very field-specific.

People responsible for animal health have been qualitatively assessing risks surrounding disease since the middle ages. Veterinarians and veterinary services have traditionally based decisions regarding disease risks associated with the movement of animals and animal products on experience and qualitative assessment. In 1969, quantitative risk assessment methodology was advanced by Starr who, in Science, proposed a standardized format for the quantitative assessment of risk. In 1980, Lowrance suggested that quantitative risk assessment methods should be applied to evaluating infectious disease-associated risks. In 1981, signs that risk analysis was becoming a formal discipline were

evident as the journal Risk Analysis was created. Risk assessment methodologies commonly used in animal and human health fields today can be traced to 1983 when the National Research Council of the National Academy of Sciences (NRC-NAS) standardized the format for the assessment of the effects of hazardous chemicals on human health in what is referred to as the Red Book.

Other health-related organizations have published risk analysis frameworks; most follow the generic risk analysis process but have differing risk assessment formats. A comparison of the intricacies of the formats can be found in the ILSI Revised Framework for Microbial Risk Assessment. A close inspection of the comparison provided by ILSI shows that many risk assessment models, although evolving separately, have begun to converge into a similar format. In 2003, the CBSG working group on disease risk assessment tools and processes developed the following guidelines based upon those implanted by the OIE.

1) Define the Risk Analysis Issue – what is the policy-related issue on the table. For example, what is the likelihood that diseases are spreading between people (native or tourists) and NH primates in areas where the populations overlap?

2) Draw a picture of the issue (if you can't draw it, you can't model it)

3) Conduct a hazard identification for all diseases potentially present within 1 above. Hazards/diseases of high priority should be modeled in the risk assessment

4) Establish a list of prioritized SPECIFIC risk assessment questions for modeling. For example, what is the likelihood that a disease present in primates, but not in humans, spreads to a susceptible human through close contact with a primate, and is subsequently spread throughout the local human population. Another example would be the previous question in reverse.

5) Choose a software package sufficient for modeling the risk assessment question.

6) Build the model for the first question and validate relationships

7) Collect data and expert opinion for model input

8) Input and run model

9) Conduct sensitivity analysis – this examines the uncertainty in the model by showing where poor data most affected the variability in the outcome. This is where you play with things like disease prevalence in order to see how changes affect the outcomes. If you lower prevalence due to vaccination or better treatments, how does it affect the answer? If you decrease the rate of contact between people and primates, what happens to the outcome? Etc. Etc.

10) Test the model under different disease conditions or change model to accommodate risk assessment question #2.

By 2005, the working group found that these guidelines worked fairly well for dealing with animals movements such as translocations and reintroduction programs but were limited in numerous areas:

1) The hazard identification guidelines were not well defined and more guidance needs to be given for these methods
2) This format did not work well for complex ecological questions – more input/involvement of ecological disease modelers is needed
3) There should be explanations and training for the different roles that one plays within a risk analysis team. These roles consist of participant, modeler and facilitator. Training should be based upon the potential role that the individual will play and should be delivered through the principals of adult learning.
4) More published case studies / examples are needed to support training goals.
5) Standardized language should be used for communication purposes. The following were used at that time:

   Reservoir: The reservoir is: any animate (humans, animals, insects, etc.) or inanimate object (plant, soil, feces, etc.) or any combination of these serving as a habitat of a pathogen that reproduces itself in such a way as to be transmitted to a susceptible host.

   Route(s) of transmission: Action/event/process whereby a pathogen is passed from one individual to another. How is the agent transmitted? Horizontal vs. Vertical; Direct vs. Indirect; +/- biological vectors; +/- mechanical vectors; airborne; sexual; other routes of direct contact etc.

   Route(s) of exposure: Potential routes of exposure are those mentioned above in routes of transmission that are likely given the scenario outlined, as stated in the introduction

   Infectivity: The characteristic of a microorganism that allows it to infect and subsequently survive and multiply within a susceptible host. It is commonly measured using the ID50 - the median infective dose - or, the dose that will infect 50% of an exposed group.

   Pathogenicity: The host-specific ability of an agent to cause disease, given infectivity, or otherwise induce pathological change in a susceptible host. The types of pathological change should be outlined as well.

   Virulence: Given disease, the host-specific ability of an infectious agent to multiply in the host while inducing lesions and disease; the severity of signs given disease; the number of infected that actually come down with clinical disease; often measured by the LD50 - the median lethal dose - or, the dose that will kill 50% of the tested group.

   Susceptibility: The state of being readily affected by a pathogen; a lack of resistance due to insufficient immunity because of: age, genetics, acquired conditions or any other factor making an individual more likely to become infected upon exposure.

Can be in terms of individual or the group (herd immunity). Any known susceptibility factors should be outlined here.

Potential for spread: Potential for spread depends on numerous factors including housing density, contact between animals (contact structure), herd immune status, characteristics of the agent (infectivity). This is often measured by Ro - the number of individuals that one infected individual may infect.

Ro: The value representing transmissibility of an infectious agent between individuals. It is the number of animals/people that one infected individual is likely to infect. A value of '1' would meant that one person would likely infect one other person; values >1 mean that the infection would spread widely throughout the population; values <1 mean that an outbreak is subsiding. Each infectious agent has a basic Ro, risk management practices seek to decrease Ro below '1' in order to control an outbreak. Vaccines and antibiotics are perfect examples of risk management strategies applied to decrease this value

** definitions derived from the Dictionary of Veterinary Epidemiology. Toma B, Vaillancourt J, Dufour B, Eliot M, Moutou F, Marsh W, Benet J, Sanaa M, Michel P. Iowa State University Press, Ames. 1999.

Discussion:

- *What do we mean by modelling? What situations are we talking about modelling? People have all sorts of different questions that can be addressed by models, potentially. Before you can assess risk you need to build the model or "pathway".*
- *Political context has a lot of influence over perceptions of acceptability of risk.*
- *With respect to the comment above it may be important to separate the decision-making component from the assessment itself. However, the way the risk management potential is dealt with – i.e. in terms of modelling different management scenarios – can have an influence over the decision that is taken.*
- *It's important to draw in those people who perhaps imagine that they have too few data to run a risk assessment, by pitching the Guide in the right way.*
- *It's important to take a step back, as part of this process, to show the bigger picture in which this work sits. We need to make sure that we understand where disease sits in the wider wildlife management picture and start the analysis at the right level, asking the right questions.*
- *It may be the case that the most important parasites are those that we don't even know about. How do we deal with that? We need to recognise that these processes are iterative – we need to do the best we can with the information we have now, understanding that the process does not stop there but is influenced down the track as more information becomes available.*

Introduction to / history of the current DRA workbook
Phil Miller

The current Disease Risk Analysis Guide traces its roots back to a meeting held in 2000 at Omaha's Henry Doorly Zoo. At that meeting, participants began to explore the types of issues of concern to wildlife conservation medicine practitioners and the diversity of tools that were currently available. Working groups began focusing in specific types of tools, from worksheet mechanisms for disease data assembly to quantitative predictive modeling platforms that could enhance tradition population viability analysis tools such as the Vortex package created by CBSG and colleagues. Even at this very early stage of the development process, participants were encouraged to develop case studies to ground DRA questions and to test various tools. Richard Jakob-Hoff began exploring the adaptation of a DRA worksheet originally developed by New Zealand's Department of Conservation, the concept of decision tree analysis was initially studied, and a small group of people began sketching out the structure of a disease dynamics simulation model that could be used alone or, ultimately, in conjunction with PVA tools to provide more useful information on disease-based threats and their management.

Workshop II, held later in 2000 in conjunction with the American Association of Zoo Veterinarians conference in New Orleans, continued to focus on species-based case studies as a means of demonstrating DRA tools and processes. It was here that we began exploring the utility of systems-level modeling using tools like Stella and VenSim, and also started our detailed exploration of graphical depictions of specific disease risk scenarios as a first step in proper question formulation as part of a formal risk analysis process.

New experts and tools continued to be brought into the expanding and evolving group during out third workshop, held in June 2001 at the White Oak Plantation in Florida. We began to discuss how GIS tools can assist in the informative process of disease risk analysis, and we used this workshop to formulate a formal Protocol for Disease Risk Analysis. At this meeting, we were able to show early prototypes of our disease dynamics simulation which we called Outbreak.

With the products from these three meetings in hand, we were able to produce a draft Guide that we then used as a training tool in workshops in Mexico (October, 2002), South Africa (November, 2002) and Costa Rica (2003). We also used the tools described in the Guide to address issues of disease risk in populations of the Channel Island fox (Urocyon littoralis) off the coast of southern California, and were able to expand our audience for DRA tools and processes to those interested in disease risk in the transport of biomaterials. An interesting example of such an application was the issue of risk of moving rinderpest into captive populations of gerenuk in the USA through the transport of potentially contaminated semen collected from animals in Africa. Finally, tools for disease risk assessment were on center stage at a workshop facilitated by CBSG in southwestern Japan for the Tsushima leopard cat (Felis bengalensis euptilura), a species threatened by introduction of diseases such as feline leukemia virus from local populations of feral and domestic cats. Richard Jakob-Hoff joined Alberto Paras (CBSG Mexico) in Japan to work with local veterinarians and leopard cat biologists on this important issue.

Many important tasks still remain on our "To-Do List", but we're confident that the large group of dedicated experts that have worked on this important project since the beginning will continue to make invaluable contributions to a revised version of the Guide in this year and beyond.

Discussion:
Q. What has been the cost of producing the CBSG workbook?
A. That is not known. We need to be aware of the limited resources available for conservation and make sure that they are well-targeted. It would be difficult to do a real cost-benefit analysis of this kind of resource because of the volume of in-kind contributions, and the unknown cost of the duplication of effort that could otherwise occur as a result of that document not being available. This is an issue that is being addressed to some extent within the CRC-bidding process.

DAY 3: April 6, 2011

Diseases in Brazil
Rodrigo Lopez

Notes taken during the presentation:

The São Paulo Zoo is very large, covering an area of 900,000m^2

In Brazil there is a lot of illegal wildlife trafficking; the occasional wild to wild translocations have not considered disease risks in the past; there is little cooperation between zoos so not many captive to captive transfers.

There is currently very little national oversight monitoring wildlife disease and laws regarding disease control only cover importations and even this is quite weak. The priority given to disease risks depends on who's in charge.

Currently Disease Risk Analyses are based on personal experience, knowledge and common sense and are compromised by lack of resources (both money and diagnostic laboratories). However the São Paulo Zoo is currently increasing its diagnostic capability by building its own PCR and genetics laboratories.

The São Paulo Zoo and two others in Brazil have a preventative zoo medical programme. Information about diseases in the wild is still in its infancy but is gradually growing over the last 10 years.

- Example1: Howler monkeys in a rescue centre had a heavy Enterobius parasite infestation and were all treated. They then developed diarrhea. So conducted a survey of wild Howler monkeys and found that these parasites are common and appear to have an important role in digestion in this species. The captive animals were dosed with the parasites and the diarrhea resolved.
- Example 2: Toucans commonly eat fruit with a high iron content. They also are commonly infested with Capillaria nematodes. It is believed the parasites have a role

to play in reducing iron uptake and thereby preventing the disease haemochromatosis which is a common cause of death in captive toucans.

- Example 3: Giant anteaters have high leptospirosis titres but the significance is not known.

There is currently no coordinated data storage facility.

Our goals are to raise awareness of the use of DRA tools, to use them as an basic part of managing the health of animals in the Zoo and to educate conservation agencies and use as a tool to politically influence policy.

