



A strategic plan for kea conservation

A collaboration between the Department of Conservation (DOC) and the Kea Conservation Trust (KCT)

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1 Vision

A healthy and secure future for kea.

2 Mission

To secure a thriving kea population in the wilds of New Zealand's South Island – Te Wai Pounamu - and a well-managed global captive population that may be appreciated by, and inspire all who encounter them.

3 Purpose of this document

This document provides the strategic context for kea conservation projects to support the species over the next 10 years. We anticipate that this will inform and stimulate other organisations and individuals interested in kea to become involved and to do so with clearly defined initiatives which have direct conservation outcomes for kea.

To ensure this plan (and its associated management documents) are consistent and effective at achieving its stated outcomes, we will aim to address national legislation and policy; provide a clear context for community involvement; ensure evolving research into threats and management options; clearly define project timeframes and stakeholder responsibilities; ensure accountability of stakeholders and spending; and put in place effective monitoring of performance criteria and analyses of conservation outcomes (McBride 2011).

This Strategy will be reviewed every five years (next review date September 2020).

4 Background

New Zealand's (NZ) rate of endemic species extinction (particularly land and freshwater birds) and the number of species threatened directly as a consequence of human settlement is one of the highest in the world (Hitchmough et al, 2007). The New Zealand Biodiversity Strategy (2000), developed as part of NZ's commitment to the Convention on Biological Diversity, states its intention to "halt the decline of our indigenous biodiversity". However, since the signing of this strategy, threatened species continue to decline. The main reasons for this loss include human settlement and land modification, climate change, and introduction of predators and competitors (MfE 2007). Department of Conservation (DOC), who administers the aims of the New Zealand Biodiversity Strategy, states a key focus as "conserving nationally threatened species to ensure their persistence" (DOC 2010). To help support this intention, species recovery plans are developed that outline the process/es of population recovery. To date, 30 recovery plans have been developed for 34 threatened NZ bird species, leaving 43 (including kea) with no formal recovery plan.

NZ's unique, endemic parrot, the Kea (*Nestor notabilis*), is disappearing from the mountains of Te Waipounamu. In an effort to ensure their future, a strategic plan to monitor status, manage threats, and increase public support is required.

A healthy and productive population of wild kea, existing in harmony with people, is universally desired. Kea are renowned as one of the world's most intelligent birds, are part of a select group of animal tool-users, provide essential ecosystem services, and, as the only mountain parrot in the world,

bring colour and character to our southern landscapes. However, for all of its unique qualities, the future of kea remains uncertain.

An estimated 150,000 kea were culled between the late 1860s and early 1970s during a government-sponsored control scheme involving the payment of a bounty. Although fully protected since 1986, kea continue to face a range of anthropogenic threats, including predation by introduced pests, poisoning, ongoing persecution, and injury and death through interaction with human property.

Kea are now listed as Nationally Endangered under the New Zealand Threat Classification System (Robertson et al, 2013) and Vulnerable, on the IUCN Red List reflecting a continuing population decline (Birdlife, 2012). The total population size is difficult to estimate, but may be less than 5,000 individual birds.

The NZ Bird Atlas (Robertson 2007) shows that the kea population is sparsely spread across its range of approximately 3.5 million hectares from Waitutu in the far south, to Kahurangi in the northwest (Figure1). Pockets of high population densities persist in some areas, such as around Arthur's Pass and South Westland (Kemp and van Klink pers comm). However, a rapid decline since 1998 in the unmanaged Nelson Lakes National Park is cause for serious concern (Adams et al, 2011), as are numerous anecdotal reports of decreases from other unmanaged areas.

Kea are a highly distinctive species (de Kloet, 2005). Together with kakapo and kaka, they form the longest and deepest branch of the parrot family tree having diverged very early from other parrot lineages. As such, the kea is an international treasure. They also fulfil a vitally important role within our mountain ecosystem as alpine seed distributors (Young et al, 2012) and, anecdotally, are an important draw card for tourists to New Zealand. For many people, kea epitomise what it means to be a New Zealander; fearless, adventurous, adaptive, and fun-loving with the kiwi 'number 8 wire mentality'. They are considered 'guardians of the mountains' by Waitaha Maori and taonga (treasure) by Ngāi Tahu. Our mountains would certainly be the poorer without the presence of New Zealand's charismatic "clown of the mountains" (Diamond and Bond, 1999) and less colourful without New Zealander's fabled 'feathered wolf'.

