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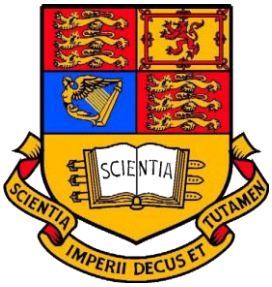

A framework for evaluating the impact of the IUCN Red List

Jessica Betts

September 2016

A thesis submitted for the partial fulfilment of the requirements for the degree of Master of Science and the Diploma of Imperial College London

Submitted for the MSc Conservation Science

DECLARATION OF OWN WORK

I declare that this thesis, "A framework for evaluating the impact of the IUCN Red List of Threatened Species", is entirely my own work, and that where material could be construed as the work of another, it is fully cited and referenced, and/ or with appropriate acknowledgement given.

Signature

Name of student Jessica Betts

Name of Supervisor(s) Richard Young

Mike Hoffmann

EJ Milner-Gulland

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LIST OF ACTONYMS

ACAP	Amphibian Conservation Action Plan
ASA	Amphibian Survival Alliance
ASG	Amphibian Specialist Group
AZE	Alliance for Zero Extinction
BACI	Before and After Control Impact
CBD	Convention on Biological Diversity
CEPF	Critical Ecosystem Partnership Fund
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CMS	Convention on Migratory Species
CR	Critically Endangered
DAPTF	Declining Amphibian Populations Task Force
EDGE	Evolutionary Distinct and Globally Endangered
EN	Endangered
EU	European Union
GAA	Global Amphibian Assessment
GEF	Global Environment Facility
GWC	Global Wildlife Conservation
IBA	Important Bird and Biodiversity Areas
IFC	International Finance Corporation
IPA	Important Plant Areas
IUCN	International Union for the Conservation of Nature
LC	Least Concern
NGO	Non-governmental Organisation
NT	Near Threatened
SPA	Special Protected Areas

SSC	Species Survival Commission
STAR	System for the Transparent Allocation of Resources
USFWS	US Fish and Wildlife Service
VU	Vulnerable
WCC	World Conservation Congress
ZSL	Zoological Society of London

ACKNOWLEDGEMENTS

I would like to thank Simon Stuart, Jon-Paul Rodriguez and Rachel Hoffmann for their initial input into the development of this project. I am also very grateful to each Red List stakeholder who made time to talk with me about the Red List and enabled this project to be conducted. Finally I would like to thank my family and friends for their continued support and encouragement.

ABSTRACT

As biodiversity is declining more rapidly than has been recorded before, it is important to ensure conservation tools are being implemented effectively. The IUCN Red List of Threatened Species has been guiding conservation efforts for over five decades. It is widely assumed that it has been instrumental in preventing species from moving closer to extinction. The exact impact of the IUCN Red List in guiding conservation has not yet been evaluated. Here I develop a Theory of Change and Evaluation Framework with indicators for evaluating the impact of the IUCN Red List in generating scientific knowledge, raising awareness to stakeholders, designating priority conservation sites, allocating funding and resources, influencing legislation and policy development as well as influencing targeted conservation action to reach its long-term impact goal. I identify Red List assessments as the primary input, leading to outputs (scientific knowledge and raised awareness), outcomes (priority setting, funding and resource availability, and legislation and policy) and impact (implemented conservation action) which results in the overarching IUCN Red List Goal. We selected a sub-set of indicators to conduct case studies on to begin to attribute the impact of the IUCN Red List across themes and found it instrumental across the five themes tested. I identify the IUCN Red List as a fundamental tool influencing global conservation efforts, and anticipate the Evaluation Framework to be used as a starting point for the development and testing of further indicators.

KEY WORDS: IUCN Red List, Threatened Species, Impact Evaluation, Theory of Change

WORD COUNT: 5983

1. Introduction

It is widely acknowledged that the world is experiencing the most rapid decline in biodiversity in recorded history (Miller 2005). These rapid and expansive declines have been linked to anthropogenic pressures (overexploitation, resource consumption and expanding urbanisation; Chapman et al. 2016; Rawat & Agarwal 2015) and increasing environmental pressures (invasive alien species and climate change; Early et al. 2015; Thomas et al. 2004). As humans become more aware of the intrinsic link between ourselves, ecosystem services (i.e. water purification; Vie et al. 2009) and biodiversity (Mace et al. 2012) demand increases for the identification of conservation successes and replicable methods which can be applied to conservation projects globally.

The International Union for the Conservation of Nature (IUCN) Red List of Threatened Species (hereafter referred to as the Red List) is the leading authority on global species extinction risk (Rodrigues et al. 2006). During its five decades, the Red List has developed from its roots as a subjective list of extinction risk compiled by species experts to a scientifically robust, rigorously applied assessment of species extinction risk and threat status using quantitative criteria and categories (IUCN 2001; Rodrigues et al. 2006). To date, Red List assessments have been completed to identify extinction risk for 82,000 species (http://support.iucnredlist.org/goal), across several whole groups including birds, mammals, (Schipper et al. 2008), amphibians, (Stuart et al. 2004), reef-building corals (Carpenter et al. 2008), sharks and rays (Camhi et al. 2009; Dulvy et al. 2014), freshwater crustaceans (De Grave et al. 2015), cycads and conifers. In an attempt to resolve the underrepresentation of hyper-diverse species groups, Stuart et al. (2010) set an ambitious target to reach 160,000 Red List assessments by 2020.

The long-term impact goal of the Red List is: to provide information and analyses on the status, trends and threats to species in order to inform and catalyse action for biodiversity conservation (Hilton-Taylor 2000). This is broken down into two goals: (i) to identify and document those species most in need of conservation attention to reduce global extinction rates (the more

52 traditional goal of the Red List), and (ii) to provide a global index of the state of change of
53 biodiversity (using Red List data to identify and monitor trends in species threat status). To
54 achieve these goals, the Red List aims to (i) establish a baseline from which to monitor the change
55 in status of species, (ii) provide a global context for the establishment of conservation priorities
56 at the local level and (iii) monitor the status of a representative selection of species that cover the
57 major ecosystems of the world (Hilton-Taylor 2000; Vie et al. 2008).

58 As a highly respected source of information, the Red List appears to be integrated in many aspects
59 of conservation (policy development, awareness raising, resource allocation; Eken et al. 2004;
60 Rodrigues et al. 2006; Hoffmann et al. 2008). This reputation is built upon the collaboration of
61 multi-disciplinary experts including members of the Species Survival Commission (SSC), Red List
62 partners (including Arizona State University, Birdlife International, Botanic Garden Conservation
63 International, Conservation International, NatureServe, Royal Botanic Gardens Kew, Sapienza
64 University of Rome, Texas A&M University and the Zoological Society of London), as well as many
65 other individual universities, museums, research institutes, non-government organisations
66 (NGOs), governments and other conservation practitioners across the world. The Red List
67 assessment process requires assessors to follow scientifically rigorous guidelines and assign any
68 species (excluding micro-organisms) to one of eight categories of extinction risk according to an
69 objective set of criteria, based on data linked to population trend, size and structure and
70 geographic range (IUCN 2001).

71 It is widely assumed that the development and implementation of the Red List has led to positive
72 conservation results, though this has not been systematically measured. Monitoring and
73 evaluation should be a critical component of every project, as it ensures the desired outcomes
74 and impacts are being achieved whilst increasing transparency, accountability and cost
75 effectiveness. During the project design process, indicators which are feasible, cost-effective,
76 measurable and appropriate need to be identified to allow successful monitoring and evaluation
77 (Salafsky & Margoluis 1998). Ferraro and Pattanayak (2006) suggest factors which mean the

78 monitoring and evaluation component of a project is often not completed, including the belief by
79 conservation practitioners that evaluation is time consuming and resource intensive. Given the
80 complex and long-running nature of the Red List, appropriate indicators have not been selected
81 to measure progress towards its long term impact goal. To understand the interacting direct and
82 indirect impacts of the Red List and understand the causal mechanisms leading to the overall ipact
83 goal, a simplified conceptual framework of the whole system (i.e. Theory of Change ToC) should
84 be developed (Salafsky et al. 2002; Woodhouse et al. 2016), from which indicators can be
85 determined to monitor progress towards its goal.

86 In order to evaluate success, appropriate indicators must be identified, against which an
87 improvement towards a goal can be measured. Typical approaches to evaluation include before
88 vs. after studies (comparing the value of a variable after an intervention takes places to a pre-
89 intervention baseline); control vs. intervention studies (comparing the value of a variable in a
90 control group to an intervention group); before vs. after and control vs. intervention (BACI;
91 studies using both before vs. after and control vs. intervention in their design); quasi-
92 experimental studies (using statistical techniques such as matching to identify appropriate
93 comparison groups); and experimental studies (random assignment to intervention and non-
94 intervention control groups with replication). However, the impact of the Red List is a result of
95 multiple complex and interrelated factors. Typical evaluation approaches are difficult to apply,
96 though process tracing is an appropriate technique. It uses qualitative information to evaluate an
97 intervention and provide an insight into causal mechanisms (Collier 2011) by comparing
98 hypotheses based on a theoretical scenario (i.e. ToC, literature review, past experience) to the
99 current scenario (Woodhouse et al. 2016).