Discussion:

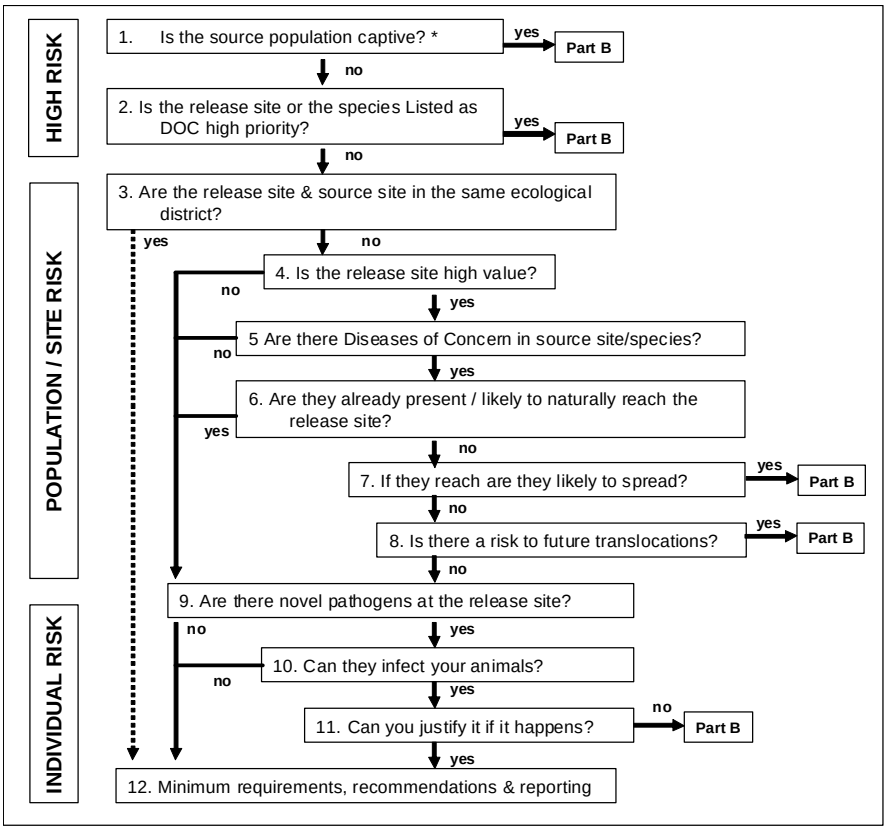
- *Sao Paulo Zoo is a Foundation so is part-government and part government funded*
- *The research talked about is done mainly through in-country universities*
- *There is an ongoing attempt to bring together those working on yellow fever in the wild, with the captive community.*
- *The Golden Lion-tamarin project is an exemplar project in many ways but it has been running a long time and there are no other projects that are as well developed.*

Department of Conservation DRA procedures for New Zealand
Kate McInnes

- The Department of Conservation has developed a Disease Risk Assessment Tool for use in species translocations. Its aim is to simplify the process to engage conservation managers and provide a logical tool to assist them in their planning.
- Currently the Department uses the (Animal Movements Risk Assessment) Workbook designed by Richard Jakob-Hoff for this purpose. The Workbook is highly effective, however conservation managers find it difficult to use due to limited resources, background knowledge, funding, time and access to veterinary advice. The new process includes the RJH Workbook but provides a "front-end" which performs a simpler risk assessment process. This allows non-vets to make the first assessment of their project and increases their ownership of the results.
- The Process: a series of questions in the form of a flow-chart leads the user through the process. These questions determine the theoretical consequence and likelihood of a disease event occurring, thus determining the level of risk. High risk situations are identified in the first few questions e.g. those involving sites which have high ecosystem value, or highly endangered species, or species being bred/held in captivity. If the translocation involves any of these situations, then the user is referred to the RJH Workbook to undertake a more thorough assessment with veterinary assistance to develop a management plan for risk mitigation if required.
- The process then looks at the ecological distance between the sites as a quick way to assess the risk of introduction of a novel pathogen to the release site. Those translocations which are within a single ecological area are considered low risk. The user the proceeds to the end of the flow-chart and the minimum requirements.
- Where the source and release sites are not within the ecological area, the user continues with the flow-chart questions. These then examine the specific translocation more thoroughly, looking at source and release sites, and likelihood of

introducing a new pathogenic organism, and the consequence if one did arrive. As the user progresses through these questions, it becomes apparent whether the theoretical risk is low or not low. This is somewhat limited by baseline knowledge, and therefore encourages the user to be aware of this limitation and help assist in filling any gaps!

- Where the theoretical risk is not low, once again the user is directed to the RJH workbook. If the risk is deemed low, then the user reaches the end of the flow-chart and the minimum requirements for the translocation to manage health e.g. physical examination and weighing of all animals with only apparently healthy ones to be moved; reporting of results and any abnormalities, collection of baseline health samples if possible.



The process was presented to get critical feedback from the Workshop Group.

Discussion:

- *Suggest that the decision tree presented is part hazard identification and part risk assessment.*
- *There are written rationales to accompany each decision-point.*
- *Islands may be added as "high value sites" because of their importance to NZ conservation strategies for threatened species.*

- *Not all captive populations are created equal...some well monitored populations are a great resource for conservation. The DOC tool does allow their use, they just have to go through another process to ensure their suitability.*
- *There is much information required for use of the decision tree that is not known. However, an information database is building.*
- *Difficult to balance the need to include community groups in conservation work – because DOC doesn't have the resources – with making the regulation of these community efforts prohibitively expensive. Some of these initiatives are not considered priorities by DOC and so would not receive funds even if available. Others are considered priorities but cannot be funded because of lack of DOC funds.*
-

Use of Population Viability Analysis models (and more…) in endangered species management
Phil Miller

I. Use and Misuse of PVA
It is important to understand the proper use of population viability analysis models, and the situations in which the tool can be used to its greatest potential. Fundamentally, population viability analysis is designed to predict future conditions for a wildlife population or metapopulation under a given set of conditions. What is the likelihood that a population will remain stable in abundance, or perhaps become unstable and decline to extinction? If this risk of decline is deemed to be too great, what demographic conditions are necessary to achieve population growth and, by extension, greater stability? To answer these types of questions, fairly complex computer simulation models are typically seen as the most appropriate tool. One of the most popular generic tools for PVA is called Vortex, and has been developed by CBSG Chairman Bob Lacy in collaboration with a host of population biologists and wildlife managers. Vortex models demographic stochasticity (the randomness of reproduction and deaths among individuals in a population), environmental variation in the annual birth and death rates, the impacts of sporadic catastrophes, and the effects of inbreeding in small populations. Vortex also allows analysis of the effects of losses or gains in habitat, harvest or supplementation of populations, and movement of individuals among local populations.

One of the most common criticisms against PVA models is the difficulty in collecting enough input data to make them "useful". But it is critically important to recognize that such models can be used to make very useful wildlife management decisions – even if data on the species or population under consideration are very sparse. As an analogy of this phenomenon, consider a detailed map of a city like Chicago. If I want to go from point A to point B, I may be able to use this map – which is, in fact, a model – to answer very specific and detailed questions such as which route is the fastest, and how long will it take me to get there. On the other hand, if all I had was a crude, hand-drawn map that gave me a sense of direction, I may not be able to answer the same type of detailed question. I would, however, be able to decide on the proper direction I should move to get to point B, as long as I was able to predict from the map the relative consequences of traveling in alternative

directions (e.g., away from the lake vs. keeping the lake on my left-hand side). In the same manner, a comparatively rough PVA model may not be able to make accurate predictions of extinction risk under any one scenario, but it could be extremely useful to wildlife managers who must decide among a group of alternative management options. This is because PVA models can make robust relative predictions of population dynamics, even though specific predictions are far less robust.

An excellent example of this property is seen in a PVA conducted for Scott's tree kangaroo of Papua New Guinea by CBSG staff in 1998. Very little data on population demography were available, but we did know that local villagers hunted the species which likely was a major factor in the inferred population decline. I was able to create a very simple baseline model of tree kangaroo population dynamics, and then used the model to mimic the female-biased hunting practices villagers described in the pre-workshop data collection efforts. Without making statements about the accuracy or realism of any one modeling scenario, we were able to demonstrate the long-term population threat posed by this mechanism of hunting. This information led to a moratorium on Scott's tree kangaroo hunting by villagers in the area surrounding the species' remaining habitat, and recent field data suggest a steady increase in population abundance – likely due at least in part to the relaxation in hunting pressure brought about by the moratorium. In this case, very basic PVA models helped managers to identify a threat and make simple but effective recommendations for long-term management of a critically endangered species.

Template for wildlife disease risk analysis: Case study
Richard Jakob-Hoff

Background to the DRA worksheet tool

I was commissioned by the New Zealand Department of Conservation (DOC), in 1999 to develop a protocol for minimising disease risk in the translocation of wildlife within New Zealand. In recognition of the absence of staff veterinarians within DOC, a worksheet was developed to assist conservation managers to apply disease risk analysis principles to the systematic development of a quarantine and health screen protocol that was situation-specific, transparent (ie the bases of risk decisions and assumptions were explicit) and also provided a stimulus to the collection of wildlife disease surveillance and health assessment baseline data. It was widely piloted and refined with DOC staff prior to implementation by the Department as its standard operating procedure. I subsequently joined a core group of CBSG DRA tool developers and have continued to refine the tool with use.

Case study: Kakapo translocations and human/kakapo interactions

In 2008, the worksheet template was used to structure a 1.5 day DRA workshop to analyse the disease risks associated with a) kakapo translocations between various sites in NZ b) kakapo manipulations for research and veterinary care and c) close contact with people in a variety of circumstances. Two key elements were 1. Ensuring all the right people were in the room (ie expertise and decision makers) and 2. Preparation of comprehensive briefing notes for circulation to participants prior to the meeting.

The analysis used a "Movement Diagram" as a simple model of the range of translocations which, in turn, provided a basis for the development of a movement chart for discussion of each step of the movement and identification of critical control points for disease transmission. The pre-workshop review of published and unpublished literature provided the basis for listing of disease hazards and a 'rough assessment' table was used to rank these hazards on the basis of likelihood of infection x consequence to the population. To ensure transparency, a synopsis of the biology of each disease was provided together with an explanation of reasoning and assumptions behind each rough assessment ranking. Subsequently risk management actions were developed (vaccination, hygiene, quarantine etc) and finally a risk communication table was developed to ensure all stakeholder information needs were considered and planned for.

Electronic DRA template

Working with John Williams (JWComputers, Washington DC) an electronic version of the worksheet was developed and an example of its use for a Tasmanian Devil DRA demonstrated. However, the lack of funds and distance between John and myself has delayed the completion of this part of the project to date. In August, 2010 we were able to do some more work on a re-design and expansion of its scope to incorporate both translocation and *in situ* disease risk scenarios - including the ability to import PDF reports from other DRA tools that could be applied at different stages of the analytical process. The vision for this tool is:

"A freeware on-line template for the structured development of wildlife disease risk analyses able to link to, and import results from, a wide range of DRA tools, generate a range of reports to meet the needs of relevant stakeholders and provide (or link to) a repository of DRAs and a reference library".

To complete this project we will need:

- Additional collaborators with relevant skills in DRA and IT
- Tool development funding
- End-user testing

Discussion:

- *Would be useful to include "unknown" as a disease category*
- *There will be issues with sharing data.*
- *There is a local organisation that has community pages on its portal designed for sharing information. CBSG also has a portal facility like that operated through ISIS (International Species Information System). There was a web-based WCS initiative – open source, open access, that didn't go as well as hoped but there may be other reasons for that.*
- *People can adapt this for their own use though this needs to be managed carefully so that sufficient data can still be captured for the master data repository.*
- *This will be really good from the data storage, data collection standpoint. The disease risk assessment component is another layer.*

Methodology for DRA at the Zoological Society of London
Tony Sainsbury

(See powerpoint presentation on DRA website)

Discussion:

- *There's a lot of effort going into reintroduction. There's a lot of traffic through those areas – dogs, cats, humans etc. So we can't ever entirely monitor and control the content of the environment. We need to think about what is a reasonable amount of attention to this.*
- *Ross River virus – an assessment was done on the import of about 700 horses a year with respect to this, though thousands of people come in who are equally likely to carry the disease – we need to think about proportionality.*
- *Amphibian diseases are a similar case – in areas with high tourist traffic it is unreasonable to expend large amounts of effort on ensuring biosecure practices amongst field biologists.*
- *We should be doing the best we can and perhaps extrapolating good practice to other arenas in a way that is practical and achievable.*

The pitfalls of using test results for decision-making in conservation programs.
Bruce Rideout

There are fundamental problems associated with the way test results are traditionally used for decision-making in conservation programs. These problems are best illustrated by looking at two common scenarios.

The first scenario occurs when a population of apparently healthy animals is being screened to identify disease carriers, or those in the early (asymptomatic) stages of disease, so they can be *excluded* from a release cohort. Because test performance is proportional to agent prevalence in the population, and agent prevalence will be low in apparently healthy animals, test performance will be correspondingly low in this situation. The poor test performance will be manifested as a high proportion of false positives, leading to misclassification errors that not only exclude valuable individuals from translocation programs, but sometimes result in euthanasia of perfectly healthy animals.

The second scenario occurs when a mixed population of healthy and diseased animals is being tested to verify that the apparently healthy individuals are truly disease-free (test-negative), so they can be *included* in a release cohort. Test performance will also be poor in this situation, but will be manifested this time as a high proportion of false negative results. This leads to misclassification of infected animals as uninfected, and therefore to the unintentional release of diseased individuals into the wild.

Using test results for decision-making in conservation programs requires a thorough understanding of these pitfalls and the tailoring of surveillance programs to the specific

populations and questions at hand. These issues, with actual examples, will be discussed in this presentation.

Discussion

- *There are steps that can be taken to improve test performance and these can be explained simply – e.g. "Do you think you're dealing with low prevalence? If so, do these things..."*
- *This is also important in human medicine. The other thing that can be important is the clinical examination of the animals themselves before they move. Unfortunately this is not sufficiently valued.*
- *It's important to emphasise accountability – assessing after the fact, and repeatedly, whether the right decisions are being made in choosing tests, interpreting test results, and in the action taken as a result of those test results.*
- *We need to not be too prescriptive in telling people what to do whilst at the same time providing adequate guidance.*

Adult learning principles
Hazel Hodgkin

Notes taken during the session:
Purpose: to understand the key principles of adult learning and explore the implications for the DRA tool.

What leads to changed behaviour?
Changing circumstances, some kind of reward or value, sometimes you have no choice (law change, boss), peer pressures, relationships, normative pressures, changing values, seeing criticism as an opportunity for change, changing perspective, cultural context, illness or sickness, broadening horizons, pursuing goals, boredom, changing behaviour through education, accountability, fear, pursuing goals.