The knowledge that kea may decline to extinction within our lifetimes triggered the development of this strategic plan. The Strategic Plan for Kea Conservation has built on earlier conservation and advocacy initiatives driven in the main by DOC. These include the Kea-Kaka Population Viability Analysis (Grant et al 1993); the purpose of which was to facilitate the development of conservation strategies to assure the continued survival and adaptive evolution of kea and kaka; the Wild Kea Management Statement (Grant, 1993) which identified a number of areas to support kea conservation including i) obtaining baseline ecological information, ii) promoting and enhancing the public perception of kea and iii) appropriately managing (anthropogenic) problems involving kea; the Kea Advocacy Strategy (Peat, 1995), which aimed to reduce the extent of human-kea conflict through a range of advocacy initiatives and; the Kea Captive Management Plan and Husbandry Manual (Pullar, 1996), which sought to direct management of a self-sustaining population of kea in captivity to support conservation of kea in the wild.

A review of these and other kea research publications (in-situ and ex-situ), in the early 2000s led to the establishment of the Kea Conservation Trust (KCT), a charitable non-governmental organisation (NGO), in 2006. The trust aims to assist in conservation of wild kea and to increase the husbandry standards and advocacy potential of captive kea within New Zealand. Since its inception, a new Captive

Husbandry Manual (2010) has been developed, as well as a number of projects initiated in collaboration with DOC: population estimates, nest monitoring, pest control, community advocacy, conflict resolution and education programmes (funded by both national and international funding and stakeholder organisations).

The Strategic Plan for Kea Conservation describes a strategic direction for the conservation and management of kea in New Zealand and is a collaborative effort by the KCT and DOC. The strategy generates three aims, each of which are described in detail and addressed in separate management documents.