100 The aim of this study is to understand the impact of the Red List on species conservation, and this
101 will be achieved by completing the objectives:

102 (i) Develop a ToC to simplify and visualise the interrelated impacts of the Red List,

(ii) Develop an Evaluation Framework alongside the ToC for assessing the impact of the Red List across impact theme and scale,

(iii) Conduct case study examples for a sub-set of suggested indicators.

2. Methods

2.1 Scoping Interviews

Initial development of the ToC and Evaluation Framework began with informal discussions with key Red List stakeholders at the 22nd meeting of the Red List Committee in Cambridge, April 2016. The Red List Committee is the senior governance mechanism for the Red List, including representatives from the IUCN Secretariat, the IUCN's 10,000-member strong SSC and the IUCN Red List Partner institutions. Following the project introduction, I asked Red List Committee members to participate in a short interview. The interviews aimed to develop a deeper understanding of how the Red List was used in the field of conservation and whether the Red List was perceived as having a positive, neutral or negative impact on global species conservation. I asked interviewees about their relationship to the Red List (i.e. Red List Committee member, Red List Assessor or Red List user), whether they use the Red List directly or indirectly and what they believe the biggest impact of the Red List to be. Using snowball sampling, we conducted further interviews with different Red List stakeholders across roles, sectors and regions. Interviews were conducted until saturation point was reached and new information regarding impact themes stopped emerging.

2.2 Theory of Change and Evaluation Framework Development

Using the responses from the discussions with Red List stakeholders, I identified frequently discussed impact themes by transcribing and coding the interview. The impact theme was broken down depending on the scale at which it acted: (i) the species scale, (ii) the taxonomic/regional scale and (iii) the global scale. I developed a conceptual ToC to map the interaction between each of the impact themes and to understand where each theme acts on the activity/input–output–outcome–impact continuum, with the long-term impact goal of the Red List being to provide information and analyses on the status, trends and threats to species in order to inform and

catalyse action for biodiversity conservation. This goal is aligned with the impact oriented Aichi Target 12: Extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained. Using impact themes, I developed an Evaluation Framework consisting of outputs/outcomes, indicators, assumptions and methods across each theme and scale whilst considering a counterfactual scenario against which to measure the impact of the Red List.

2.3 Testing Impact Theme Indicators

The six broad impact themes identified through the ToC and evaluation framework are: (i) improved derived scientific knowledge, (ii) raised awareness of conservation issues, (iii) better understood conservation priorities and planning, (iv) more or better targeted funding and resource allocation, (v) legal and policy development or change and (vi) more or better targeted conservation action. Across these six themes, a sub-set of five indicators from the evaluation framework were selected to test the Red List impact.

2.3.1 *Improved Derived Scientific Knowledge at the Global Scale*: As the literature citing the Red List increased each year from 1989 to 2005 (Hoffmann et al. 2008), I hypothesised that this trend would continue and the volume of scientific publications using the Red List would increase each year since. I used Web of Science to identify the trends in publications in peer-reviewed journals of papers containing the search term "Red List" OR "Red Data Book" in the title, abstract or key words from 1989 to 2015. From the 1st January to the 31st December each year (Basic Search, Web of Science, http://apps.webofknowledge.com, 8th August 2016). I repeated this using Google Scholar which searches whole documents of 'grey' literature (reports, articles, books, abstracts and theses) in addition to peer-reviewed papers (Google Scholar, https://scholar.google.co.uk/, 8th August 2016). In a counterfactual situation I would expect no increase in the number of papers and documents relating to the Red List each year.

157 2.3.2 *Raised Awareness in Stakeholders at the Global Scale*: the Red List generates
158 significant media interest in the public eye through media attention or through Red List status
159 displays in educational material or zoo, aquarium and botanic garden exhibits and enclosures. I
160 hypothesised that the volume of information shared online (through social media, institutional
161 websites, blogs etc.) and through other media sources (articles, newspapers, specialist
162 magazines, television and radio) would increase over time and reach wider audiences, thus
163 increasing search activity for the Red List. This increase is expected to be most apparent following
164 particular Red List events (e.g. the Global Mammal Assessment in 2008). Using Google Trends
165 (https://www.google.com/trends/), I looked at the popularity of a search term ("Red List")
166 relative to the total search volume across regions over time. Alternatively, if media generated
167 through the Red List are not reaching a wider audience, I expect there to be no change in the
168 frequency of searches for the "Red List" over time or region.

169 2.3.3 *Priority Setting and Conservation Planning at the Global IUCN Scale*: following the
170 wide ranging uses of the Red List, I predicted the Red List would have a fundamental role in
171 determining priority species and habitats for conservation attention. As the Red List Authority
172 for birds, I held and transcribed semi-structured key informant interviews with BirdLife
173 International members to further understand the role of the Red List in underpinning the
174 determination of their priority sites - Important Bird and Biodiversity Areas (IBA; BirdLife
175 International 2016). In a counterfactual scenario, NGOs would select priority sites using different
176 mechanisms (e.g. endemic species, migratory populations or charismatic species).

177 2.3.4 *Funding and Resource Allocation at the Global Scale*: the value of the Red List to
178 donors and funding bodies is in its ability to divide all species into assessed vs. non-assessed, and
179 then to divide those assessed species into eight categories. Donors can choose to allocate their
180 resources to species most in need of conservation action (Critically Endangered, Endangered or
181 Vulnerable), in potential need (Near Threatened or Least Concern) or to species which require
182 further research (Data Deficient) meaning resources are not wasted on Extinct in the Wild or

183 Extinct species. For example, the Global Environment Facility (GEF) has included information
184 from the Red List in its resource allocation framework (STAR: System for Transparent Allocation
185 of Resources) since 2008 (Möhner & Klein 2007; Vie et al. 2009). Funding streams discussed in
186 interviews and an online search identified key conservation funding organisations. I divided these
187 funding bodies by scale into (i) species specific funding (e.g. the US Fish and Wildlife Service Asian
188 Elephant Conservation Fund), (ii) taxonomically/regionally flexible funding (e.g. Critical
189 Ecosystem Partnership Fund, CEPF) and (iii) globally flexible funding (e.g. GEF) according to their
190 eligibility criteria. Following a review of grant application guidelines, I categorised the funding
191 bodies into three groups depending on whether they required species Red List status, threat
192 status by another mechanism or whether threat status was not required. I hypothesise that a
193 higher proportion of species specific funding will be dependent on Red List threat status than
194 regional/taxonomic or globally flexible funding. However, the counterfactual would predict
195 funding decisions at each scale to be independent of Red List status.

196 2.3.5 *Conservation Action at the Species Scale*: it is widely considered that the Red List is
197 helpful in prioritising species for conservation attention and action to prevent them moving
198 closer to extinction. I hypothesised that following the completion of a Red List assessment, or the
199 up-listing following a reassessment, the species would receive increased conservation attention
200 (i.e. habitat protection or restoration, captive breeding, reintroduction programmes). I selected a
201 Specialist Group where Red List assessments have been completed across all species in the
202 taxonomic group (Amphibian Specialist Group) to allow comparisons before and after
203 intervention. I held semi-structured key informant interviews with Red List Authority
204 Coordinators to understand how conservation action for the species group has changed over time
205 following assessment. When considering the counterfactual, I would expect there to be no
206 increase in conservation attention to a species following a Red List assessment, or I would expect
207 current conservation attention to focus on species which are not threatened on the Red List.

208

209 ## 3. Results

210 ### 3.1 Theory of Change and Evaluation Framework

211 Saturation point was reached following informal discussions with 28 Red List stakeholders
212 (Appendix 2) and the six broad impact themes identified are: (i) improved derived scientific
213 knowledge (n=14), (ii) raised awareness of conservation issues (n=7), (iii) better understood
214 conservation priorities and planning (n=13), (iv) more/better targeted funding and resource
215 allocation (n=17), (v) legal and policy development or change (n=24), and (vi) more/better
216 targeted conservation action (n=12). The conceptual ToC (Figure 1) allows visual inspection of
217 how each of the six themes are perceived to be interrelated and how they lead to the long term
218 impact goal of the Red List. The Evaluation Framework (Appendix 1) allows the impact of the Red
219 List to be measured using indicators.