SCARF
S- status- giving advice or instructions can be experienced as a threat
C-certainty- the brain craves certainty which allows it to predict
A-Autonomy Control over ones environment increases autonomy, lowers stress
R- Relatedness positive social connections increase engagement, trust, collaboration
R- Fairness fair exchanges are intrinsically rewarding

Some people come at a question from a big picture perspective and some from an analytical point of view:

1) Analytical thinkers

- Like to focus on tasks and details
- Prefer information in a sequentially organize format
- Like to be an expert in a content area

- Need to have specifics and facts provided
- Prefer to be undisturbed in thinking process
- Learn step by step and act step by step
- Analyse a problem then reach a decision
- Remember details
- Dislike vague questions eg just suppose….

2) Global thinkers

- Can't be bothered with details and need the big picture and the reasons for a task
- Often enjoy multitasking and thrive on creative chaos
- Need overviews and summaries, skip the details
- Need to understand the whole idea before starting
- Impulsive in reaching a decision
- See relationships and like analogies
- Want to see the relevance of information
- May assume that others can skip the details as long as the end goal is clear

Visual learning and working style

- Prefers seen or observed things
- Uses phrases such as show me, lets have a look at that
- Reads the instructions or watches someone else do it first
- Works from a list and written directions and instructions

Auditory

- Prefers transfer of info by spoken word
- Uses phrases like tell me, lets talk it over
- Prefers to do a task after listening to instructions from an expert
- Happy being given spoken instructions over the telephone
- Remember all the verses

Kinaesthetic

- Physical experience, touching, feeling, holding, doing
- Let me try, how do you feel
- Does a new task by going ahead and trying it out learning as they go
- Likes to experiment, hands on and never looks at the instructions first

Because we use computers so much we are becoming more visual but some cultures would be more auditory.

We probably have a default position, but can learn another way, or "balance up", there is no right way and people tend to take jobs that play to their strengths.

Learning influences:

- 70% on the job learning

- 20% feedback from others
- 10% formal

Kolb's cycle of experimental learning:
Concrete experience, reflective observation, abstract conceptualization, active experimentation

So what would cause people to adopt the DRA toolkit? What will lead them to find the tool?

Reinforcement of learning
Within 3-6 months learning drops off – it needs reinforcing within 3 months.

DAY 4: April 7, 2011

Simulation modeling for disease risk assessment
Phil Miller

We have now created an individual-based stochastic simulation of disease epidemiological dynamics on wildlife populations. The software is called Outbreak, and is ready for general use by the conservation medicine community.

Outbreak simulates traditional S-E-I-R disease dynamics, with random variation in disease state transitions on a daily timestep. The model has a simple demographic system built into it so that it can be run as a standalone application. Model output includes state-specific distributions of individuals as a time series and at the end of the simulation, as well as information on the demographic profile of the population in response to the disease dynamics.

While Outbreak can be run as a standalone application, from the beginning of its development we saw the value of combining its relatively sophisticated treatment of disease dynamics with the equivalent sophistication with which Vortex handle population demography and genetics. This recognition formed the basis of a long-term research project on the application of biocomplexity to endangered species management which we called metamodeling. In this project, our goal was to develop new ways to engage an even wider diversity of stakeholders in our conservation planning workshop processes – not only bringing them to the table, but bringing their data as well that could be explicitly included in discipline-specific simulation models that could physically communicate and thereby create a more realistic and more informative environment for threat analysis and management decision-making.

We have developed a software package we call MetaModelManager, that facilitates the exchange of simulation modeling output across multiple models. For example, we can now create a two-species PVA by allowing two instances of Vortex to run simultaneously, as in a predator-prey system. We have done this for the well-known system of black-footed ferret

and its obligate prey, the black-tailed prairie dog. Moreover, we have linked an instance of Outbreak to the prairie dog model in order to simulate periodic epidemics of sylvatic plague. Therefore, we are able to simulate extinction in a ferret population through excessive reduction in abundance of its prey by disease.

We have also used this metamodeling technology in a recent workshop on the issue of bovine tuberculosis among the lion population of Kruger National Park, South Africa. In this application, we linked Outbreak to a lion-specific demographic model developed by Craig Packer and his colleagues at the University of Minnesota. This model includes social structure in a way that Vortex is lacking. This linkage of Outbreak with a completely external model demonstrates the flexibility that has been built into MetaModelManager, and our general philosophical approach as a whole. The metamodel approach was very successful in bringing together wildlife medicine professionals and lion ecologists who previously had difficulty effectively communicating across discipline-specific boundaries.

More information on our approach to metamodeling, and our workshop philosophy in general, can be found in a book we recently published with Island Press. Numerous case studies are discussed in the book, including the tree kangaroo just discussed.

Discussion:

- *A new module of meta-model is "Spatial" which will allow incorporation of landscape features and GIS data.*
- *Climate change aspects can be factored in*
- *There is a set of protocols that will enable people to build or modify models so that they will articulate with meta-model.*
- *We need the ability to compare systems. For example, when you put a fence around something the system starts to behave differently – e.g. TB goes right up compared to extensive systems without a fence.*

Appendix 1 List of participants

IUCN-SSC Disease Risk Analysis (DRA) tool development meeting participants, March – April, 2011

Title	First Name	Surname	Affiliations	E-mail address	Workshop Participant	Virtual Meeting Participant
Dr	Andrea	Reiss	Zoo & Aquarium Association	andrea@zooaquarium.org.au	√	√
Dr	Annie	Philips	Biodiversity Conservation Branch, Dpt Primary Industry, Parks, Water & Environment, Tasmania	Annie.Philips@dpipwe.tas.gov.au		√
Dr.	Arnaud	Desbiez	CBSG Brasil	adesbiez@hotmail.com		√
Dr	Bethany	Jackson	NZCCM, Auckland Zoo / Murdoch University	bethany.jackson@aucklandcouncil.govt.nz	√	
Dr	Bruce	Rideout	Centre for Conservation Research, San Diego Zoo	BRideout@sandiegozoo.org	√	√
Dr.	Carly	Holyoake	Murdoch University	C.holyoake@murdoch.edu.au	√	

Title	First Name	Surname	Affiliations	E-mail address	Workshop Participant	Virtual Meeting Participant
Ms	Caroline	Lees	CBSG Australasia	caroline@cbsgaustralasia.org	√	√
Dr	Craig	Pritchard	NZCCM, Auckland Zoo	Craig.pritchard@aucklandcouncil.govt.nz	√	
Dr	Dan	Tompkins	Landcare Research	tompkinsd@landcareresearch.co.n	√	√
Dr	Dominic	Travis	University of Minnesota	datravis@umn.edu	√	√
Prof	Doug	Armstrong	Massey University	D.P.Armstrong@massey.ac.nz	√	
Ms	Hazel	Hodgkin	Breakthrough Strategies	hazel@breakthroughstrategies.co.nz	√	
Dr	Ian	Langstaff	Animal Health Australia	ILangstaff@animalhealthaustralia.com.au	√	√
Dr	Janelle	Ward	IVABS, Massey University	wildlifehealthsolutions@gmail.com		√
Dr	John	Ewen	Institute of Zoology, Zoological Society of London	John.Ewen@ioz.ac.uk		√
Dr	Kate	McInnes	NZ Department of Conservation (DOC)	kmcinnes@doc.govt.nz	√	√

Title	First Name	Surname	Affiliations	E-mail address	Workshop Participant	Virtual Meeting Participant
Ms	Kathy	LaFauce	Department of Agriculture, Fisheries and Forestry	Kathy.LaFauce@daff.gov.au		√
Dr	Kevin	Parker	Massey University	k.parker@massey.ac.nz		√
Dr.	Kris	Warren	Murdoch University	kwarren@murdoch.edu.au	√	
Dr	Lee	Skerratt	James Cook University	lee.skerratt@jcu.edu.au	√	√
Dr.	Maj	de Poorter	SSC/ISSG/Royal Forest & Bird Protection Society	M.dePoorter@forestandbird.org.nz	√	
Dr	Mary	van Andel	Investigation and Diagnostics Centre, MAF	Mary.vanAndel@maf.govt.nz	√	√
Dr	Phil	Miller	Conservation Breeding Specialist Group (CBSG)	pmiller@cbsg.org	√	√
Dr	Rebecca	Vaughan	Institute of Zoology, Zoological Society of London	Rebecca.Vaughan@ioz.ac.uk		√
Dr	Richard	Jakob-Hoff	NZCCM, Auckland Zoo; CBSG Australasia	richard.jakob-hoff@aucklandcouncil.govt.nz	√	√

Title	First Name	Surname	Affiliations	E-mail address	Workshop Participant	Virtual Meeting Participant
Prof	Richard	Kock	Royal Veterinary College London; IUCN-SSC Wildlife Health Specialist Group	rkock@rvc.ac.uk	√	√
Dr	Rodrigo	Pinho Gomez Lopez	São Paulo Zoological society	vetgrilo@hotmail.com	√	√
Dr	Rosemary	Barraclough	Massey University	R.K.Barraclough@massey.ac.nz	√	
Dr.	Shan	Siah	ConserveAction International	Shan@ConservAction.org		√
Dr	Shyama	Pagad	IUCN SSC Invasive Species Specialist Group, Regional Pacific Office, University of Auckland	s.pagad@auckland.ac.nz	√	
Dr	Simone	Vitalli	Perth Zoo	simone.vitali@perthzoo.wa.gov.au		√
Dr	Steve	Unwin	Chester Zoo / Pan African Santuary Alliance	s.unwin@chesterzoo.org		√

Title	First Name	Surname	Affiliations	E-mail address	Workshop Participant	Virtual Meeting Participant
Dr.	Stuart	MacDiarmid	New Zealand Ministry of Agriculture and Forestry (MAF); / World Organisation for Animal Health (OIE)	Stuart.MacDiarmid@maf.govt.nz	√	√
Dr	Sue	Bigwood	Zoos SA	sbigwood@zoossa.com.au		√
Dr	Susie	Hester	Australian Centre of Excellence in Risk Assessment	shester@une.edu.au		√
Dr.	Tiggy	Grillo	Australian Wildlife Health Network	tgrillo@zoo.nsw.gov.au		√
Dr	Tony	Sainsbury	Institute of Zoology, Zoological Society of London	Tony.Sainsbury@ioz.ac.uk	√	
Dr	Verné	Dove	Murdoch University	verne.dolphin@gmail.com		√

Appendix 2 DRAFT Glossary of terms

The following is a first draft of a glossary for the DRA *Guide* only – it is not an attempt to standardise or prescribe terminology across the field of wildlife management.

The list includes those terms for which the OIE has an agreed definition, plus additional terms added during the Auckland workshop because they were considered potentially ambiguous.

TERM	*OIE Definition*
Acceptible risk	Risk level judged by each OIE member to be compatible with the protection of animal and public health within its country. The equivalent term used in the SPS Agreement is Appropriate Level of Protection (ALOP).
Commodity	Live animals, products of animal origin, animal genetic material, biological products and pathological material.
Consequence assessment	The process of describing the relationship between specified exposures to a biological agent and the consequences of those exposures. A causal process must exist by which exposures produce adverse health or environmental consequences which may, in turn, lead to socio-economic consequences. The consequence assessment describes the consequences of a given exposure and estimates the probability of them occurring.
Diagnostic test	SMcD comment: 'Does this really need a definition?" Where a word is used that is totally consistent with a common dictionary definition, there is no merit in drafting our own definition."
Disease	?
Disease risk analysis	?
Exposure assessment	The process of describing the biological pathway(s) necessary for exposure of animals and humans in the importing country to the hazards (in this case the pathogenic agents) released from a given risk sources, and estimating the probability of exposure(s) occurring either qualitatively or quatitatively.
Factor	Needs to account for Hazard vs Factor. SMacD comment: "I see no merit in the term 'Factor'. It is vague in common usage and I cannot see how we can give it sufficient rigour to use it here.