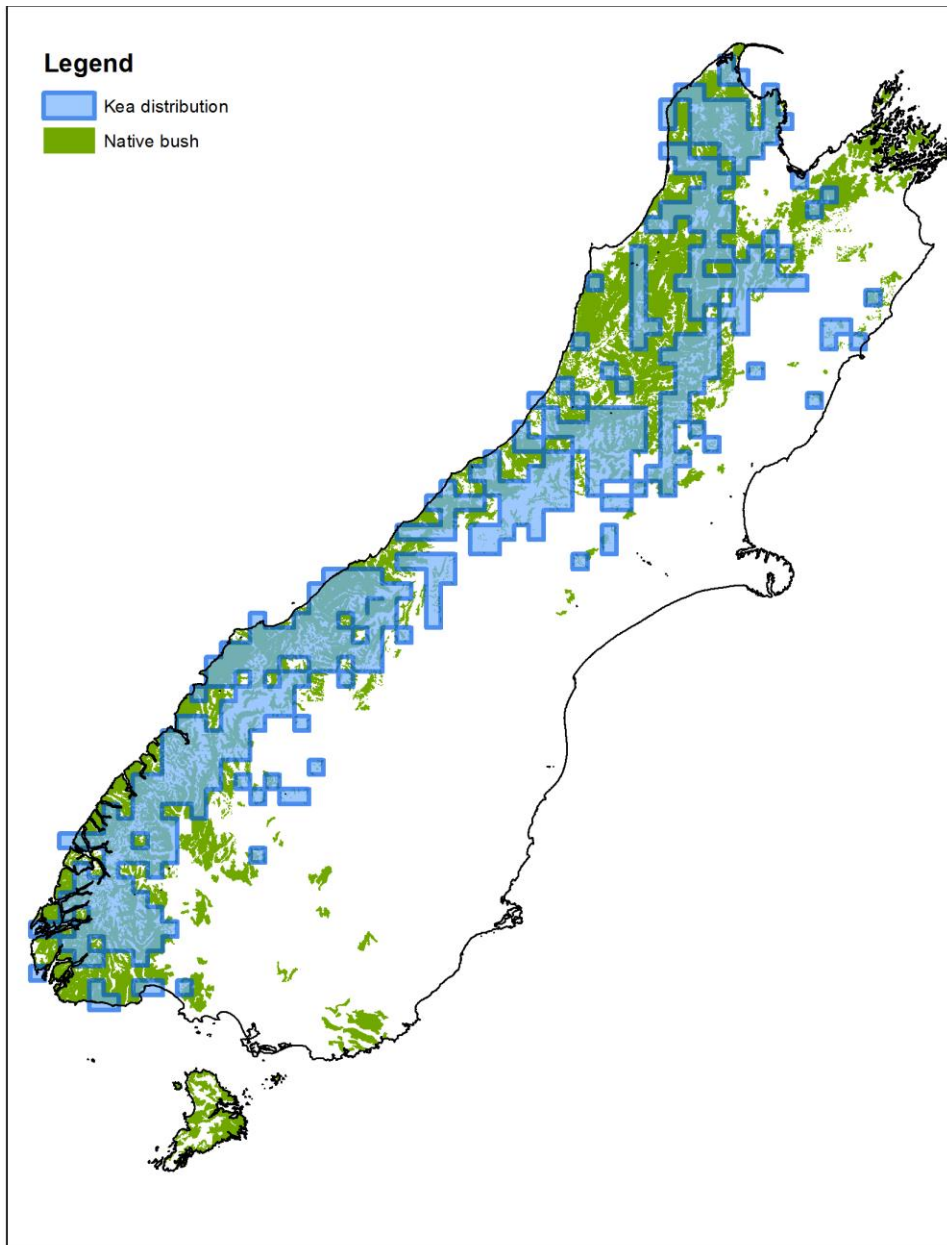


Figure 1. Map of kea distribution across the South Island (based on Robertson et. al. 2007, Atlas of Bird Distribution in New Zealand).

5 Strategic aims critical to achieving the Vision and Mission

Three main aims have been identified to enable kea conservation outcomes.

1. Population size, trends, dynamics, and genetic structure are measured and understood.
2. The kea population is actively managed for conservation.
3. Public perceptions, awareness of and interactions with kea are proactively and positively directed.

Each of these aims will be summarised briefly below and addressed in detail in separate management documents.

5.1 Aim 1: Population size, trends, dynamics, and genetic structure are measured and understood.

In order to achieve our Vision and Mission, factors underpinning the status of the kea population must be better understood. This information will provide managers with a better understanding of individual population drivers across the species' range, which in turn will enable better management of the remaining kea population. Aim 1 will be actioned through development and implementation of a **Kea Population Research and Monitoring Plan**. This will provide direction to:

1. Estimate kea numbers and measure change in numbers over time
2. Understand kea population dynamics (i.e. the relative importance of different vital rates, e.g. productivity versus survival)
3. Understand the drivers of genetic structure (present and historical)

5.1.1 Estimate kea numbers and measure change in numbers over time

Our approach to estimating total population size is to conduct a localised census at carefully selected study areas, calibrate census results with an index of relative abundance, and then measure relative abundance across the species' range.

Our strategic approach to measure long-term trends is to repeat the localised census areas at 5-10 year intervals, and to conduct relative abundance indexing (frequency to be determined).

Methods for the census and relative abundance indexing are not well developed. Details on the current approach taken are specified in the Kea Population Research and Monitoring Plan.

A commitment to ongoing development of methods is part of this strategy.

Project 1.1: Survey kea populations reliably across the species' range (in representative locations) on a rotational 5-10 year interval.

5.1.2 Understand kea population dynamics

The widely accepted method for understanding the drivers of population growth in animal populations is population simulation modelling. This is a computer-based method requiring field estimates of population parameters, such as sex ratio, age structure, age at first breeding, annual productivity rates, annual age-specific survival rates, and annual migration rates. Population models use this information to identify which factors are most important to the growth of a population over time. As such, this type of modelling helps to target research, monitoring, and management to the most critical factors impacting population growth.

Our strategic approach to understanding kea population dynamics is to have a working kea population model developed and refined by an experienced scientist. Field studies will be guided by the recommendations arising from the kea population modelling. The KCT/DOC kea science advisors will be required to be familiar with the model.