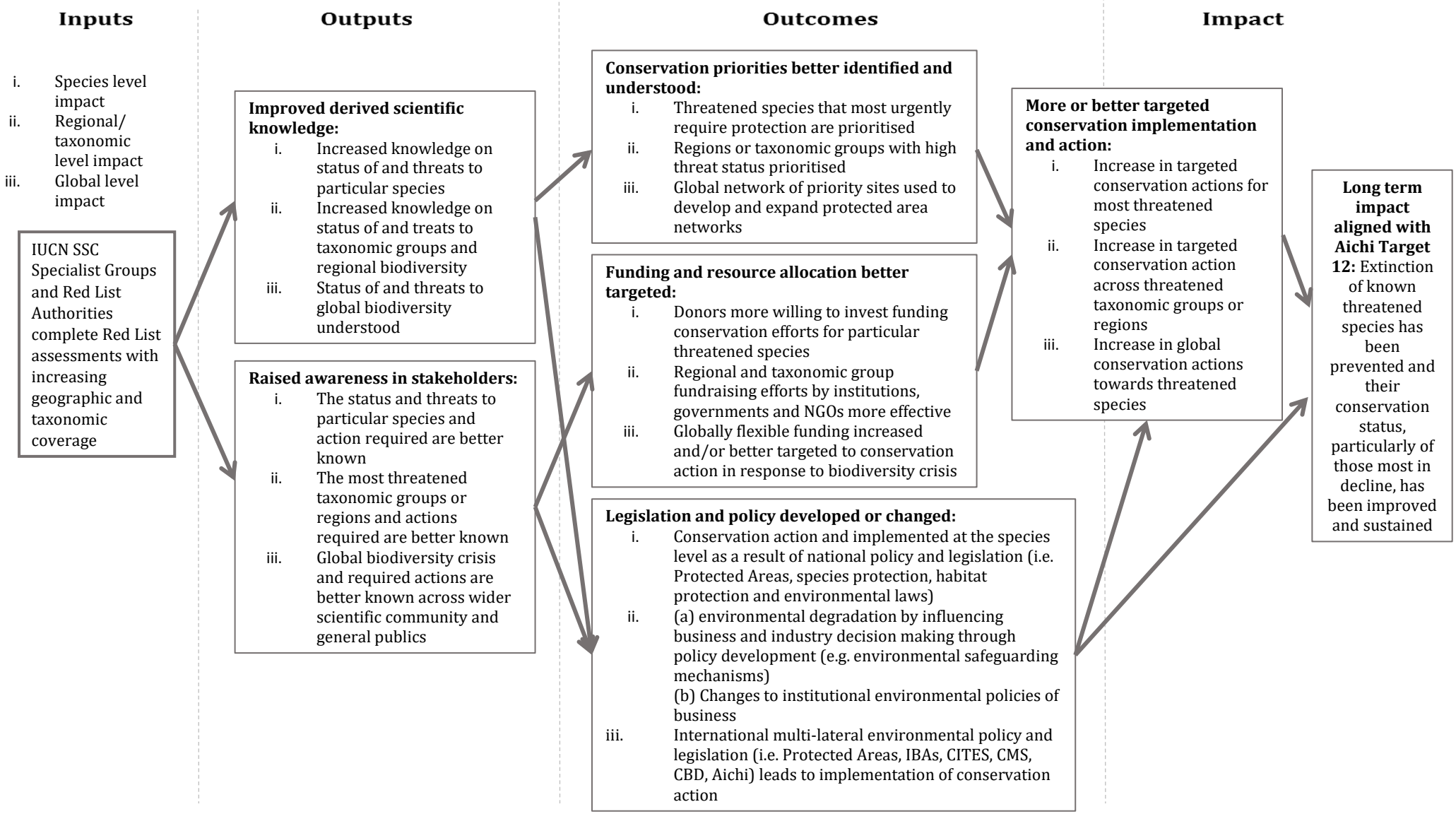
220

221 ### 3.2 Case Study of Indicator Examples

222 3.2.1 *Improved Derived Scientific Knowledge at the Global Scale*: Web of Science searches
223 for the term "Red List OR Red Data Book" identified a positive trend in the number of paper
224 publications in peer-reviewed journals each year from 1989 to 2015, indicating an increase in
225 scientific knowledge generated through the completion of Red List assessments and the use of
226 Red List data (Figure 2). Papers referring to the Red List or Red Data Books increased from 0 in
227 1989 to 410 in 2015 with a total of 3093 papers being published over the 27 years. This positive
228 trend was replicated using Google Scholar where the number of references in the grey literature
229 and peer reviewed journals to the "Red List OR Red Data Book" increased from 277 in 1989 to
230 13,200 in 2015 (n=112,615).

231

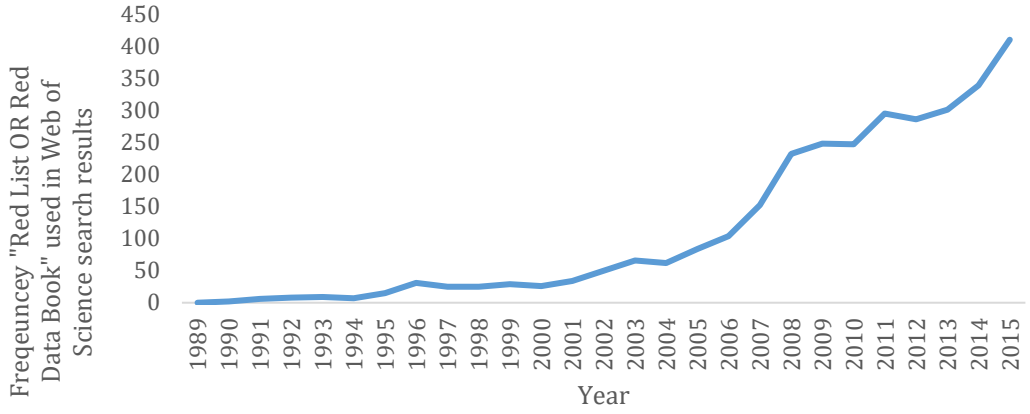
Figure 1: Draft Theory of Change for the IUCN Red List



Key assumptions (for further detail see Appendix 1):

- Red List assessments scientifically rigorous and robust
- Data is published though peer-reviewed journals and grey literature
- Red List assessment data is available and accessible
- Stakeholder collaborations and knowledge sharing methods developed or maintained
- Species are prioritised because of their threat status
- Governments want to actively protect biodiversity in order to reach targets
- Legislation and/or policy are developed using Red List data at local, regional, national and international levels to protect threatened species
- Donors consider species threat status when choosing to support conservation efforts
- Conservation action decisions are made with consideration to policy and legislation
- Conservation successes and failures are shared in an attempt to replicate success and avoid failure

(a)



(b)

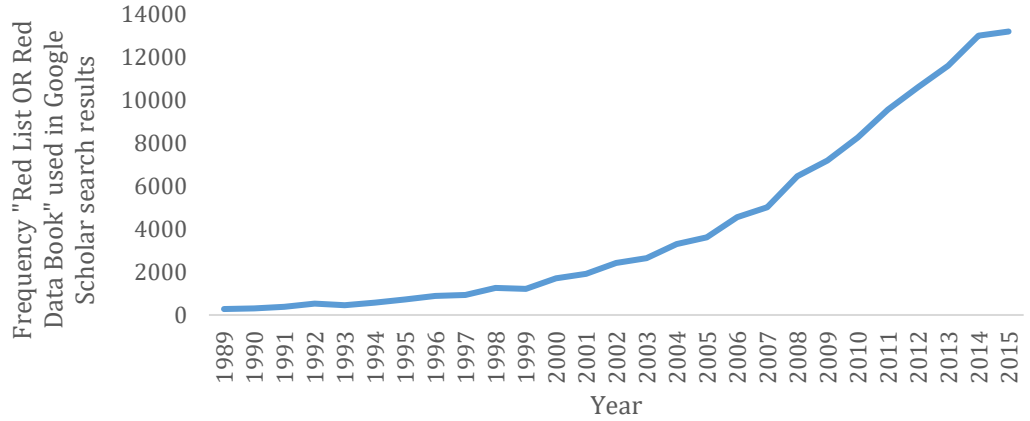


Figure 2a: Number of Web of Science search results for papers published in peer-reviewed journals including the terms "Red List" or "Red Data Book" in the title, abstract or keywords from 1989 (n=0) to 2015 (n=410).Total number of papers = 3,093. Web of Science, http://apps.webofknowledge.com, 8th August 2016.

Figure 2b: Number of Google Scholar search results for reports, articles, abstracts, books and theses including the terms "Red List" or "Red Data Book" from 1989 (n=277) to 2015 (n=13,200). Total number = 112,615. Google Scholar, https://scholar.google.co.uk/, 8th August 2016.