TERM	OIE Definition
Hazard	A biological, chemical or physical agent in, or a condition of, an animal or animal product with the potential to cause an adverse health effect.
Hazard Identification	The process of identifying the pathogenic agents which could potentially be introduced in the commodity considered for importation.
Infection	?
Infectious disease	?
Model	?
Monitoring	?
Parasite	?
Pathogen	?
Process	?
Qualitative risk assessment	An assessment where the outputs on the likelihood of the outcome or the magnitude of the consequences are expressed in qualitative terms such as high, medium, low or negligible.
Quantitative risk assessment	An assessment where the outputs of the risk assessment are expressed numerically.
Quarantine	?
Release assessment	The process of describing the biological pathway(s) necessary for an importation activity to 'release' (that is, introduce) pathogenic agents into a particular environment, and estimating the probability, either qualitatively or quantitatively, of that complete process occurring.
Risk	The likelihood of the occurrence and the likely magnitude of the biological and economic consequences of an adverse event or effect to animal or human health.
Risk analysis	The process composed of hazard identification, risk assessment, risk management and risk communication
Risk assessment	The evaluation of the likelihood and the biological and economic consequences of entry, establishment, or spread of a pathogenic agent within the territory of an importing country
Risk evaluation	The process of comparing the risk estimated in the risk assessment with the Member's appropriate level of protection??
Risk management	?
Risk communication	The interactive exchange of information and opinions throughout the risk analysis process concerning risk, risk-related factors and risk perceptions among risk assessors, risk managers, risk communicators, the general public and other interested parties.
Risk estimation	The process of integrating the results from the release assessment, exposure assessment, and consequence assessment to produce overall measures of risks associated with the hazards identified at the outset
Risk management	The process of identifying, selecting and implementing measures that can be applied to reduce the level of risk

TERM	OIE Definition
Risk tolerance	?
Surveillance	?
Screening test	?
Threat	? SMacD: "Threat" is another term that I see no merit in. How does a "threat" differ from a "risk"? What benefit do we gain from inventing a distinction
Tool	?
Transparency	Comprehensive documentation of all data, information, assumptions, methods, results, discussion and conclusions used in the risk analysis. Conclusions should be supported by an objective and logical discussion and the document should be fully referenced
Transmissible disease	?
Uncertainty	The lack of precise knowledge of the input values which is due to measurement error or to lack of knowledge of the steps required, and the pathways from hazard to risk, when building the scenario being assessed
Variability	A real-world complexity in which the value of an input is not the same for each case due to natural diversity in a given population

Note: The OIE has several more definitions not already listed. They can be found in the glossary to the Terrestrial Animal Health Code/

Appendix 3 Auckland workshop programme

Wildlife DRA tool development workshop 4 – 7 April 2011

Workshop Vision
A mix of subject matter experts and end-users of wildlife DRA tools has achieved consensus agreement on the structure and content of a new, integrated DRA *Guide* and associated training resources and a plan and commitment to complete this by December 2011.

Workshop Goals

1. Bring together a broad group of subject matter experts and end-users of DRA tools (started prior to workshop)
2. Identify key issues and begin assembly of information (completed prior to workshop)
3. Review global Wildlife DRA tool needs across a range of sectors (completed prior to workshop)
4. Consensus agreement on Vision and Goals for this project
5. Consensus agreement on structure of new, integrated Wildlife DRA *Guide* Framework
6. Draft a detailed outline for each section of the new *Guide*
7. Map the existing CBSG Workbook to the new framework and identify gaps
8. Collaboratively develop a plan to follow up this workshop and complete the development of the *Guide* and associated training materials
9. Ensure principles of adult education are applied to the development of the DRA training resource.
10. Identify and outline the basis of one or more publications to distribute information gained at this workshop to a wider audience
11. Develop a strategy for uptake of the *Guide*
12. Consensus agreement on a name for the end-product

Basic principle for participants:
By end of workshop, are you willing to continue to be a part of this process? A YES entails committing to writing part of the new *Guide* and/or developing the training resources

DRA Workshop agenda

Monday 4 April: Theme: Where have we been, where are we now?

9.30 am	Registration and Coffee
10.00 am	Welcome and self-introductions
11.00 am	History and Perspectives (a series of 10 min presentations from a range of perspectives including the history of this process.
	Phil Miller, CBSG: Getting the science right, getting the right science - CBSG's Perspective on Disease Risk Assessment in Conservation
	Richard Kock, WHSG: Wildlife Health Specialist Group History and Perspectives
	Maj de Poorter, ISSG: Wildlife disease risks & assessment – relevance to IUCN's and CBD's Invasive Alien Species issues
12.30 pm	LUNCH
1.00pm	Perspectives session continued
	Doug Armstrong, RSG..Toward Optimisation of Parasite Management in Translocations (RSG)
	Dan Tompkins, Disease Ecologist, Landcare Research: Wildlife disease management – Treating the causes, not the symptoms (Landcare Research)
	Stuart McDiarmid, Biosecurity, NZ Ministry of Agriculture and Forestry (MAF) The OIE, international trade and risk analysis
2.30 pm	Richard Jakob-Hoff Overview of the need for these tools - survey results
3.00 pm	TEA-BREAK
3.15 pm fruition	Dominic Travis, Keynote Address : Disease Risk Analysis: From Frustration to
4.00pm	Phil Miller: From pencil to workstation - Developing a Toolkit for Disease Risk Assessment in Conservation
4.30 pm	Review of the Existing CBSG Workbook (structured around the review questions posed)
	Section 1: Richard Kock
	Section 2: Kate McInnes
	Section 3: Dan Tompkins
5.00pm	Ends. Light Refreshments and optional tour of NZCCM

Tuesday 5 April: Theme: where are we going (resulting in agreement on overall process components, broad chapter headings etc.).

New framework up on wall – each major component separated from the others –used to brainstorm additions both verbally and by individuals adding sticky notes.

8.30am House keeping

Goal of Session – general outline of new Guide (Facilitator Dom Travis)

8.45 am Richard Kock: Report from the VISION/GOALS Working Group – a brief presentation and discussion of the VISION/GOALS revision

9.15 am Dominic Travis: Presentation of New *Guide* Framework – broad categories only

Tasks:

1. Agree on major sections of book- whole group
2. Suggest topics under each section – brainstorm with whole group
3. Set up CBSG Workbook mapping exercise – whole group

10.00 am: Morning Tea (Sticky notes to map CBSG Workbook to structure during break – RK, KM & DT)

10.30am: Resume whole group: (Facilitator Richard Jakob-Hoff)

4. Discussion of mapping proposals (Richard K, Kate M, Dan T)
5. Formation of working groups

12.00pm LUNCH

1.00pm Small group session Task: Organise brainstorm items and create first draft Section outline

3.00pm AFTERNOON TEA

3.15pm Resume session

4.30pm Reports back to whole group with facilitate discussion of way forward from here

(Minutes of Day to be posted on website for input at end of each day (Caroline)

5.00 pm Review of program for rest of Workshop (RJH)

5.30pm Ends

6.30pm DINNER at Mekong Neua restaurant (sponsored by Auckland Zoo)

Wednesday 6 April: Task: Review case studies of use of different tools, develop further what's going into the *Guide* (working groups to flesh out what goes into each chapter); begin consideration of development of training resource.

8.30am	House keeping
8.45am	Case studies – different approaches using different tools to answer diff questions
8.45am	Rodrigo Lopez, São Paulo Zoo – a Brazilian end-user perspective
9.05am	Kate McInnes Department of Conservation (NZ) Disease Risk Decision Tool
9.35am	Richard Jakob-Hoff: Template for Wildlife DRA
10.00am	MORNING TEA
10.30am	Phil Miller Use of Population Viability Analysis Models (and more…) in Endangered Species Management
11.00am	Tony Sainsbury Methodology for DRA for translocations for biodiversity conservation
11.30am	Bruce Rideout: Using Test Results for Decision-Making
12.00pm	LUNCH (joined by Hazel Hodgkin)
12.45pm	Working Groups resume
3.00pm	Afternoon tea
3.15pm	Hazel Hodgkin: Adult learning principles - presentation followed by discussion of training resource development
5.00pm	Progress review
5.30pm	Ends

Thursday 7 April: Goal: hand in detailed outline and specific names on specific homework titles

8.30am	Richard Kock - Vision and goals review
9.00am	Phil Miller: Tool Development for Disease Risk Assessment and Management
9.30am	Working Group reports

- Integration and flow between sections (outline only)
- Consistency of terminology and DRA structure
- Gaps

10.30am	Morning tea
10.45am	Work plan (who, what, when)
12.00pm	Closing
12.15pm	Evaluation and group photo

12.30pm Lunch

1.00 – 3.00pm Zoo Tour

Friday 8 April: Optional field trip to Tiritiri Matangi island sanctuary (all day)

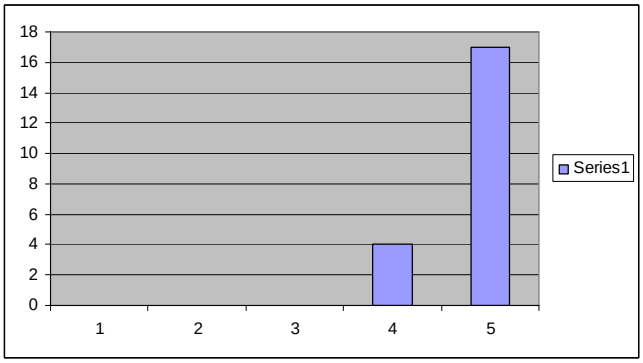
Personal Goals of Workshop Participants

- Clear goals and mission of project
- Expanded collaboration
- To contribute what I can to DRA development
- To learn more about DRA and share this with my region and my collaborators
- To identify gaps for research in DRA
- Ensure tools have optimum uptake
- Make tools as systematic and user-friendly as possible
- A risk analysis methodology compatible with that of the OIE
- To help make the product useful to wildlife managers
- To encourage the input of non-conventional thinking on disease risk assessment
- To identify a set of efficient and effective tools for DRA that can be used in productive, participative, conservation decision making workshops around the world
- User-friendly disease risk assessment tools that can be applied in the field
- Feedback on DRDT (DOC)
- To learn
- An understanding of end-user needs, particularly in what format a tool will be most useful
- To gain an understanding of the obstructing to use of DRA – e.g. economic, political etc., and ways to overcome these
- To improve methods for dealing with the management of wildlife translocation with respect to disease
- To learn more about the Disease Risk Assessment process and its application to breed for release programmes
- To look at how this project – the development of more systematic tools for DRA – might articulate usefully with the Health and Disease programme component of a Cooperative Research Centre bid

- To see how well the combination of virtue and face-to-face tools works in the context of this DRA tool development project
- To help meet the challenge of constructing a set of DRA tools for disease and wildlife that are robust, accessible and usable by governments and wildlife agencies
- To help develop a user-friendly DRA Toolkit with a clear implementation plan before we leave
- To expand my network of international contacts and learn form the experiences and perspectives of the participants

Appendix 4: Auckland workshop evaluation

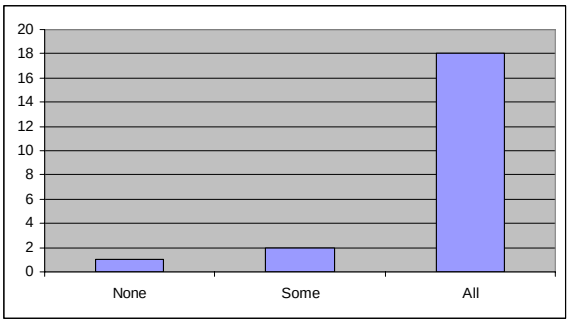
1. On a scale of 1 to 5 (where 1 = no value 5 = very valuable), please rank the value of this workshop to you in the box marked SCORE.



Result: Mean Score = 4.8 (N = 21)

5	Workshop was energising. Learnt a lot. Made the most of the networking opportunities. Los of dots joined.
5	Showed me that there are many people interested in this
5	Very valuable from organisation to content. Excellent
5	This was the best organised, most productive and most enjoyable workshop or symposium I have ever participated in.
5	Simply well organised and crafted workshop
4	… but GENERAL value = 5!
5	I met both my goals: contributing + expanding my network.
5?	Ultimately the value can only be assessed retrospectively – once we see if and how good a product emerges.
4	I arrived with no real understanding of the issues but had a narrow goal which was met. So, the participation was valuable. Well worth my time.
5	-
5	Great information exchange, excellent productivity
5	Key reasons for value (i) discuss different approaches to DRA (ii) build relationships with those involved in workshop project. On both accounts it worked very well.
5	Very good results, pleasant & respectful atmosphere
5	Main track of research for me
5	I think it showed that even the people who are leading this area were not 'set' / 'confused' on what DRA encompasses… we need to establish this to move forward + make progress.
4	The symposium was valuable to me as it vouched?? And addressed my area of work.
5	Workshop has been highly effective in developing the framework and ensuring product development & delivering according to a timeline.
5	For me the values came from observing and being part of the workshop process as much as from the technical DRA learning.
5	-
4	Greatest value was meeting other parties involved or interested in their work & hearing their perspectives.
5	Great initiative, well prepared, well executed

2. Were your personal goals for the workshop achieved?



Result: None = 1 Some = 2 All = 18

Some	Yes. Gave more knowledge & insight into DRA, research, facilitation…. Really important to keep end user in mind throughout process. We lost this at times throughout workshop.
All	Comprehensive approach
All	The whole workshop was very important to increase my knowledge on many aspects, especially the team work
All	I set fairly modest big picture goals, but they were fully met. In fact the workshop exceeded my goals.
All	I realise colleagues are focusing on the user groups now and not the "doing" a tool aspect. Innovation is coming….
All	-
All	See above. Also, this workshop has made me think of some aspects of my current work a little differently
None?	Can't tell yet. Workshop was only a part of the personal goals so can't tell yet whether achieved.
All	I had one only. It was achieved
All	Directly provided feedback on work I am developing AND provided me with more understanding of what is being done AND networked with amazing people AND inspired me regarding the development of the new *Guide*.
All	We definitely have a product in the pipeline now, and I have made some VERY VALUABLE new contacts!
All	My goal was very broad – to improve (or provide the mechanism to improve) the pre-existing workbook and this was definitely achieved.
All	Feeding invasives / issues / lessons into the ??? Learning more about disease / conservation Networking / contacts . info – sources discovery
All	-
All	-
All	I was able to contribute and participate more than I had hoped.
All	I think so – however one of my goals was that the *Guide* is user-friendly – that is one of our overall goals and I am sure we will achieve it.
All	My goals were networking + learning – both were achieved.
All	-
Some	One goal was discussing / identifying obstructions to use of DRA (part economic / political) & how to overcome these. Did not quite cover all of this.
All	I learnt A LOT & hope I contributed something