Project 1.2: Develop a kea population model and run simulations using currently available information.

5.1.3 Understand the drivers of genetic structure

The wild kea population displays moderate genetic structure with up to 3 genetic clusters forming a genetic gradient from north to south. This structure results from distance-driven isolation following post-glacial population expansion. This level of population genetic structure is surprising considering that the species' habitat is continuous and kea can travel long distances. (Dusseux et al, 2014). Comparison of contemporary, historical and fossil samples show a loss of mitochondrial diversity and population size since the end of the last glaciation (Otiran Glacial), but no loss of overall genetic diversity despite the government-sponsored kea cull. Microsatellite variation indicates a recent bottleneck for only one population (i.e. cluster) and a range-wide decline in effective population size dating back some 300 – 6,000 years ago, a period predating European arrival in NZ. Combined, these results suggest that despite a high level of recent human persecution, kea might have experienced a large population decline in response to Holocene changes in habitat distribution well prior to human settlement of NZ. These results therefore show that it is necessary to understand the respective effects of climate change, and human activities on endangered species dynamics and population structure (Dusseux et al, 2015).

In the context of the present conservation plan, management of core populations could be considered to avoid inbreeding or to re-establish viable populations. Conservation efforts should aim to maintain the high genetic diversity of the Aspiring, Nelson Lakes and Fiordland populations (Dusseux et al, 2014) to maintain as much evolutionary potential as possible (Moritz 1994b; Moritz 2002; Conner & Hartl 2004). The identification of three clusters suggests a strategy for translocations is to restrict movements between nearby mountain ranges and only within clusters rather than between them. Additionally, research into kea foraging behaviour (Greer, 2015) suggests dietary differences between lowland versus highland kea with resulting morphological and sexual selection implications. Further studies on the impact of translocation of individuals across genetic clusters and potential disruption of local adaptation should therefore be considered.

Finally, even though no loss of genetic diversity associated with the government cull was detected, the recent population decline exacerbated by introduced predators means that small and isolated populations could be subject to inbreeding depression. Level of inbreeding should therefore be assessed in wild kea populations.

Project 1.3: Review current genetic research results and identify any management implications arising from this information.

Project 1.4: Assess the relative importance of inbreeding as a threat to kea as a species.

5.2 Aim 2: The kea population is actively managed for conservation.

Kea populations (in-situ and ex-situ) are currently under-managed. The wild kea population is subject to a complex range of threats impacting on productivity and survivorship and the captive population

is under-utilised. Further, many captive kea are recipients of substandard husbandry. Active management of the wild and captive populations will be addressed through development and implementation of a **National Kea Management Plan**, which will direct the following:

1. Threats to the wild kea population and their management are identified, quantified and acted on.
2. Feasibility of an insurance population is investigated.
3. The captive population is proactively managed to increase welfare, education, advocacy, and research potential.

5.2.1 Identify and quantify threats and their management

The range of the kea falls largely within public conservation land. Consequently, habitat fragmentation and loss are not major threats as with many other of our native species. However, eight threats, actual and potential, to the wild kea population have been identified by kea researchers. These may be broadly defined as either environmental and ubiquitous (1-5), or as human and localised (6-8):

- 1) Predation by introduced mammals
- 2) Lead in kea habitat (e.g. flashings and lead-head nails, tyre weights, lead shot)
- 3) Poorly-deployed pest control (e.g. poison baits and traps laid for pest control and aerial 1080 operations)
- 4) Avian diseases
- 5) Climate change (e.g. changes in predator abundance, food availability and habitat quality)
- 6) Accidents with human objects (e.g. motor vehicles, snow groomers, rubbish bins, electricity sub-stations)
- 7) Destruction/removal of nuisance individuals (permitted or illegal)
- 8) Illicit trade in wildlife

The relative impact of each, their requirement for active management versus ongoing monitoring, and methods of threat mitigation (minimisation versus removal) are to be investigated.

Project 2.1: Develop and implement a threat monitoring, assessment, and mitigation programme.