232

233 3.2.2 *Raised Awareness in Stakeholders at the Global Scale*: Google Trend data for the
234 search term "Red List" begins in 2008 and continues to present. When searching for the "Red List"
235 in the News Search filter between 2008 and 2016 (Figure 3a), the two largest peaks (relative

scores 100 and 58) occur in October 2012 and 2008 following the World Conservation Congress (WCC) in Jeju and Barcelona respectively. This is also true of shorter time frames when the four peaks in search activity from the 1st January to 31st December in 2008 follow specific IUCN events (Figure 3b).

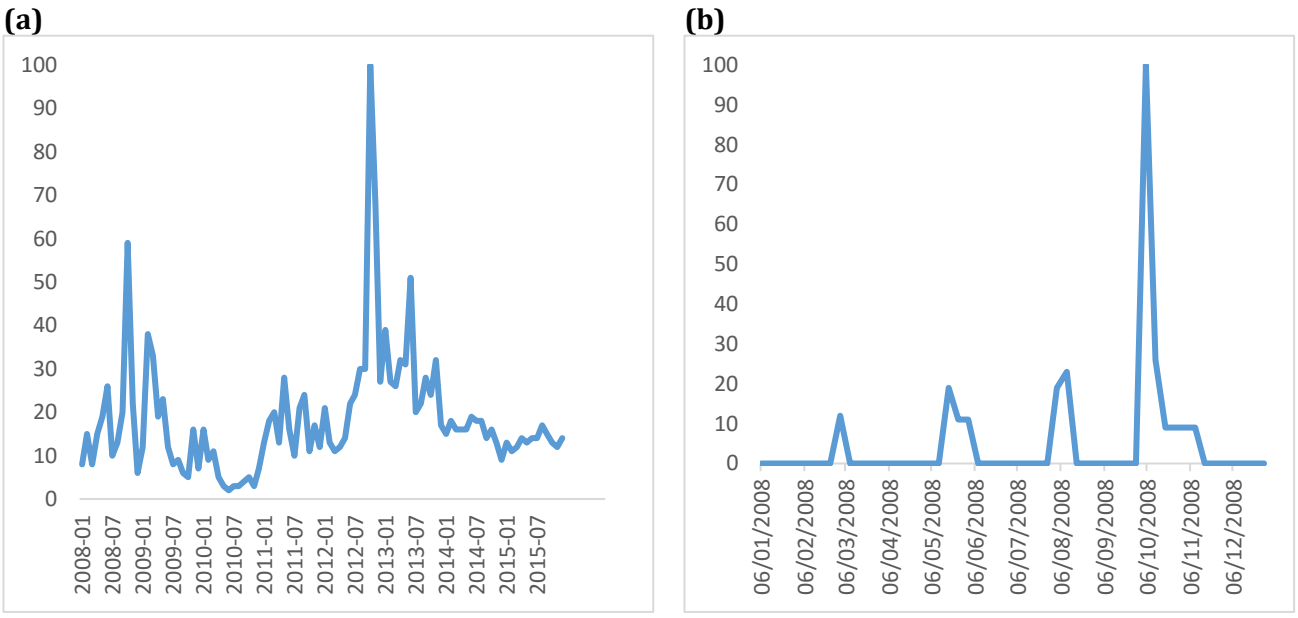


Figure 3a: Largest relative peaks in search for the term "Red List" in the News Search Filter on Google Trends from January 2008 to December 2015; October 2008 (relative score = 59), October and November 2012 (relative scores = 100 and 68) and June 2013 (relative score = 51).

Figure 3b: Largest relative peaks in search for the "Red List" in the News Search Filter on Google Trends from 1st January to 31st December 2008, weeks commencing: 2nd March 08 (relative score = 12), 18th May (relative score = 19), 10th August (relative score = 23) and 5th October (relative score = 100).

3.2.3 *Priority Setting and Conservation Planning at the Global IUCN Scale*: The Red List data is an essential criteria for the designation of priority sites for many NGOs and governments. The first criterion of BirdLife International in selecting a site for IBA status is: "the site is known or thought regularly to hold significant numbers of globally threatened species, or other species of global conservation concern….where the species is categorised by the IUCN Red List as CR, EN or VU". Semi-structured key informant interviews confirmed the Red List as a critical tool for

247 determining BirdLife International's global IBA network. However, at the regional and sub-
248 regional level, the Red List is not essential for prioritisation - "the standard protocol is to use the
249 global Red List, especially for global IBA sites. However, regional and sub-regional IBAs can use
250 different criteria. For example, in Europe, IBAs are determined using species on Annex 1 of the
251 Birds Directive" (BirdLife International). For the 194 rare or vulnerable species on Annex 1 of the
252 EU Birds Directive, Natura 2000 requires legal protection through the development of Special
253 Protected Areas (SPAs). SPA site selection does not follow specific guidelines but is determined
254 by each member state, some of which use the European Red List of Threatened Species (based on
255 IUCN Red List guidelines) whereas others use alternative mechanisms (e.g. the Ramsar 1%
256 Flyaway population which is independent to the Red List; Evans 2012).

257 3.2.4 *Funding and Resource Allocation at the Global IUCN Scale:* I identified 71 funding
258 bodies and donors using informal discussions and online searches where "biodiversity
259 conservation" or "wildlife conservation" were stated as one of the main goals (Appendix 3). The
260 maximum grant amount for each of the species specific funding bodies (n=5),
261 regionally/taxonomically flexible funding (n=37) and globally flexible funding (n=29) were
262 summed (Table 1). Within the species specific funding, a much higher proportion is available to
263 species which are listed as threatened on the Red List (80%) compared to species threatened
264 according to other mechanisms (0%) or threat status was not required (20%). However, within
265 the globally flexible funding, a smaller ratio is available for Red List threatened species (51.7%)
266 compared to 34.4% for species categorised by other threatened mechanisms and 13.8% when
267 the threat status is not required (Table 1).

Table 1: Summed maximum grant availability (USD) from species specific, regionally/taxonomically flexible and globally flexible funding bodies, and proportions of funding available at each scale

	Species Specific Funding		Regional/taxonomic flexible funding		Globally flexible funding		Totals	
	USD ($) available	% of total	USD ($) available	% of total	USD ($) available	% of total	USD ($) available	% of total
IUCN Red List Threatened	117,000	80	237,300	48.6	1,592,800	51.7	1,947,100	**27.5**
Threatened (other mechanism)	0	0	1,575,000	21.6	1,523,000	34.4	3,098,000	**43.8**
Not required	35,000	20	1,937,300	29.78	61,000	13.8	2,033,300	**28.7**
Totals	152,000		3,749,600		3,176,800		**7,078,400**	

3.2.5 *Conservation Action at the Species Scale*: It is believed that following the rigorous application of Red List categories and criteria, threatened species receive more conservation action to prevent them from moving closer to extinction. Several key steps in conservation action were identified following Red List assessment. The need for communication between Red List authorities, species experts, academics, funders, governments and conservation practitioners was repeatedly highlighted as a crucial requirement for successfully securing resources, influencing policy and ultimately implementing conservation action plans. Using the Global Amphibian Assessment (GAA) as a case study, the chain of processes leading to amphibian conservation action is summarised in Table 2.

Table 2: Summary of chain of events from decline awareness to conservation action being implemented for amphibians following the completion of the Global Amphibian Assessment. (http://www.amphibians.org/the-partnership/)

Timeline		Actions taken to implement amphibian conservation action
1990	January	Declining Amphibian Populations Task Force (DAPTF) established by SSC
2004	December	Global Amphibian Assessment completed
2005	September	Amphibian Conservation Summit in Washington, DC
		IUCN SSC Amphibian Specialist Group (ASG) formed
2006	January	Amphibian Ark conservation action group to focus on ex-situ efforts
2007	January	Amphibian Conservation Action Plan (ACAP) published to guide herpetology networks in amphibian conservation
		ASG focuses on amphibian habitat protection
2009	August	Mini-summit for leaders in amphibian conservation at Zoological Society of London (ZSL)
2010	August	The Search for Lost Frogs launched by Conservation International and Amphibian Specialist Group to document species not seen in over a decade
2011	June	The Amphibian Survival Alliance (ASA) formally launched
2012	August	Sapiens article published: The Amphibian Crisis – what will it take to put the action into the Conservation Action Plan?
2013	January	Global Wildlife Conservation (GWC) provides institutional and financial support to the ASA
	March	The motion "Further steps to combat the amphibian crisis" presented and passed at the World Conservation Congress
	May	ASA Organisational Strategic Plan developed
		ASA directly supports amphibian Red Listing efforts
	June	Working Groups established and formal partnerships with ASG implemented
		Leapfrog Conservation Fund established
	October	Joint website between ASA and ASG launched (amphibians.org)
	November	ASA reaches 50 partner organisations
	December	$1,000,000 secured within Leapfrog Conservation Fund
2014	January	First Habitat Project is supported followed
	February	First Education Project launched
	March	First book published
	April	First Research Program is supported
	July	ASA reaches 100 partner organisations

4. Discussion

Measuring the effectiveness of an intervention in conservation is difficult. The scale of the Red List means it is near impossible to fully disentangle the role of the Red List in each impact theme, though for the purpose of this study, each theme was considered independently and we tested a sub-set of indicators.