3. In what ways could this workshop have been improved for you?

A visual outline of workshop process may have helped?
-
I think it worked perfectly but time is always a concern. Maybe one day more would be great.
I can't think of anything. I will be using this workshop as a model for anything similar I organise in the future.
I think we should not be over ambitious about pre-meeting virtual activities. Face to face are much more productive and integrated, concerns more easily reached.
Can't think of anything!
… Just the coffee ☺
More group discussion.
I would have preferred the start time, finish time and after match function (Tiritiri Matangi) to have been advised earlier because I got locked in to cheapest fares
Always need more time…. Perhaps the midday end on day 4 to have a break & then final morning added to day 5 could have allowed more discussion. Make cleared ? day 1 was a review of the web meetings & to hold discussion or space out more to allow discussion
More time for working groups… The tools group didn't get as far as would have liked.
If the globe was smaller so travel was easier! Difficult to improve on this. The organisers used their immense experience in facilitation to ensure workshop was incredible.
"More chocolates." (In other words it was very good, really).
Actually more time added for case studies
Definite confusion with terminology. In the beginning it was not clear what we were trying to achieve / develop… but I also think this was a positive thing.
I should have read more before the workshop.
-
I would have liked to have felt totally at ease from the first day, but this is not the fault of the organisers, rather my own approach. Once I felt at ease in the group the full benefit could be realised.
Nil
-
More global participants (Asian, Northern Hemisphere, South Africa)

4. Do you feel that workshop participants were able to reflect a sufficiently broad range of relevant subject matter expertise and end-user needs? YES/NO

Result: YES = 16; NO = 5

If you answered No please comment on the gaps in representation and suggest who else should be involved in this project

Yes	Could have been more end user focussed but as the *Guide* is refined this may be a better place to engage end users?
No	Could have had more end users (wildlife managers) but would have slowed progress of workshop. Plan to check on products with them is good.
Yes	-
Yes	I think disciplines were fairly well represented. The only possible improvements might have

	been to include some conservation program managers and more participants from under developed countries.
Yes	-
Yes	-
Yes	-
Yes	-
Yes	-
No	Adult learning expert needed at all steps of development – need more social scientists to ensure development delivers outcomes!
Yes	(For Australasia) I think there should be specific opportunities for other regions to provide input.
Yes	There are some specific experts that could provide input but these people might not have sufficient interest to take four days out of their programme
Yes	Reality of travel limits global representation at workshop itself (and picked up in post workshop) But in ideal world (where $ doesn't matter) – more non Anglo representation.
Yes	-
Yes & no	Perhaps we needed an ecologist in each of the 3 working groups & also more representation from people working / from the 'third world'
No	I felt there could have been more regional representation especially from developing high biodiversity areas.
Yes	It would have been good if there was more representation by ecologists
-	Subtext matter, yes reflected. I'm not convinced that end users were represented
Yes	-
No	Gaps: Policy makers, NGOs, ecologists, marketing expertise. Also, no indigenous groups represented & bias to Australasia / Western countries.
Yes	Yes, but it would have been improved by more widely global representation & by representation by wildlife managers eg DoC wildlife manager

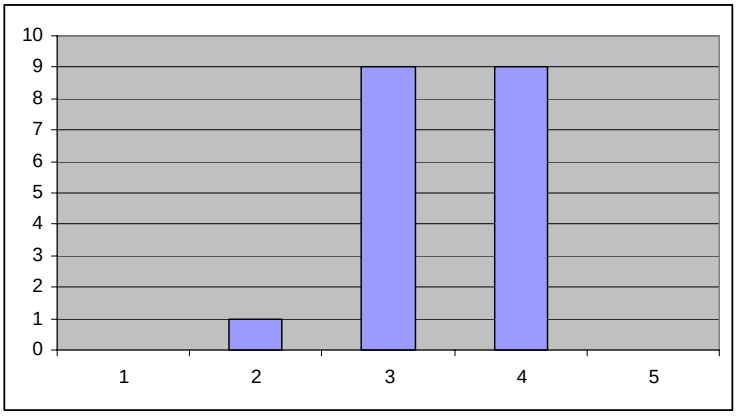
5. Was sufficient discussion and exchange of information provided for in the programme and effectively facilitated? YES/NO

Result: YES = 21; NO = 0

Yes	Good facilitation. May be focus(ed) more on getting thoughts from quieter members of workshop group.
Yes	-
Yes	Very highly skilled people in terms of knowledge, content and organisation
Yes	Yes, this workshop was very well facilitated to ensure that everyone had an opportunity for full participation without feeling marginalised if their viewpoints were different.
Yes	-
Yes	Best workshop ever!
Yes	Well facilitated + well organised.
Yes	-
Yes	The overall facilitation was superb. It was inclusive, friendly, respectful. The group session was also well facilitated
Yes	It was a good mix, RJH, Dom + Phil to share facilitation duties. Needed more time at start to bring non-web members up to date + allow their discussion / ideas to be heard.

Yes	Could have had more working group time
Yes	-
Yes	Yes. Very good facilitation. Good opportunity to all participate. Respectful atmosphere.
Yes	We even started mostly on time
Yes	-
Yes	I was able to be? go? through? the workshop quite well informed in spite of my bad preparation.
Yes	Facilitation was excellent. I think time allocation was sufficient however it was critical that the schedule was modified to allow time to dwell on important issues.
Yes	Fantastic facilitation
Yes	-
Yes	-
Yes	Well done to facilitators.

6. On a scale of 1 – 5 (where 1 = no value 5 = very valuable), how valuable was the session on Adult Learning in assisting your understanding of the approach needed for developing training resources for the DRA *Guide*?

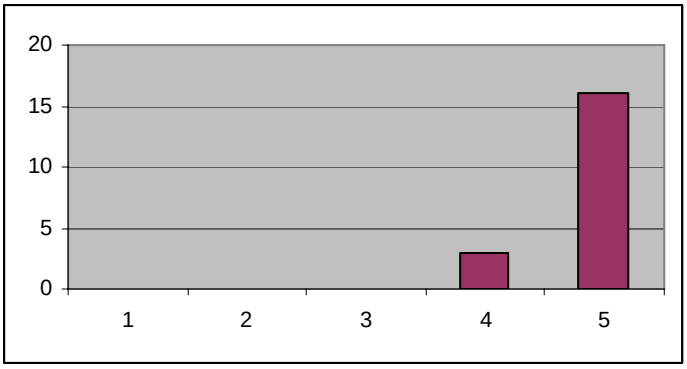


Mean Score = 3.4 (N = 19)

3	Was not involved in the full session
4	Perhaps could have been more discussion on application to DRA.
-	-
-	-
3	Since we did not get sufficiently into the depth of a training approach - of limited relevance – but a good and useful distraction!
3	-
4	A very good reminder of the different ways people approach tasks. Also re the reasons for making changes!
3	Trainer was very good & knowledgeable but session needed to be targeted to the *Guide* specifics – perhaps once outline is more complete this could be done?
2	Been there, done that
3	Helpful but obviously time restrictions limited content. Value of an adult learning expert in whole team!
3	I would have liked more information on concrete advice instead of things to think about
3	Probably a small component of the workshop goals
4	Only so much you can do in one session (hence not “5”).But great / useful addition to workshop.

4	Great start, need more time
3.5	-
3	Was helpful
4	I thought this was a valuable session which provided insight into key issues in adult learning that we need to incorporate / address.
3.5	I was hoping for more specific feedback from the adult learning expert. Maybe she could attend the whole 3 days?
4	-
4	For the time frame it covered key principles well, however not enough time to provide everything needed.
3	Some very interesting stuff but perhaps a little vague & incomplete for my preference. There are other key aspects of (Adult) learning styles which were not mentioned. However useful beginning point for a group.

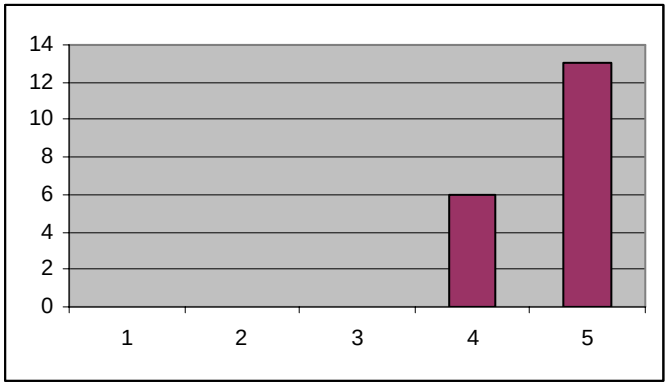
7. On a scale of 1 – 5 (where 1 = very poor 5 = excellent), please rank the workshop facilities?



Mean Score = 4.4 (N = 19)

4	-
5	-
-	-
-	-
5	-
5	Where else could you watch procedures on kiwis during breaks!
5	We were well looked after.
5	FAB
5	Comfortable, pleasant
5	Good to have 3 rooms, easy access to tea / toilets etc. Lovely feel to building + garden behind. Chairs are comfortable for long time sitting! Room for paper / whiteboards . computers.
5	-
5	NZCCM is a brilliant building for this sort of thing
5	Great! & Love the blue ducks!
5	Great facilities, maybe writing surface for chairs
4	-
5	Created a good working atmosphere and comfortable.
5	The NZCCM is a fantastic facility – wonderful place to host such a workshop.
5	-
5	-
4	-
5	Very nice.

8. On a scale of 1 – 5 (where 1 = very poor 5 = excellent), please rank the catering for this event?



Mean Score = 4.7 (N = 19)

4	-
5	-
-	-
-	-
5	-
4	-
4	Nice to have fruit and good lunches / snacks. I'm just a coffee / latte addict… therefore the '4'.
5	Best zoo catering in the world.
5	-
5	Yum yum yum!
5	Yummy…
5	Very enjoyable
5	Great.
5	-
5	-
4	-
5	The catering was great
5	-
4	-
4	-
5	Very nice. Would be nice to have a little card saying what was in the lunch rolls etc

9. Do you have any other comments?

Great workshop. Excellent preplanning. Well done
Well done. Out of about 5-10 of these type of workshops that I have attended I think this was the best!
-
-
Since this is a global initiative, however difficult more global representation in the program ? will help to get an appropriate final product.
Well done Richard for a great job facilitating.
I really enjoyed meeting the other participants + the workshop has stimulated ideas for future work.

Think this was great & very productive but everything now depends on quality of follow up/
I was surprised to be invited, Flattered. I enjoyed the whole process and although my contribution was minor I look forward to working further in an editorial capacity and promoting the end product.
Fantastic job, very well done. Inspiring!
Well done Richard and Caroline!
Thanks for some brilliant organisation and for raising the funds to support this workshop.
-
Great group of engaged, energetic and experienced people!
Thank you for seeing the need for this & doing something about it. Through the virtual process it has been very inclusive. I think it is great that the Southern hemisphere has also had such representation.
-
The workshop was stimulating & productive and it is great to be part of the process.
Thank you so much for the opportunity to contribute and be a part of the process.
-
I still think you need to effectively identify the key organisers that create or influence policy / are active in conservation, in each region, and promote heavily there. Needs to be done early. Eg. Australia: WDA, Government agencies, Australian Wildlife Conservancy South America: Local / National government, Wildlife Conservation Society etc.
Fantastic job to all organisers. Very well done.