Without the input of the IUCN SSC Specialist Groups and Red List Authorities in completing Red List assessments, the Red List would not be the objective and scientifically robust measure of extinction risk that it is today. The positive trend identified in the publication of both scientific and grey literature of references to the Red List or Red Data Books confirms that the knowledge regarding species extinction risk is increasing (Stuart et al. 2010). Following a Red List assessment, the data is collated and a chain of events is triggered leading to the development and implementation of conservation action plans (i.e. GAA). This scientific knowledge appears to be instrumental in developing criteria which determines the selection of conservation priority sites, in deciding where to allocate limited conservation resources and where to develop or change legislation. I argue that developing the Barometer of Life to reach its goal of 160,000 species by 2020 would be a beneficial investment (Stuart et al. 2010) because of the importance of scientific knowledge in informing conservation decisions. This benefit would be particularly noted in currently underrepresented hyper-diverse species group (i.e. fungi) where conservation action is limited because of the limited scientific knowledge.

As the flagship product of the IUCN, the Red List is widely recognised in both the scientific community and the general public with hundreds of new articles published reaching thousands of readers through media platforms (i.e. websites, social media, newspapers etc.). The results from Google Trends confirm that there is a global awareness of the Red List as peak online interest and activity occurs following the completion of global species assessments (i.e. the Global Mammal Assessment) and international IUCN meetings (i.e. the quadrennial WCC). This was also true of material presented in enclosures and exhibitions at zoos, aquariums and botanic gardens

– "when visiting a zoo, visitors are interested in seeing the Critically Endangered species, they can relate, it's easy to understand and interpret" (Zoological Society of London, Collection Manager). This could be applied in the development and distribution of material relating to the Red List and species conservation, as awareness raising is an important first step in influencing behaviour change (Harrison et al. 2000). Using the Red List to raise awareness of conservation issues locally, regionally and globally might influence an individual or organisation to behave more ethically regarding biodiversity (e.g. volunteering time to conservation projects, providing financial support to the Red List, engaging community members in awareness raising campaigns).

One of the most important conservation tools are protected areas (Rodrigues et al. 2004). Before a site can attain protected area status it must be selected as a priority for conservation attention using objective criteria (Margules & Pressey 2000). Key informant interviews confirmed the importance of using the Red List data in priority site selection for BirdLife Internationals global IBA sites. However, regional and sub-regional IBA sites can be determined using alternative priority mechanisms which might lead to inconsistences in resource allocation or legal protection. It would be interesting to further study the overlap in geographic range, species, resource allocation and legislation between Red List selected IBA sites and sites selected using other mechanisms (i.e. European sites are selected using the EU Birds directive and are afforded legal protection, unlike global Red List selected IBA sites). This could be extended to other priority sites including Important Plant Areas (IPAs) and Alliance for Zero Extinction sites (AZE), as they use the Red List data in their criteria (Vie et al. 2009). Red List data is also beneficial in conservation planning when industries (i.e. petrochemical and mining) want to offset their negative environmental impact through No Net Loss and Net Positive Impact initiatives. The Red List data is enshrined in environmental safeguard mechanisms (e.g. the IFC Performance Standard 6 and the World Bank) and further research would be interesting to highlight the extent to which Red List data is used in global safe guarding mechanisms.

330 The Red List threat categories are key in guiding conservation investment (Collar 1996). I confirm
331 the importance of the Red List in influencing funding decisions and resource allocation to
332 biodiversity conservation, as almost one third of the available funding for conservation is
333 allocated to species threatened on the Red List (Rodrigues et al. 2006). However, the Red List
334 itself does not make more funding available, but it is used to enable a more strategic and targeted
335 allocation of resources– "when (funding organisation) was set up, it certainly wasn't done on the
336 basis of the (IUCN) Red List, it was set up to help species conservation. However, having the
337 (IUCN) Red List as a scientifically correct and impartial tool is crucial for making funding
338 decisions" (Fund Manager). Further key informant interviews repeatedly recognised that
339 different mechanisms would be developed as a means of targeting resources if the Red List hasn't
340 been established - "(the IUCN Red List) makes it easier to get funding; when a species has been
341 assessed it gets money. It would be more difficult to allocate resources without the Red List, we
342 would need NGOs and partners to beat the drums of conservation (ZSL Collection Manager)",
343 which included focus by governments on endemic species, focus by NGOs on flagship species and
344 prioritisation to ecosystem keystone species, though no alternative mechanisms appear to be as
345 independent and scientifically robust as the global Red List meaning funding decisions without
346 the Red List would be much more "difficult and opaque" (Fund Manager). I identified that species
347 level funding was most dependent on Red List status whereas regionally/taxonomically flexible
348 funding was least dependent on Red List threat status. This may be because at the
349 regional/taxonomic and global scales, funding is more targeted at ecosystem conservation where
350 a single species threat status is one of many interacting factors determining resource allocation.
351 In contrast, at the species level, donors want to ensure their resources are going to species most
352 at risk which is clearly identified through Red List status. Although funding is essential to the
353 success of a conservation project, the data generated through Red List must be used appropriately
354 to ensure resources are not wasted on projects or species which have limited chance of success
355 (Possingham et al. 2002).

356 The development of legislation and policy was the most frequently discussed impact theme of the
357 Red List, but the most complex to evaluate. Many multi-lateral agreements were developed
358 alongside the Red List categories and criteria, so are intrinsically linked (i.e. Convention on
359 International Trade in Endangered Species, Convention on Migratory Species, Ramsar Wetland
360 Convention, Convention on Biological Diversity). The Red List was also adopted by governments
361 at the Conference of the Parties to the CBD to report on and measure progress towards the Aichi
362 Targets, specifically Target 12 ("by 2020, the extinction of known threatened species has been
363 prevented and their conservation status, particularly of those most in decline, has been improved
364 and sustained"; Venter et al. 2014). It is essential that intergovernmental connections and
365 collaborations are maintained to effectively conserve cross boundary species: "we have a
366 particular issue with cetaceans. Some are listed as threatened globally (on the Red List) on the
367 basis of decline criteria, but if they have not declined in some areas they are not threatened
368 locally. Countries which consider them not declined are actively loathed to treat them as
369 threatened" (SSC Specialist Group Member). There can be a reluctance for governments to use
370 the global Red List threat status for a species when it is classified in a different category at the
371 National Red Level. The limitations of the Red List are largely irrelevant to policy officials
372 however – "A lot of criticisms come from scientists because they think the (IUCN) Red List is not
373 perfect…but to (policy) officials the fact that it's imperfect is almost irrelevant, they accept the
374 limitations and use the (IUCN) Red List as a measurable tool….don't let the best be the enemy of
375 the good" (Senior Lecturer in Biodiversity and Conservation). Further research into testing policy
376 and legislation impact indicators is essential to understand the exact role of the Red List.

377 A key part of the Red List long-term goal is to "catalyse action for biodiversity conservation". It is
378 believed that the Red List data is essential in guiding conservation action (Rodrigues et al. 2006),
379 thus the goal is achieved through the previously discussed inputs, outputs and outcomes. In the
380 case study I tested (the Amphibian Specialist Group) there was a chain of events that occurred
381 following Red List assessment, Red List assessments do lead to conservation action. However,
382 even with the species information generated through a Red List assessment, without successful

communication between species experts, academics, policy makers, funders and practitioners, conservation action plans are unlikely to be developed – "the (IUCN) Red List brings the threat of species to the attention of the right stakeholders, which enables the right people to communicate" (SSC Red List Authority Coordinator). Given the importance of communication and stakeholder engagement in implementing conservation action, it would be interesting to look further into the most effective methods of communication (i.e. face to face workshops, online workshops) for developing conservation action plans (i.e. do the benefits of online workshops outweigh the costs?).

There is little doubt that the Red List has a positive impact on the conservation of biodiversity at the species, taxonomic and regional, and global scale through the application of its objective categories and criteria. This research begins to identify the impact of the Red List across six main themes through the development of a ToC and Evaluation Framework. To further assess whether the Red List is achieving its long-term goal, more indicators need to be incorporated into the framework and these need to be systematically tested.

Acknowledgements

I would like to thank Richard Young, Mike Hoffmann and E.J, Milner-Gulland for their dedicated support and guidance throughout this project.

Supporting Information

Evaluation Framework (Appendix 1), Informal Discussion and Interview Participants (Appendix 2) and Funding Bodies (Appendix 3) are available online. The authors are solely responsible for the content and functionality of these materials. Queries (other than absence of the material) should be directed to the corresponding author.

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SUPPORTING INFORMATION

APPENDIX I: Evaluation Framework

	Scale 1: individual species or individual species populations (i.e. geographically from local to national to global scale).	**Scale 2: Whole taxonomic groups and/or regional communities of species (i.e. at national level, ecoregion level).**	**Scale 3: IUCN Red List impact on threatened species as a whole at a global level.**
Improved Derived Scientific Knowledge	*Outcomes/Outputs:* • IUCN SSC Specialist groups continue to input time and resources to complete Red List Assessments for previously unassessed species. • Specialist Groups conduct re-assessments of species at regular intervals to ensure most current data is available. • New data is generated to fill knowledge gaps in particular species or particular species populations.	*Outcomes/Outputs:* • Gaps in knowledge about species extinction risk in taxonomic groups or regions are filled to better understand distribution and traits of Data Deficient species. • Specialist Groups have plans in place to conduct further assessments and reassessments of species in their group. • The use of data generated through Red List Assessments for conservation purposes is made available through paper publications in peer-reviewed. • Red List Assessment data is published in scientific magazines/blogs etc. and is accessible to institutions. • The wider scientific community is aware of the completion of Red List Assessments through paper publications in peer-reviewed journals.	*Outcomes/Outputs:* • International NGO's and governments continuously conduct research and generate scientific knowledge through conservation projects and this data then feeds into the IUCN Red List. • Supporting data generated through Red List Assessments leads to the development of new conservation tools to understand global trends in biodiversity (i.e. Red List Index and Sampled RLI, Living Planet Index). • International NGO's and governments are aware of and have access to conservation tools. • The number of Red List Assessments being completed each year increases in recent years in an attempt to reach 160,000 target by 2020.*
	Indicator: • Number of additional Red List assessments completed • Number of Red List re-assessments completed	*Indicator:* • Number of Data Deficient species re-assessed • Action plans are developed • Number and frequency or articles published through social media,	*Indicator:* • Number of papers published in peer-reviewed journals, scientific reports and environmental reports

• Number of Red List assessments completed to fill gaps in knowledge *Assumptions*: The information produced by completing a Red List Assessment is made available through supporting documentation. The Red List Assessment supporting documentation is freely available and easily accessible online. Red List Assessments increase and enhance scientific knowledge rather than just collating it.	newspapers, websites, magazines, blogs etc. • Number of papers published in peer-reviewed journals *Assumptions*: When a Red List Assessment is completed, Specialist Groups publish the data in peer-reviewed journals. Conservation projects which use Red List Assessment data in their conservation efforts publish papers in peer-reviewed journals and scientific magazines/blogs.	• Number of paper published regarding conservation tools developed through the Red List • Rate at which Red List assessments are being completed *Assumptions:* Interdisciplinary experts communicate and collaborate to develop conservation tools and then use these tools in conservation efforts. Papers using conservation tools are published in peer-reviewed journals. Conservation tools are cited in increasing numbers of papers in peer-reviewed journals. Experts communicate with NGO's and governments. Global species experts collaborate and engage with Specialist Groups to assess and reassess more species in order to reach the 160,000 target by 2020.
Method: Use the Red List website to identify the number of Red List Assessments and reassessments being completed each year. Use the Red List website to ensure supporting material for Red List Assessments are available and accessible online. Identify trends in number of Red List assessments being completed each year.	*Method:* Use Web of Science to identify number of papers published in peer-reviewed journals as a result of Red List Assessments being completed and as a result of Red List Assessments being used to implement conservation action. Identify changes in use of Red List data over time by filtering search results on Web of Science. Use Google Scholar to identify the number of articles, theses, books and abstracts that are available because of Red List Assessments.	*Method:* Use global databases, peer-reviewed journals and government reports to identify any change in the number of occasions Red List tools are used. Use Web of Science and Google Scholar to look at trends over time in the publication and citation of Red List tools in journals, articles, books, theses and abstracts. ***Case Study**: Use Web of Science and Google Scholar to calculate the number of papers, articles, abstracts, theses and books published each year from 1989 (58 in total) to 2015 (86,323 in total) with only 135 new

			publications in 2001 compared to 1577 new publications in 2015 alone.
	Counterfactual/attribution: Action plans for species assessments to be completed independent of the IUCN Red List are in place.	*Counterfactual:* The number of Red List Assessment papers being published in peer-reviewed journals in no different to the number of papers being published relating to conservation on non-Red Listed species.	*Counterfactual:* The development and uptake of Red List tools has not influenced conservation decision making.
Raised Awareness	*Outcomes/Outputs:* • Specialist Groups and NGO's run campaigns and develop educational material about a threatened species or population. • Members of the public have access to material through news articles, blogs, posters, leaflets etc. • The general public and wider scientific community are aware of the Red List threat status of a particular species or population.	*Outcomes/Outputs:* • NGO's and governments use IUCN Red List data to produce articles, blog posts and educational material to raise awareness of threatened endemic species and in-country wildlife. • Zoos, aquariums and botanical gardens hold events to attract members of the public to increase awareness of nationally or regionally threatened species. • Wider scientific community and general public are aware of the work being completed by IUCN Specialist Groups to assess and re-assess species for the IUCN Red List.	*Outcomes/Outputs:* • International IUCN campaigns raise awareness of the Red List and its activity globally (i.e. Red List 50). • International governments and NGO's are aware of and use the data generated through Red List Assessments. • Red List extinction risk information is provided at zoos, aquariums and botanical gardens globally. • Education programmes are used to teach children, young people and public about conservation efforts of threatened species globally. • The Red List is actively discussed online with articles being shared through websites and social media platforms.*
	Indicator: • Number of articles relating to particular species following awareness raising campaign. • Articles published reach wider scientific community and general public audiences	*Indicator:* • Number of articles relating to whole groups (e.g. amphibians, vultures) • Number of participants engaging in public awareness events	*Indicator:* • Number of articles published relating to the IUCN Red List increases • Articles published reach wider scientific community and general public audiences

Assumptions: Information about particular species extinction (using the Red List status as a proxy) is made available on platforms accessible to the public.	*Assumptions:* At the regional and national levels, members of the public demonstrate an interest in understanding more about threatened wildlife. Resources are available to zoos, aquariums and botanical gardens to hold public events.	• Number of individuals that participate and engage with education programmes *Assumptions:* When knowledge is generated through the Red List, experts will make the information accessible through articles and blogs published on NGO or government websites. Information provided by the IUCN about the Red List is spread online. Zoos, aquariums and botanical gardens demonstrate extinction risk of species within their displays and enclosures. As awareness of the Red List increases, more information is shared in the general public and scientific community.
Method: Use Google Trends to look at how Google searches for different species change over time following their Red List Assessment or Reassessment. Use social media platforms to identify the reach and distribution of particular media.	*Method:* Use the IUCN Red List and Specialist Group web pages to look at changes in the number of webpage hits following the completion of Red List Assessments by Specialist Groups. Use Google Trends to identify changes in frequency of searches following particular Red List events (i.e. completion of Global Amphibian Assessment, Red List 50 campaign). Use Google Trends to look at changes in search activity by region or taxonomic group. Use Altmetric to look at the total online activity surrounding a species, region or threat category search term across multiple websites and social media platforms.	*Method:* Contact zoos, aquariums and botanical gardens to understand how Red List information is used and displayed to inform and engage visitors. Interview members of zoo, aquarium or botanical garden education programmes to understand how the development, availability and uptake of education programmes have changed over time (i.e. ZSL Education Department). Research publicly accessible NGO and governmental articles or documents which relate to Red List data. Use Altmetric to look at total online activity surrounding the term “Red List” across multiple websites or social media platforms.

			*__Case Study__: Google Trend data from 2008 shows four peaks in the number of times the term "Red List" was searched, which corresponds with IUCN Red List activity.
	Counterfactual: Members of the public and wider scientific community learn about species threats through NGO's or governments, regardless of IUCN Red List.	*Counterfactual:* Members of the public and the wider scientific community use information from other mechanisms (i.e. US Endangered Species Act, EU Birds Directive) to better understand conservation issues.	*Counterfactual:* Awareness is related to other traits of species including threats or biology independent of the IUCN Red List (e.g. Rainforest species, widely distributed species, hunted species).
Priority Setting	*Outcomes/Outputs:* • IUCN SSC Specialist Groups identify most threatened species within their Specialist Group for prioritisation. • Species most threatened with extinction are prioritised for increased conservation attention (resource allocation, legal protection etc.) after the completion of a Red List Assessment compared to species which are not categorised as threatened or have not been assessed. • Individual populations of threatened species are recognised and particularly vulnerable populations are prioritised.	*Outcomes/Outputs:* • IUCN SSC Specialist Groups are formed when groups of species are widely threatened either regionally or taxonomically (i.e. Amphibian Specialist Group development following the Global Amphibian Assessment). • Experts and institutions develop criteria to determine regions of high extinction risk using data produced through Red List Assessments. • Experts and institutions implement action plans to reduce threats and minimise extinction risk or further decline of prioritised species/groups.	*Outcomes/Outputs:* • Governments and international NGO's invest time and resources in identifying species of particular importance and global areas of high extinction risk for prioritisation using data generated through the IUCN Red List (i.e. EDGE species or IBA sites).* • Communication is maintained between Specialist Groups, NGO's and governments to ensure high priority areas are identified and protected. • Industries explore opportunities to reduce the negative impacts on biodiversity and promote more sustainable production • Initiatives of petrochemical, mining aggregate and financial industry such as Net Positive Impact (NPI) and No Net Loss benefit from access to information on the distribution of species and their conservation status.