Appendix 5 Virtual Workshop Programme

Pre-DRA Workshop Virtual Meeting Topics and Schedule

Objectives of these sessions:

1. To begin development of a collaborative team
2. To agree on the goal of this project
3. To agree on a new structure for the end product we want – outline of chapters/sections
4. To describe in brief what should be in each chapter/section
5. To map the contents of the current workbook to the new structure
6. To identify gaps and areas for revision.
7. To begin the development of a glossary of terms and bibliography

Date	TIME ZONE	AGENDA
1 March	USA, UK, BRAZIL	• Introduce Virtual platform and participants • Working Agreement • Review this schedule and topics for discussion pre-workshop • Discuss goal of the end product • **Review the draft needs analysis questionnaire** • <u>Homework</u> 1. Review draft new wildlife DRA toolkit framework – section & chapter headings and brief description of each. Questions to consider: a. Are these the right steps? b. Are there alternative approaches that we should be considering? c. Are there any steps missing? d. Are the steps in the right order? e. Are the steps labelled unambiguously? 2. Initiate the development of a DRA bibliography – key documents and case studies of DRA questions (see example) 3. Initiate development of a glossary of terms.
2 March	AUSTRALIA, NEW ZEALAND	
8 March	USA, UK, BRAZIL	• Discussion of draft wildlife DRA toolkit framework • Sign up people to review one of three section of the

9 March	AUSTRALIA, NEW ZEALAND	CBSG Workbook for discussion at one of three sessions next week. Assign a leader for each group. • Assign homework – overall brief is to ID strengths, weaknesses and gaps for each existing workbook section. Questions to consider: o How well is this material presented in terms of depth/clarity? o How easily understood will this be for the target audience(s)? o How current is the information? o How do the contents map to the new workbook structure?
15 March	USA, UK, BRAZIL	**New and Current RA tools.** • To an existing list of tools, brainstorm any new/missing ones. • Presentations on some known current and/or new Risk Assessment tools, from key people unable to attend the Auckland workshop – in particular Mark Burgman. and Susie H.ester (possibly also Stuart MacDiarmid if unable to attend).
16 March	AUSTRALIA, NEW ZEALAND	
29 March	USA, UK, BRAZIL	• Report on Needs Analysis survey • Re-visit draft framework for the new wildlife DRA toolkit resource in light of further thought and discussion • Discuss Workshop objectives, format and content (including presentations).
30 March	AUSTRALIA, NEW ZEALAND	

Richard and Caroline will co-facilitate sessions and gather and feed back minutes to the wider group of collaborators through the DRA website

Preliminary Workshop Content

- Introductory session
- Review of case studies and the use of DRA tools
- Tool demonstration and practice
- Develop a work plan for creating the new wildlife DRA resource.
- Developing the outline of a wildlife DRA training package

Appendix 6 Virtual Workshop Record

DRA Toolkit Development - Virtual Session 1 (March 2, 2011)

Present:
Verné Dove
Richard Jakob-Hoff
Caroline Lees
Rodrigo Lopez
Stuart MacDiarmid
Kate McInnes
Andrea Reiss (attended only briefly due to technical problems)
Shan Siah (attended, heroically, at 4.00am and without sound)
Dan Tompkins
Steve Unwin
Mary van Andel

Technical issues
There were some technical problems at the beginning of the meeting – both with Skype and with VYEW. Also, VYEW dropped out for a number of people during the session. For future reference we need to:

- Allow longer for the calls to take account of the difficulty of getting everyone hooked-in simultaneously (say 2 hours each session).
- Make sure that in time for the next call we have everyone on the most recent version of Skype.
- Be aware that emails from VYEW may disappear into junk mail...
- Encourage everyone who hasn't already to test their access to VYEW/Skype on all computers they might want to use it on.
- Contact those who experienced problems individually, to see if they can be fixed in time for the next meeting (Shan, Andrea, others?).
- Research a more stable alternative to VYEW for interactive screen sharing.
- Send Stuart's emails to home and work also.

Project Aims:
Richard walked participants through the aims of the DRA Toolkit project. The emphasis is on looking forwards, to the resource we want to build, rather than locking ourselves into reviewing and updating the previous toolkit. The intention is to roll out this resource globally.

The importance of providing translated versions of the final resource was stressed.

- Rodrigo - offered to provide translation into Spanish and Portugese
- Steve – offered to provide a French translation

It was agreed that this will significantly enhance the value of the finished product.
Stuart noted that the OIE has just published a revised composition of its risk analysis Guide. Much of that content is relevant and useful to this purpose.
Some years ago Stuart helped people in North America deal with disease in trout – this highlighted the need for disease assessment around the movement of animals and animal products.

Review of DRAFT Goal

The purpose of the draft goal is to articulate succinctly what we're trying to achieve with the end product. We're keen to get input into this so that it reflects what we all want to achieve.

Preliminary comments:

Is the veterinary community considered outside the wildlife community? i.e. do we need to specify vet community separately?
Kate - originally the tool was going to be about translocations - are we now looking more broadly than at - at general *in situ* threats?
Response to Kate from Shan - I've used the tools for *in-situ* threats. At the workshop 2002, people used it for assessing risk of transporting elephant semen, so yes it is beyond translocations. I've also used the tools in combined risk analyses in a One Health project - real-world needs including the financial impact. Also, looking at human health, agricultural animals and wildlife disease risks together – and ranking them.

Actions:

Caroline:

- post a DRAFT Goal Review page on the DRA Web-site (https://sites.google.com/site/cbsgdratoolkitreview/) for participants to continue commenting on (DONE)
- add reviewing the Goal to the homework (DONE)

Richard:

- Send everyone a link to the DRA Web-Site after this meeting (note need to send Stuart's emails to home and work).

DRA Survey Questions

Richard has compiled a draft DRA Survey (see below), to expand on the initial survey circulated at the outset of this project. We're looking for help with these survey questions, which we want to see going out to as broad a network as possible. The idea is to compile the feedback into a bold, well substantiated statement about the global need for DRA tools, and to gain further insights into how the toolkit resource should develop.

DRAFT Survey:

1. Your Name
2. Your occupation
3. Country (ies) in which you work
4. Wildlife Species with which you work
5. What does "Risk Assessment" mean to you?

6. Do you have one or more case studies that demonstrate the use of wildlife disease risk assessment tools? YES/NO? If yes, what are the topics? Are you able to share them for this project?
7. What do you need to assist you to make a meaningful risk assessment in relation to wildlife disease?
8. What key questions do you want answered in relation to wildlife disease risk?
9. What information and tools would be contained in your ideal one-stop wildlife DRA resource?
10.In what form would you find this resource most useful to you: 1. Electronic (stand alone - eg on CD) 2. Electronic (via the internet); 3. Hard copy (eg a book); 4. Other (please specify)

Preliminary comments

General

- We all make risk analyses on a daily basis but it may not be obvious. I'm for a bit of background at the start of the questionnaire.
- Rodrigo - in general risk assessment is new in Brazil and probably in South America. Few people know how to analyse and manage the information on disease that comes from samples taken from the wild.
- It's true that risk analyses are made on a daily basis, but it's important to understand what we mean, in the formal sense, of "Risk Assessment".
- Note that part of the value of formalising this process is that we're often dealing with knowledge gaps and uncertainty - going through this process helps us to identify those areas.

Shan proposed the following aims for what we want to find out from the survey:

1. Background information about respondents
2. Their understanding and usage of risk analysis / assessment
3. Their needs (as they currently see it)
4. We can / should also deduce

a. what educational development may be required
b. improving the toolkit / manual and its delivery
c. target audiences – under-represented wildlife workers?

We need to stay focused on this in modifying/developing the questions. Specific comments on draft questions were as follows:

Question 4.

- Could we include a few tick boxes for the activities people do with their wildlife species also (Shan)?

Question 5:

- Risk analysis is the whole process - risk assessment is the middle component of that.
- Dan - risk analysis of GMOs - the analysis process is the wider process - risk assessment is a component within that.

- The OIE's process uses risk analysis as the over-arching discipline. It comprises hazard identification, risk assessment, risk management. Risk assessment comprises release assessment and consequence assessment. Will get electronic copies of OIE Guide
- We should change the term "risk assessment" to "risk analysis" to be more inclusive

Question 6.

- Using examples of risk assessment tools in practice gives people a clearer idea of what we're talking about – hence the inclusion of the Kakapo example.
- Would be good to get together about 20 case studies that cover the spread of DRA in wildlife for illustration - to clarify what we're doing.

Questions 7 and 9

Q. 7 - What do you need to make a meaningful risk assessment in relation to wildlife disease? Is this too fluffy? Is there a better way of asking this? Are these the same? It might be good to leave the question relatively open at this point?

Actions:

Stuart

- To provide an electronic copy of the OIE Guide – for the DRA web-site reference library?

Richard

- To re-craft the survey questions and develop some background text, using Shan's framework of aims and the above feedback from the group. Post on the new web-site page, with a deadline for review.

Caroline

- To set up a page on the DRA site to facilitate review of the new questions and text by the group. Add this to the group's homework (DONE).

All

- To review the new material and provide comment asap

Networks to Survey

The group discussed who should be surveyed to capture a global, cross-disciplinary picture of DRA needs/uses.

- There's a Congolese group that move animals all the time - we should make groups like that part of the audience for this questionnaire.
- The OIE has a permanent wildlife working group. That group could reach all OIE members.
- We are hoping to make the survey viral - by using the networks. We'll need the right survey tool for this, and also some translation of the documents - Steve can do French, Rodrigo may be able to do Spanish and Portugese depending on time contraints. It's really important to gather info from places where English isn't used, but where they are conducting DRA

- How many people do you consider a good number for the survey? (This from Rodrigo – we didn't get a response to this during the meeting?)
- The tool could be used measure risk at the interface of human/animal health - one world one health- biosecurity preparedness e.g. the biosecurity responses in NZ don't take into account wildlife at all.
- The OIE is currently working on issues around the wildlife/domestic animal interface. This group should communicate with OIE Wildlife Working Group. Stuart M. can find contact details.

Participants listed the following networks as potential survey recipients:

Network/Organisation	**Responsibility for contacting**	**Comment?**
DEFRA/National Zoonosis Centre, UK	Steve Unwin	
UCL Gashika Programme, Nigeria	Steve Unwin	
Pan-African Sanctuary Alliance – links to ICCN, Ugandan Wildlife Service	Steve Unwin	
Kenya Wildlife Service mountain Gorilla Vet programme	Steve Unwin	
WCS Field Vet Programme	Steve Unwin	
Robert Koch Institute/Great Ape Health Monitoring Unit Germany	Steve Unwin	
Sabah Wildlife Authority, Orang Utan Vet Advisory Group, Indonesia/Malaysia	Steve Unwin	
American Zoo Vet Association/American Association of Wildlife Vets	Steve Unwin	
UK Zoo Vets	Steve Unwin	
FAO Italy	Steve Unwin	
Wildlife Disease Association	Richard Jakob-Hoff	
Australian Wildlife Health Network	Richard Jakob-Hoff	
OIE networks	Stuart MacDiarmid	
MAF and DOC NZ	Kate McInnes	
Consortium for Conservation Medicine	Verne Dove	
Various networks across South America covering a range of disciplines	Rodrigo Lopez	

Notes about network representation and contact

Rodrigo - if we are going to do the survey we need to explain a bit about what we are doing and why their input is important - maybe 10 lines on the whole project as background

- Rodrigo - thinking about sending to NGOs, some field biologists, agriculturalists etc - different sectors to get different perspectives on this issue.
- Richard - we need to be aware that these tools are not necessarily going to be used primarily by veterinarians - therefore we need to make the tools accessible to those without a veterinary background.
- FAO - deals with transboundary diseases in domestic species - were helpful in setting up something with wildlife.

- Maybe OIE should be the portal for getting this out to other agencies.

Action:
Richard/Caroline

- Send table around for any additions and post on the web-site for further comment.
- Need to take into account potential to use OIE as portal (Stuart's suggestions)

Homework
Details of the homework for this section are provided on the Homework page at https://sites.google.com/site/cbsgdratoolkitreview/
This Site will be key to activities in the lead up to the Auckland meeting so please let us know if you're having any access problems: caroline@cbsgaustralasia.org or richard@cbsgaustralasia.org.

THANKS FOR TAKING PART!!!

DRA Toolkit Development - Virtual Meeting 2, March 8-9

Present:
Phil Miller (USA), Sue Bigwood (South Australia), Kate McInnes (NZ), Susie Hester (NSW), Verné Dove (Queensland), Bruce Rideout (USA), Arnaud Desbiez (Brazil), Steve Unwin (UK), Stuart McDiarmid (NZ), Andrea Reiss (NSW), Rodrigo Lopez (Brazil), Tiggy Grillo(NSW), Richard Kock (UK), Dan Tomkins (NZ), Janelle Ward (NZ), Richard Jakob-Hoff (NZ), Caroline Lees (NZ), Simone Vitali (WA), Shan Siah (WA), Bec Vaughan (UK) (the latter three at later meeting with RJH due to time zone issues)

Richard reminded everyone of the working agreement.

Technical Issues:

- A number of people were not able to get onto the VYEW site – one issue of connectivity and several others related to a decrease from 15 to 10 as the maximum number of participants.
- Some participants are not able to load comments onto the DRA Toolkit Web-site.
- Stuart M. Still having sound problems.

Actions:
Caroline to:

- Purchase VYEW temporarily to expand workshop capacity
- Work with Andrea to explore internet speed problems – and as a back-up to try Steve's suggestion of Skype Screenshare so that Andrea can see Richard's screen during the live sessions.

Richard to:

- Connect to Stuart to see if the mic issue can be resolved. This may also help Susie Hester.

Item 1. Agenda

- Working agreement
- Review homework from last time and any technical issues arising
- Review the goal and vision statements
- Review the draft DRA TOOLKIT FRAMEWORK
- The needs analysis survey – a brief reminder
- Set up groups to review the CBSG Workbook
- Homework
- Session Evaluation

Item 2. Draft Goal

To provide a reference for tools and processes that can be used by the international wildlife and veterinary community to develop better decisions around wildlife management with respect to disease

Comments:

- No need to differentiate the veterinary community from the international wildlife community.
- Who are going to be identified as members of the wildlife veterinary community? May be broader than the conservation community – tools are also aimed at the biosecurity community?
- This discussion has been had in other fora – Wildlife Health Community might be a good, all-encompassing term.
- Also the wildlife rehab/carer community should be included. This may not need a change in the wording.
- Suggestion for alternative working – "used by those working in wildlife health"? E.g. in the UK there has been interest from medics working with zoonoses in Africa.
- Community sounds a little narrow – perhaps those working in wildlife health broadens it out?

Richard had added some additional vision/goals for discussion:

Suggested alternative vision:

To provide a DRA resource that will make a positive contribution to reducing the impact of wildlife disease on threatened wildlife, domestic animals and people.