Indicator: • Action plans developed place for priority species • Attention focussed on particularly threatened species *Assumptions:* Species and/or populations are prioritised because of their threat status.	*Indicator:* • Number of Specialist Groups formed to tackle species groups threats • Criteria and guideline documents for priority site selection • Documents outlining action plans for species or groups of species *Assumptions*: Global network of experts identify when groups of species are threatened through research and completion of Red List Assessments. Experts collaborate to evaluate risk and develop action plans for the protection of priority areas and species.	*Indicator*: • Number of prioritisation mechanisms that are underpinned by IUCN Red List data • Partnerships with industry • Number of industry organisations which use initiatives such as NPI or No Net Loss • Rate of uptake of NPI and No Net Loss initiatives by industries *Assumptions*: Experts regularly communicate most recent research and data with each other and with international NGO's and governments. Governments want to actively protect priority species and areas as it will assist in reaching global biodiversity targets (i.e. Aichi Target 12 for the Convention on Biological Diversity).
Method: Use the Sampled Red List to identify groups of species which have been partially assessed and then identify assessed species which are in a threatened category. Use 'before and after control intervention' design to draw comparisons in conservation effort between non-assessed species, non-threatened species and threatened species. Use Key Informant Interviews with Red List assessors to understand the differences in conservation attention received by threatened vs. non-threatened and non-assessed species.	*Method:* Use Key Informant Interviews with members of Specialist Groups to understand how Red List Assessments change the way species are prioritised depending on the category to which they are assigned. Use Key Informant Interviews with local governments to understand if and how they use priority sites in legislation.	*Method:* Use Key Informant Interviews with international NGO's, governments or Red List Authorities to understand the extent to which the Red List is used in determining priority sites.* Use Key Informant Interviews with environmental departments to understand how development and extraction planning procedures use Red List information. ***Case Study**: Key Informant Interviews with BirdLife (IUCN Red List Authority for birds) to understand how the Red List is integrated

			in their criteria to identify globally Important Bird and Biodiversity Areas.
	Counterfactual: Species which are not listed on the IUCN Red List are protected through other priority mechanisms (i.e. US Endangered Species Act, EU Birds Directive).	*Counterfactual:* Local governments do have prioritisation sites but these are based on a different set of criteria to the Red List. Species action plans are developed and implemented using different priority criteria.	*Counterfactual:* Biodiversity hotspots are still identified and protected from development and extraction through national criteria or legislation (i.e. US Endangered Species Act).
Funding and Resource Allocation	*Outcomes/Outputs:* • IUCN Red List status is a key factor driving individual donation decisions. • Particular species or populations receive funding attention because of their threatened Red List status (i.e. Vulnerable, Endangered and Critically Endangered). • Individual donors and funding bodies allocate resources to the conservation efforts for specific threatened species (i.e. African Elephant Conservation Fund).	*Outcomes/Outputs:* • Individual donors and funding bodies commit to funding ecoregions or taxonomic groups with high proportion of threatened species (i.e. amphibian group/Cape Floristic Region). • Governments use the IUCN Red List to prioritise resource allocation to threatened endemic species or national populations of threatened species. • Donations and resources made to taxonomic groups or ecoregions are used directly in implementing conservation action rather than administrative costs etc. • Specialist Groups with an active member body (re/assessment plans, conservation action plans, actively seeking funding) receive more resources to protect threatened species.	*Outcomes/Outputs:* • Funding is made available to threatened species conservation efforts globally through large scale international funding streams (World Bank, GEF).* • Funding bodies use Red List data to inform decisions on where to allocate resources. • International communication is maintained between funding bodies to ensure resources are allocated to sub-populations or migratory species across whole ranges. • Members of the public donate directly to the IUCN Red List through the Red List website and through other means. • Long term funding streams are established for global threatened species conservation. • Global resources are better targeted because of the IUCN Red List.

Indicator: • Amount donated to conservation efforts of specific threatened species • Amount donated to threatened species in comparison to species which are not • Proportion of funding available to specific species *Assumptions:* Donors choose to support conservation efforts for particular species based on their threat status. The more threatened a species is, the more funding it will receive in comparison to a non-threatened or non-Red Listed species.	*Indicator:* • Amount available to conservation efforts of threatened taxonomic groups or regions • Government funding available only to threatened species or populations • Proportion of donations made to conservation efforts vs. other costs • Amount of funding received by specific Specialist Groups *Assumptions:* More active Specialist Groups engage with more donors and are given more funding. Donors prefer to support taxonomic groups or ecoregions where they are most likely to see a return on investment. Governments want to protect national populations or species.	*Indicator:* • Amount of funding to conservation made available by international funding bodies • Funding and grant applications require indication of Red List status for target species • Partnerships between international funding bodies • Proportion of globally flexible funding committed to long term projects *Assumptions:* Funding bodies want to prioritise their resources to species most at risk of global extinction and will therefore consider IUCN Red List status in decision making. Bigger conservation benefits will be seen when funding Critically Endangered or Data Deficient species.
Method: Research how frequently specific species conservation funds require a declaration of species threat status. Identify the amount of funding made available through the donations web page on the Red List website. Conduct literature review to understand how donors support species based on threat status.	*Method:* Use Key Informant Interviews with governments, national conservation projects and Specialist Groups to understand where their funding comes from and how much is tied to the average IUCN Red List status of their species groups.	*Method:* Use Key Informant Interviews with donors to understand how they use threat status information in decision making. Research how frequently funding sources are only available to species in specific IUCN Red List threat categories.* ***Case Study**: Use grant making body application forms to identify how frequently global funding and resources are only available to conservation efforts of threatened species because of IUCN Red List status.

	Counterfactual: Species which are not on the Red List still receive targeted funding. Species which are on the Red List receive funding because of other forms of prioritisation (i.e. EDGE species).	*Counterfactual:* NGO's working with species which are not Red Listed still receive funding for conservation attention.	*Counterfactual:* Resource allocation decisions would be made using expert opinion or alternative prioritisation mechanisms (e.g. US Endangered Species Act, EU Birds Directive).
Legal and Policy Change or Development	*Outcomes/Outputs:* • Policy and legislation decisions are made at the local, regional, national and international level using data generated through the IUCN Red List to protect specific threatened species. • Threatened species are legally protected from direct threats (i.e. hunting) and indirect threats (i.e. habitat degradation and loss). • Threatened species with legal protection see an improvement in conservation status, or a reduction in threat pressure.	*Outcomes/Outputs:* • Policy and legislation are developed to protect threatened species in taxonomic groups or regions using the IUCN Red List. • Specialist Group members provide expert knowledge to governments to allow most informed policy and legislation decisions to be made. • NGO's use national policy information to influence conservation action decisions of endemic species and national populations. • Governments generate National Red Lists based on the categories and criteria of the IUCN Red List.	*Outcomes/Outputs:* • Specialist Groups and NGO's place lobbying pressure on governments to protect globally threatened species or habitats. • International collaboration allows data generated through Red List Assessments to be intrinsically included in international policy (i.e. CITES, CBD, CMS). • Tools developed through the Red List (i.e. Red List Index, Sampled RLI) are used in policy decision making. • International networks of NGO's use international policy to influence conservation action decisions for globally threatened species.
	Indicator: • Proportion of species specific legislation that used Red List data in development • Number of laws or policies introduced to protect threatened species • Number of species prevented from moving closer to extinction or improving as a result of specific policy or legislation	*Indicator:* • Partnerships between Specialist Groups and governments • Number of laws and policy specifically in place to protect threatened endemic species or populations • Criteria guideline documents for National Red Lists	*Indicator*: • Legislation and policy developed because of lobbying pressure • Number of international policies and conventions which incorporate Red List data into their indicators • Number of policies and conventions that use tools generated through the Red List as indicators

	Assumptions: Local, regional, national and international governments want to generate legislation to protect threatened species as it will assist in reaching global conservation targets. Governments will benefit from strengthened relationships with conservation NGO's and projects through policy development. Species which are listed as most threatened will have the strongest legal protection and therefore see best conservation outcomes.	*Assumptions:* Regional areas and taxonomic groups with high levels of extinction risk will receive highest legal protection. Communication is maintained between policy makers, species experts and NGO's. Conservation action decisions are made with consideration to policy and legislation.	• Number of international NGO conservation action plans which incorporate international policy *Assumptions:* Policy decision makers value the IUCN Red List as an independent, scientifically robust database of extinction risk. Data generated through Red List Assessments are used in policy decision making.
	Method: Select a random sample of species, of which some have been Red List Assessed and some have not, and identify using literature searches and Key Informant Interviews how much legal protection each species receives. Draw comparisons between the amount of legal protection for species in threatened categories and those which are not. Use Key Informant Interviews with species experts to identify any change in behaviour following introduction of legislation (i.e. reduced hunting).	*Method:* Use Key Informant Interviews with experts in Specialist Groups and NGO's to understand the amount of legal protection in a given region or taxonomic group. Use Key Informant Interviews with NGO's to understand how decisions are made using existing policy.	*Method*: Using web searches, identify how frequently international biodiversity conventions and targets are based upon data generated through Red List Assessments, or use tools derived from the Red List. Use Key Informant Interviews with local and national government policy makers to understand how Red List data is used in informing legislative decisions.

	Counterfactual: Species are legally protected through legislation which was developed before or in parallel to the IUCN Red List.	*Counterfactual:* NGO's use threat data independent of IUCN Red List data to influence decisions. Where independent National Red Lists exist, governments do not use the IUCN Red List to influence policy and legislation decisions.	*Counterfactual:* Species are legally protected through legislation which was developed before or in parallel to the IUCN Red List.
Conservation Action	*Outcomes/Outputs:* • Red List Assessments accurately identify direct and indirect threats of specific species.* • Threat mitigation efforts for specific species are implemented through conservation NGO's, projects and other conservationists. • Threatened species benefit from in- and ex-situ conservation efforts.	*Outcomes/Outputs:* • Specialist Group members and Red List Assessors provide expert knowledge to conservation practitioners. • Taxonomic and regional experts collaborate with species experts to develop in-country conservation action plans for endemic species and threatened species populations. • In-country conservation practitioners (IUCN partners, NGO's, academics, governments) use information and action plans to implement in- and ex-situ conservation (i.e. habitat protection or restoration, captive breeding programmes, reintroduction projects).	*Outcomes/Outputs:* • Multi-disciplinary experts collaborate and commit to developing projects to protect globally threatened biodiversity. • Knowledge is shared between conservation practitioners, governments, NGO's and academics to allow successful implementation of projects across species international ranges, or to overcome similar threat risks. • An increased proportion of globally threatened species are protected through international conservation efforts.
	Indicator: • Threats clearly identified in Red List assessment information • Threat mitigation incorporated in species conservation action plans • Change in species abundance or threat status following conservation efforts.	*Indicator:* • Partnerships between Specialist Group members, Red List assessors and conservation practitioners • Number of endemic species and threatened population action plans • Documents outlining in- and ex-situ conservation efforts.	*Indicator:* • Number of projects established as a result of multi-disciplinary collaboration • Partnerships between conservation practitioners, governments, NGO's and academics • Number and proportion of threatened species receiving conservation attention.

	Assumptions: Red List Assessments are thorough and rigorous. NGO's and other conservationists use the Red List as a knowledge database to learn about threat status of particular species to allow implementation of conservation efforts.	*Assumptions:* Communication is maintained between all conservation implementation stakeholders. Conservation action implementers use the knowledge provided by species and regional experts to develop and target conservation action plans.	*Assumptions:* When a conservation project experiences success or failure, it is shared so that similar successes can be achieved or failures avoided. Communication is maintained internationally between conservation practitioners and species experts.
	Method: Key Informant Interviews with Red List Assessors and conservation practitioners to identify how much a Red List Assessment influences conservation effort. ***Case Study:** Key Informant Interviews with Amphibian Specialist Group and Conifer Specialist Group Red List Authority coordinators to identify changes in conservation action for a species following the completion of a Red List Assessment, or the down listing of a species into a more threatened category.	*Method:* Key Informant Interviews with Specialist Group members and NGO's (i.e. Antelope Specialist Group working in collaboration with Marwell Zoo).	*Method:* Conduct Key Informant Interviews with individuals along the whole spectrum of conservation action from Red List Assessor through to those who implement conservation projects (i.e. Red List Assessors in Specialist Groups, academics, NGO's, conservation practitioners and governments).
	Counterfactual: Species experts still identify threats to species in the absence of the Red List. There is no difference in the amount of conservation attention received by species that have been Red List assessed and those which have not.	*Counterfactual:* There is no difference in the amount of resources received by a threatened species when compared to a non-threatened or non-Red Listed species.	*Counterfactual:* International collaborations allow for expert knowledge to be shared without the presence of the IUCN to facilitate.

APPENDIX II: Informal Discussion and Interview Participants

Amanda Vincent
Ana Rodrigues
Andrew Terry
Ariadne Angulo
Barney Long
Craig Hilton-Taylor
David Keith
David Mallon
Georgina Mace
Jane Smart
Jennifer Luedtke
Justin Cooke
Katherine Secoy
Ken Norris
Laura Gardner
Liz Bennett
Lucas Joppa
Mark Stanley Price
Monika Bohm
Nicolas Heard
Paul Donald
Philip McGowan
Philip Thomas
PJ Stephenson
Rajeev Raghavan
Stuart Butchart
Viola Clausnitzer

APPENDIX III: Funding bodies

1. African Bird Club
2. African Bird Club - Conservation Awards
3. Amphibian Survival Alliance Leapfrog Conservation Fund
4. Amphibian Survival Alliance Seed Grants
5. ARCOS Biodiversity Conservation In Africa
6. Asian Water-birds Conservation Fund
7. Chicago Zoological Society
8. Columbus Zoo Conservation Grants Program
9. Conservation International Global Conservation Fund
10. Critical Ecosystem Partnership Fund - Large Grants
11. Critical Ecosystem Partnership Fund - Small Grants
12. Critical Ecosystem Partnership Fund Biodiversity Conservation in Eastern and Southern Africa
13. David and Lucile Packard Foundation
14. Disney Worldwide Conservation Fund - Annual Conservation Grant
15. Disney Worldwide Conservation Fund - Rapid Response Grant
16. Ernest Kleinword Charitable Trust
17. Fondation Segre
18. Frenso Chaffee Zoo - Grants for Wildlife Conservation
19. Future for Nature Foundation
20. Global Environment Facility Small Grants Programme
21. Global Nature Fund Living Lakes Network
22. Gordon and Betty More Foundation Environmental Conservation Program
23. IDEA WILD
24. International Iguana Foundation
25. International Otter Survival Fund
26. J. M. Kaplan Fund
27. John Ellerman
28. Mohamed Bin Zayed Species Conservation Fund
29. National Geographic Big Cats Initiative
30. National Geographic Conservation Trust
31. Neotropical Bird Club
32. Neotropical Grassland Conservancy
33. Oak Foundation - Grants for Marine Conservation and Climate Change

34. Ocean Foundation
35. Ornithological Society of the Middle East
36. Pacific Seabird Group
37. Pacsafe Turtle Fund
38. PADI Grants for Marine Conservation
39. Paul K. Feyerabend Foundation
40. Phoenix Zoo
41. Primate Conservation Inc
42. Prince Bernhard fund for Nature
43. Rapid Response Facility Grants
44. Riverbanks Zoo and Garden
45. Royal Caribbean Cruises Ocean Fund
46. Rufford Foundation Grants for Nature Conservation
47. Russel E. Train Education for Nature Conservation Workshop Grants
48. Safari Club International Foundation
49. Save our Seas Foundation
50. Save Our Species TSG
51. Save Our Species Rapid Action Grant
52. Save the Rhino International
53. Sirenian International Protection of Manatees and Dugongs
54. The Flagship Species Fund
55. Tropical Biology Association
56. US Agency for International Development in Pakistan
57. USFWS Asian Elephant Conservation Fund
58. USFWS Conservation of Neotropical Birds
59. USFWS Marine Turtle Conservation Fund
60. USFWS Program for Mexico
61. Waitt Foundation Small Grants for MPA's and Fisheries
62. Wallace Genetic Foundation
63. Walton Family Foundation
64. Waterloo Foundation
65. Weeden Foundation Quick Response Biodiversity fund
66. Whitley Fund for Nature
67. World Land Trust
68. WWF Conservation Workshops
69. WWF In India

70. Yves Rocher Foundation
71. ZSL EDGE of existence programme