Suggested additional goals/vision components :

1.To collaboratively develop an integrated package of new and existing tools for risk assessment adapted for wildlife disease risk analysis and management.
2.To make this toolkit freely available to the global conservation and biosecurity communities
3.To provide training in the use of the toolkit globally
4.To evaluate the effectiveness of the toolkit in meeting the project vision.

Comments on these alternatives/additions:

- DRAFT GOALS - what we're trying to achieve with the end product. We're keen to get input into this so that it reflects what we all want to achieve.

- "wildlife disease" works well in this first point, where we are talking about specifics, in contrast to its use in the vision statement
- Does it have to be limited to threatened wildlife?
- Must be careful that we don't start excluding disease from what we consider to be natural ecological processes
- Perhaps 'those working in wildlife health' or 'those interested in wildlife health'
- Perhaps include something to do with assessing the risk to wildlife?
- Aren't we fundamentally interested in mitigating the risks? Our goal is to not mess things up? How about "managing the risk"? SM - Risk of domestic animal disease to wildlife also needs to be considered.
- Managing risk? wildlife disease on ecosystem health?
- use the tools to determine risk/assess risk and then what we do with it is up to the manager...?
- **Process comment – VISION statements are usually written as a description of the ideal future state – e.g. a situation where better decisions are being made as in the assessment and management of wildlife disease risk as a result of this DRA resource being available.**
- Agree that vision should be re-worded to lose the "reducing" and make it something more positive. I prefer "wildlife health" to "wildlife disease" - Simone
- Include robust and transparent as characteristics of the tool we want to build?
- We hope this tool will be used by people who may not imagine they are working in disease management but who are wildlife health but who are
- Wildlife Health community?
- DRA community, may incorporate all relevant fields, animal and human health, biosecurity, epidemiology, vets, biologists?
- I think the term "wildlife health workers" is closer to the reality of DRA which is that many workers in this field are not vets. Although I am pretty passionate about putting the case of vets forward
- use term "wildlife health" to be more inclusive and not excluding anyone. and say - people working in wildlife health, doesn't exclude people who don't think are part of a "community" Kate
- "....contribution to improving the health of wildlife, domestic animals and people"
- RK – Suggested text: "an open source package of new and existing tools".
- Bruce – one of our goals should be to increase the perceived value of these tools amongst those who don't currently feel they are particularly needed.
- VD – we should keep this toolkit dynamic so that it can incorporate new ideas and tools – the tool should be adaptive – regularly reviewed to ensure its currency.
- The toolkit mustn't be over-prescriptive – it must be flexible and able to adapt to different situations/environments in different parts of the world.

- Registration an option for the generic open source product to enable follow up evaluation feed back etc.
- There may be a set of principles emerging – or strategic objectives
- Note: Remember that this (DRA tools) is not available or being used by a lot of people. If the idea is to have this used globally, we need to make all points clear for everybody so they understand what we are looking for. And somehow explain as much as possible each step of the tools. When we mean GLOBALLY this is very challenging.
- Add in 'to encourage the use' and 'increase awareness of availability and usefulness of these tools
- instead of being prescriptive about every step of the analysis we want to provide instead the optimal overall framework in which DRA is carried out – then choice of actual tools can be geared towards the specifics of each situation.
- Be wary of using the words health and disease – make sure they are used appropriately.
- Re point 4: consider contacting collaborators on Soorae's recent reintroduction reviews.
- Suggestion: Could we state the Key Performance Indicators now? And the desired levels to be achieved?
- "End Product" - implies that we are finished when the reference is out there. Capture the concept of this being a living document somehow?

Actions:

- Richard Kock, Bruce Rideout, Verné Dove and Steve Unwin to work on these statement further using the VISION/GOALS DEVELOPMENT web-site page. Note that the Vision should be framed as a description of the desired future state as noted in Phil Miller's process comment highlighted in BOLD above.
- Caroline to post the discussion above onto the relevant area of the web-site.
- Richard to ensure the working group has each others' e-mail addresses

Item 3. NEW TOOLKIT FRAMEWORK REVIEW

Dominic Travis sent through a draft framework but is unable to join us this morning.
Discussions moved on to discussing this framework.
Richard read out the framework.

Section 1: Understand the guiding principles of analysing risk

List of contributors and acknowledgements
List of contents

Ch 1: Introductiion - justification and need

Ch 2: Risk analysis/assessment - overview of processes and language from different disciplines (depends upon their types of questions) eg:

- insurance
- ecology
- EPA
- disease
- economics
- etc

Ch 3: Communities/stakeholders in wildlife disease risk arena

Section 2: Risk Analysis Process tools and their application to wildlife disease

Ch 4 Processes to address different question types
Ch 5 Tools to facilitate these processes
Ch 6 Case studies - application of the wildlife DRA tools (separately and in combination)
Ch 7 Creating a team and carrying out the process
Ch 8 Leading the process
Ch 9 How to be a good participant in the DRA process

Appendices
1 Surveillance and standardized data
2. Publishing reports
3. Collection, storage and transport of diagnostic samples
4. Validation of diagnostic samples
5. Glossary of terms
6. References and bibliography

Index

Comments submitted to the web-site on this:
John Ewen: I think it would be nice to include some direct discussion or information about uncertainty in system states and how this is accounted in a DRA? Furthermore integrating a DRA within an Adaptive Management Framework would be helpful to judge and refine alternative management options based on changing system states (that account for uncertainty). Lots of jargon here sorry, but the easiest way to explain with brevity. I uploaded a relevant paper linked to these ideas (in reference section). For reintroduction biology a DRA needs follow through and evaluation to continue being refined (this includes but is not exclusively updating clinical findings of disease in individuals of species X and site Y). In many ways this will come through integrating an appropriate monitoring approach directly linked to the goals of a given DRA? Cheers, John

Rebecca Vaughan: I agree with John, for each of our Species Recovery Programme UK based reintroductions we produce an initial disease risk analysis document and then also produce a second disease risk management and post release health surveillance protocol which is typically a dynamic document updated yearly based on results of post release health surveillance. While this is obviously specific for animal translocations for

conservation purposes I think a similiar modified strategy should also be in place for the movement of animal products including samples to primarily evaluate what was done, how it could be improved and to evaluate any new disease threats which may have subsequently emerged.

Other comments:

1) A section on definitions is important – much of the target audience will struggle with many of these terms – we need to be clear about the terms used in the document and how they are used. This should be upfront. (Note: glossary is an appendix in the Draft)

Stuart M. has posted the OIE's glossary of terms on the web-site – others are encouraged to post other glossaries. This should help develop this section.

2) Title of section 2 – would we be talking about wildlife disease or animal movements? To make sure that the focus is in the right place?

We are looking not just at disease risks associated with animal movements but also at disease-risk associated with wildlife populations *in situ* – need to make sure we keep things broad.

3) An overview upfront would be useful - that describes the benefits and limitations – targeted towards a broader audience which would include policy-makers etc.

4) Uncertainty is a big issue – do we need a specific chapter on this or would this come under some other areas? Within this section we would also then cover assumptions

Use of qualitative data is important – it helps identify areas to focus on for collection of quantitative data.

5) Resources – a guide to the resources that might be needed – it can be frightening to see what's actually needed for a full-blown process – but useful to see what's needed to achieve the bare minimum and what the advantages are of adding the bells and whistles.

Note on costs: workshop costs – Landcare and DOC have agreed to contribute!

6) The OIE Guide on Risk Analysis, first edition posted on the website, has a discussion of different risk analysis methods used by different interests.

7) Re Appendix 4: "Validation of diagnostic samples" - should read "validation of diagnostic **tests**"

8) Chapters 7-9 : perhaps should be a separate section?

9) Project Planning: including length of post-release monitoring – constraints vs needs, evaluation of the whole project including the analyses or modelling or assumptions, dissemination of knowledge gained – some from 'mistakes' made (feedback to the 'DRA Working Group').

10) Further to my last comment on Overview, I can also demonstrate how economics may be built into the process

Actions:

- All to contribute further to discussions of this framework by posting comments on the web-site in the NEW Toolkit Framework Section.
- Caroline to post these comments to the relevant area.
- Richard to work with Dominic to modify the framework as appropriate. Based on comments received.

Item 4. The Survey

Everyone present had received the link to the survey.

There is a two week deadline for this, a reminder will come out in a week.

RK – with the IUCN now, there are people across all of the specialist groups – can we do it through Simon Stuart and the Secretariat?

This was considered a good idea – RK to follow-up

Richard thanked everyone for their contributions to developing this survey.

Actions

- All who have offered, please forward both the link and the reminder(s) to other networks.
- Richard Kock to contact the SSC Secretariat to see whether they would be able/willing to mass mail to the section of their network involved in wildlife health.

Item 5. CBSG Animal Movements and Disease Risk

The focus is on looking forwards to the ideal toolkit resource, rather than simply reviewing and updating the last CBSG workbook.

Having identified an ideal new framework we want to map sections of the old workbook to this.

The workbook has been separated into three sections. We would like to ask participants to volunteer to help review and map one of these sections, so that this work is done before the face-to-face workshop.

Richard read out the questions to consider:

- How well is this material presented in terms of depth/clarity?
- How easily understood will this be for the target audience(s)?
- How current is the information?
- How do the contents map to the new workbook structure?

Participants were asked to volunteer to assist with review of at least one section:

<u>Section 1.</u>

Goup Leader:Richard Kock

Participants: Steve Unwin, Verné Dove, Bruce Rideout, Janelle Ward, Bec Vaughan

<u>Section 2.</u>

Group Leader: Kate McInnes

Participants: Richard Jakob-Hoff, Andrea Reiss, Tiggy Grillo, Simone Vitali, Shan Siah

Section 3.

Group Leader: Dan Tompkins

Participants: Phil Miller, Bruce Rideout, Steve Unwin, Shan Siah, Susie Hester

Some broad instructions for reviewing the workbook are provided on the DRA Toolkit Web-site. There are some questions provided there – each group is to report back under those headings – groups to work as suits them. Deadline is up to the group leader but each group leader will be asked to present findings to plenary at the Auckland workshop.

Actions:

- CL to set up working areas on the web-site – to add document section to each, list of group members and also questions for review, plus any other info relating to the homework.
- Richard to ask wider group to sign up to one or more of the working groups.
- Richard to send email lists to the group leaders so that they can establish their own email contact.

Item 6. Next Meeting

Next session – Susie Hester (Australian Centre of Excellence for Risk Analysis, ACERA) has kindly agreed to give a presentation on a Risk Analysis tool review that she has carried out, and on a web-based tool that she is developing to create access to these. The title of her 15 -20 minute presentation will be '**ACERA Post border surveillance techniques: review, synthesis and deployment'** and will lead into a discussion of the issues raised and relevance to this DRA Tool Development project.

[Post meeting note by RJH: Tiggy Grillo is communicating with the Australian Fish Translocation Policy Working Group to see if one of their members would like to make a presentation at this meeting on their work in terms of disease risk analysis. If they are willing a space will be offered to them following the discussion of Susie's presentation].

Actions

- Richard and Caroline to work with Susie Hester to test the best way for her to present slides using the virtual collaboration tools available.
- Richard to communicate with Tiggy re possible presentations on DRA applied to fish translocations

Item 7. Homework

- Complete any individual actions recorded in the meeting notes
- Continue adding to the Reference Library and Glossary on the DRA website
- Complete and send out the survey – very important if we are to have the responses returned and compiled in time.
- Provide any additional input to the VISION (to be led by Richard Kock, Bruce Rideout, Steve Unwin and Verne Dove)

- Provide any additional input to the NEW Toolkit Framework
- Sign-up to one of the three review working groups if you haven't already (see CBSG Workbook Review page for details)
- Start work on reviewing and mapping the current CBSG Workbook (to be led by the designated group leaders – Section 1: Richard Kock, Section 2: Kate McInnes, Section 3: Dan Tompkins)

Item 7. Other business

Accommodation – it seems like a good idea for everyone to stay at the Quality Inn?

Actions:

Caroline to set up a web-site page and Richard to post the accommodation info there, plus directions to the venue.

THANKS EVERYONE!

DRA Toolkit Development - Virtual Meeting 3, March 15-16

Present:
Arnaud Desbiez (Brazil)
Susie Hester (NSW)
Phil Miller (USA)
Dominic Travis (USA)
Richard Jakob-Hoff (NZ)
Kate McInnes (NZ)
Bruce Rideout (USA)
Janelle Ward (NZ)
Mary van Andel (NZ)
Stuart McDiarmid (NZ)
Andrea Reiss (NSW)
Caroline Lees (NZ)
Shan Siah (WA)
Simone Vitali (WA)
Tiggy Grillo (NSW)
Verné Dove (VIC)

Apologies
Richard Kock

Participant Introductions

Technical check

1) Skype seems to be working fine for everyone now!

2) VYEW is now the paid version so up to 20 people can attend the live sessions. It appears to provide full functionality only when signed into through a Google account.

3) DRA Website: Janelle, Kate, Bruce, and Steve are still having problems adding comments and Andrea, Dominic, Shan, Stuart and Verné haven't tried this yet so may also experience problems.

Action

Caroline will re-send invite link to Google Site

- check whether you can access the comments
- check whether your name appears on the top right of the screen
- make sure Stuart Ms home address is on the list of invitees

Working agreement

Richard reiterated the working agreement.

Agenda

- Welcome/ Introductions
- Technical check
- Working agreement
- Homework progress reports - any issues?
- Needs analysis survey report
- Susie Hester (ACERA): "Post-border surveillance techniques: review, synthesis and deployment"
- Discussion of issues arising from presentation
- Next meeting - date and items for discussion
- Session evaluation
- END

DRA Toolkit Framework Discussions

There have been some really useful comments on this – Richard and Dominic will go through these and amend the framework for further discussion.

Rebecca had added some information about DRA processes she has been involved in – she is discussing with Tony Sainsbury which of their case-studies it might be useful to add to the Toolkit site. Some recent ones have involved invertebrates – this has proved very challenging, but perhaps a previous one on cranes would be useful.

DRA Workbook Review

Emails are being shared amongst group members and progress is being made.

Group 1. – some new areas have been identified for attention, some requiring extra clarity etc. All are agreed that the section is very focussed on translocation and reintroduction rather than on other areas, but the new framework should help address this.

Group 2. – is working away and has had some good discussions. Andrea R. Has found it useful in reviewing this, to go back and look at the Group 1. Section – she has some comments on this also

Group 3. – has not communicated explicitly yet, though an introductory message has come out from Dom.

Actions:

- Phil M. to upload a WORD version of the Workbook document to the website to facilitate review.
- Andrea R. – to send comments on Section 1. to the group leader (Richard Kock).

Other Homework
Richard has posted accommodation details on the Toolkit Web-site.

Survey Feedback

- 199 responses so far
- 24 languages spoken
- 42 countries on 6 continents
- 104 have worked in wildlife management for more than 6 years
- 77 out of 199 have worked with DRA for more than 6 years
- All taxa are represented – proportions in descending order from mammals down
- 5% working with invertebrates
- 53% would prefer that their DRA tools be available through the web
- Several case reports have been submitted and/or offered.

Richard to present a summary of the analysis at the meeting.

- **Presentation from Susie Hester: "Post-border surveillance techniques: review, synthesis and deployment"**

The Australian Centre of Excellence for Risk Analysis (ACERA) has a 7 year contract with the Australian Department of Agriculture, Fisheries and Forestry (DAFF) which includes this project.

Susie's presentation is available on the VYEW site which can be accessed through the DRA Toolkit Web-site. See this for details.

Community engagement in passive surveillance:
Working with a community group in Queensland which maintains an exceptionally useful database around Red Imported Fire Ant (RIFA) surveillance project.

Bec Vaughan, ZSL – noted similar nation-wide Garden Bird survey in the UK – linked to ZSL – is a good example of a community surveillance programme. Birds are sent to ZSL for post-mortem and survey data are collected on – e.g. how many other affected birds were seen. This has detected some issues with avian pox and other diseases.
Simone Vitalli is also familiar with this project and noted that it had not only engaged the general community but also significant NGO's like the Royal Society for the Protection of Birds (RSPB). See http://www.rspb.org.uk/birdwatch/

Shan noted re community engagement: would be the frontline for disease surveillance in many developing countries / the edge interface between wildlife and humans.

Re Zoo-based surveillance pilot project:
Assessing the value of information coming from wildlife rehabilitation veterinary records at 6 Australian zoos – coordinated through Rupert Woods and Australian Wildlife Health Network (AWHN). Simone V is also involved. Tiggy Grillo noted this is a collaborative program between the AWHN, DAFF, ACERA and the Zoo and Aquarium Assocation (ZAA). Andrea Reiss is the project coordinator for ZAA and has details on how this project was put together which can be made available to the group. 12,000 wildlife cases are collectively seen through the six participating zoos. Simone notes one of the benefits of this project has been that it has focussed attention on particular syndromes and promoted a more focussed approach to looking for particular syndromes. It has also enhanced relationships between government and non-government bodies and increased understanding of the each others expertise and roles.

Shan Siah asked is the knowledge gained from this accessible to us? Susie can circulate as a draft but it should be in the public domain in a couple of weeks.

Re Proof-of-freedom tookbox:
Could be very useful for all wildlife work, as in Australia, many of our invasive species are 'free-range' (and therefore comparable to wildlife)

Susie noted that one of the challenges it to determine where the toolbox lives as both ACERA and ABIN (the Australian Biosecurity Intelligence Network) have a limited life-span.

Shan asked Would CBSG / IUCN be able to host the tools too?

One of the deliverables for this project is:
"A toolbox that contains the tools available for determining proof-of-freedom for invasive species, including how/when each could be used, advantages/disadvantages and information requirements for each option."

Richard noted that it would be great to apply this format to the DRA toolkit also.

Richard thanks Susie for her presentation and noted that there is a lot of overlap and synergy here between the ACERA project and our DRA project – especially the development

of a web-based platform to make the DRA toolkit available globally. The group is very grateful to Susie and ACERA for their generosity in sharing their work with us.

Simone said it was fascinating and very helpful to see the bigger picture of the work being conducted of which the zoo-based project is one part.

Next Meeting
29-30th March – we'll need to check times post daylight saving changes.

Actions

- Richard and Dominic to get together and revise the framework before the final meeting.

DRA Toolkit Development - Virtual Session 4 – March 29/30

Present:
Kathy La Fauce (Queensland)
Stuart McDiarmid (NZ)
Tiggy Grillo (NSW)
Mary van Andel (NZ)
Bruce Rideout (USA)
Steve Unwin (UK)
Caroline Lees (NZ)
Kate McInnes (NZ)
Richard Jakob-Hoff (NZ)
Shan Siah (WA)
Arnaud Desbiez (Brazil)
Rosemary Barraclough (NZ)
Dominic Travis (USA)
Andrea Reiss (NSW)
Verné Dove (? VIC)
Janelle Ward (NZ)
Simone Vitalli (WA)
Sue Bigwood (SA)

Apologies
Rodrigo Lopez
Susie Hester
Richard Kock
Phil Miller
Dan Tompkins
Bec Vaughan

Agenda

- Welcome/Introductions
- Technical check
- Working Agreement
- Presentation: Kathy La Fauce: "Risk assessment for translocation of aquatic organisms" (questions and discussion).
- Homework progress reports
- Report on Needs Analysis survey

- Re-visit draft framework for the new wildlife DRA toolkit resource in light of further thought and discussion
- Discuss Workshop objectives, format and content (including presentations).
- Post-workshop plan
- Evaluation of virtual meetings

Presentation by Kathy La Fauce: Australian national policy on translocation of aquatic organisms

In her preface Kathy noted that the current policy is now out of date and she is leading a major review of it. It is written in lay-friendly language as it is intended for a very wide audience.

Presentation available in the VYEW area – which is accessible through VYEW and through a link on the DRA Toolkit Web-site.

Web-link to policy document referred to in Kathy's talk:
http://adl.brs.gov.au/brsShop/html/brs_prod_90000002087.html
The OIE's Aquatic Animal Health Code has a section on risk analysis:
http://www.oie.int/index.php?id=171&L=0&htmfile=titre_1.2.htm
Also a conference proceedings on aquatic risk analysis;
http://web.oie.int/boutique/index.php?page=ficprod&id_produit=39&fichrech=1&lang=en

- Shan Siah comment: The wide / online ability for stakeholders to comment would improve the robustness of the process

Discussion

- What are the linkages between this work and the work that this group is doing?
- It would be good to combine the risks of disease spread/impact with those of displaced species establishment, environmental damage etc into a single translocation policy so that it is done as a single process.
- Kathy to remain part of the group so that this work can feed into/learn from this policy development work. She will forward copies of Aquavet Manuals used by DAFF.
- The questions asked in the policy document are similar to those included in a disease risk assessment exercise and the language and approach are potentially useful to the DRA work.
- This work is aligned with the OIE work (see link above from Stuart).
- On-line accessibility for providing comment on these documents is important so that a broad sweep of comments/input can be sought.
- Recognising this is an out-of-date document, the emphasis is on diseases known in commercial species and ignores the question of what diseases are in wildlife. The

inclusion of surveillance to establish 'what is out there' in non-commercial wildlife would strengthen the next revision.

- Monitoring over time is essential to understand what diseases are significant, which species are the best indicators of system health and which parameters are the most scientifically robust to monitor.

- Important to make the point that organisms are not always pathogenic if they occur in a system that is in balance

Needs Analysis Survey Report
The survey has been translated into French (by friend of Steve's) and Portuguese (by Rodrigo)
Over 300 responses from over 25 countries and is bringing clarity to questions about potential audience and uses for this toolkit.
Richard will complete further analyses for presentation at the face-to-face workshop.

DRAFT DRA Toolkit Framework (as revised 25 March 2011 in line with input through virtual meetings)

List of contributors and acknowledgements
List of contents

Glossary of terms/Definitions

Section 1: Understand the guiding principles of analysing risk
Summary overview of DRA process - benefits and limitations (lift out for policy makers and other stakeholders)

Introduction - justification and need
Risk analysis/assessment - overview of processes and language from different disciplines (depends upon their types of questions) eg:

- insurance
- ecology
- EPA
- disease
- economics
- etc

Communities/stakeholders in wildlife disease risk arena

Section 2: Risk Analysis Process tools and their application to wildlife disease

- Processes to address different question types
- Hazard identification
- Tools to facilitate these processes
- Qualitative vs quantitative data - benefits and limitations

- Assessing and working with uncertainty
- Case studies - application of the wildlife DRA tools (separately and in combination)
- Post-release health surveillance
- Project evaluation
- Resources needed for different levels of DRA

Section 3: Creating, leading and participating in a DRA team
Creating a team and carrying out the process
Leading the process
How to be a good participant in the DRA process

Appendices
Surveillance and standardized data
Publishing reports
Collection, storage and transport of diagnostic samples
Validation of diagnostic tests

References and bibliography

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Discussion

- Broaden the scope of monitoring from just post-release monitoring.
- Include a section on using test results for decision making - this is a critical step in the process.
- Aquatic vet plans, wild animal response strategies etc can be useful for this process - Kathy La Fauce to add their relevant docs to the web-site.
- Important to give people a clear idea of the time needed to carry out DRAs
- Include a section on using test results for decision making - this is a critical step in the process.
- PPV, Se and Sp and how they work with some examples maybe
- Perhaps widen focus of Post release Health Surveillance to include Surveillance in broader terms - pre-release, ongoing, rather than just post release. To encourage idea that disease awareness and surveillance should be part of ongoing programs... and part of baseline information
- Suggest 'Release' should not be in the phrase relating to surveillance. This is a hang up from the previous workshop which was focussed on animal movements. The next book will also encompass disease in wildlife in situ. Suggest we have two sections: one on Health Monitoring and one on Disease Surveillance.
- Important to recognise the general public misunderstanding of disease as being solely infectious in nature.
- Can we illustrate the usefulness of this [surveillance] section to temporal health monitoring?

- Could we generate a generic risk of questions under the likelihood and consequence sections that would apply to all domains and create drop-down lists of these questions to encourage continuity?
- Section 3 should come before Section 2
- In the Section on developing teams we should acknowledge the range of expertise that is needed ideally for a robust DRA and encourage, where possible, to include epidemiologists, modellers and vets on the DRA team.

Actions

- Sue Bigwood: Forward Annie Philips' document on Disease Risk Analysis of Tasmanian World Heritage site which has some useful questions at the back.
- Richard to upload this and docs sent by Dom to website.

Face-to-face Workshop Schedule

Richard went over the proposed tasks for the Auckland workshop – some of these have been achieved already through the virtual sessions. The DRAFT format is available on the DRA Web-site.

Discussion

- Shan: (If I was attending :-) I would prefer to have 'lectures' only long enough to support discussions
- For those who can't attend, we would appreciate the powerpoints online, even recordings if poss. Cheers!
- The involvement of an adult learning educator in the development of the training resources is important. There was an excellent session on this at the One Health Congress which was promoting the development of a learning package (abstracts published in EcoHealth)
- At this congress it was also recognised that a critical member of a successful collaborative team is a Facilitator able to work with groups from diverse backgrounds and help them develop a common language. Richard noted that this is an area of expertise within CBSG which runs facilitator training workshops (a recent one in NZ) to develop this capability within the wildlife conservation community.
- Q. Will it be possible to attend the face-to-face workshop virtually?

Action: Richard to look into it and get back to everyone.

Virtual Meetings Evaluation

The group completed a 4-question evaluation of their level of satisfaction with the virtual meetings process and environment.

Discussion

- Tiggy: Couldn't see full survey - but great to have Skype and Vyew working side by side- nice to see everyone's cursors moving around the screen and know theyare still there!
- Shan: Looks like the respondents had trouble scrolling down (I worked out that it was because the scroller was sitting in the Sidebar Comment so unless you closed the latter, it would try to add a note everytime you clicked on the scroller - Q3 and 4 have low response numbers. :-)

This completed the pre-workshop virtual meetings. Further virtual meetings will be scheduled post-workshop and it is hoped that those who couldn't attend the workshop will continue to participate in this process with those who could. Richard thanked the group for their time, input and enthusiasm which has provided an excellent basis to ensure maximum productivity from the workshop. Minutes and outcomes of the workshop will be distributed through the DRA website and an e-mail will be circulated to advise of the next round of virtual meetings.