5.2.2 Investigate feasibility of an insurance population

Insurance populations are used to mitigate the risk of species extinction. These populations preserve an important genetic resource through two main methods: captive breeding programmes or development of island populations (mainland (fenced/open) and offshore). Both methods have a number of practical challenges that must be weighed up (extinction risk to the species versus cost of setting up and maintaining an insurance population).

Intensive monitoring of kea over the past 5 years has shown that substantial population declines can occur within a few years. Although intensive monitoring can pick up major changes in population stability, it is not feasible to carry out such monitoring across the species' range. Potentially less than 5,000 kea remain in an area of 3.5 million hectares – much of which is inaccessible and the population within it little studied. As such, the feasibility of an insurance population or populations should be investigated until such time as threats in the wild are mitigated to an acceptable level.

Project 2.2: Conduct an insurance population feasibility study.

5.2.3 Actively manage the captive population

Captive kea in NZ are held in facilities whose standards range widely between complex and enriched environments to cages and husbandry practices that constitute a serious welfare issue. Additionally, the lack of standardised advocacy approach and commitment to a research requirement means the value of captive kea to the wild population is not maximised. A new husbandry manual and audit document, developed by the KCT (Orr-Walker, 2010) and endorsed by DOC and the Zoo and Aquarium Association (ZAA), aims to address, in part, these inconsistencies. The new manual requires kea to be held in large, complex, enriched environments that provide opportunity to express natural behaviours, thereby improving mental and physical health and encouraging more positive public interactions with kea, as well as opportunities for education/research.

In 2012, DOC conducted an audit of all NZ kea facilities. As a result, a number of birds have been removed or identified for removal from substandard facilities and/or enclosures, and husbandry techniques required to be upgraded. Further follow-up to ensure compliance with husbandry standards for kea is still required. Until such time as kea standards are consistent across all holding facilities, the welfare and conservation value of many captive kea remains compromised.

Project 2.3: Develop and initiate a plan for ex-situ kea holders to support in-situ conservation through advocacy, increased welfare, education, advocacy and research and, if recommended by 5.2.2, these kea will form an insurance population.

5.3 Aim 3: Public perceptions, awareness of and interactions with kea are proactively and positively directed.

Kea are often attracted to sites of human activity. Historically this has resulted in serious conflict situations with a resulting kea cull extending over 100 years. Today the perception of kea as destructive and a nuisance still persists in some areas and kea conflict situations and persecution continue, albeit to a lesser (reported) degree. In order to reduce conflict situations and increase positive public perception and behaviour towards kea, as well as to increase the scope and level of conservation management, a programme which facilitates local community buy-in to, and involvement in, kea conservation initiatives is imperative. To achieve this aim, a **Community Kea Engagement Plan** will be designed, implemented, and evaluated to:

1. Increase positive perceptions of kea and reduce conflict
2. Utilise the captive population for effective advocacy
3. Increase education opportunities and support research initiatives
4. Facilitate formation of community led kea conservation initiatives

5.3.1 Increase positive perceptions of kea and reduce conflict

Increasing positive perception and awareness of kea is the first step in decreasing conflict and increasing interest in and support for conservation initiatives. As such, we propose to develop a Public Relations (PR)/marketing plan for kea to increase positive perceptions of and empathy for the species. Exposure would be via a range of media and, would cover a range of topics and themes central to kea conservation objectives. The aim is to generate discussion, brainstorm issues and share ideas, information, experiences, and positive stories about kea with local, national and international communities. A PR/marketing plan will provide details of key issues/messages, timeframes for delivery and channels, and the tools and methods for actioning the plan. Incorporated within this will be

existing programmes, which will be a vehicle for delivering key themes directly to those communities living with kea.

Reducing conflict also requires a practical response to conflict situations and, as such, provision of a proactive community-focused conflict response and resolution programme South Island wide is required. This aims to identify the nature of conflict experienced by people living within kea habitat, provide 'first response' during conflict situations, help people deal proactively to prevent conflict situations arising in the first instance, and research practical methods of conflict resolution in collaboration and partnership with communities and DOC.

Project 3.1: Run annual South Island Advocacy Tour.

Project 3.2: Develop a PR/marketing plan to increase positive public perceptions for kea.

Project 3.3: Offer a South Island wide community conflict response and resolution programme.

5.3.2 Utilise the captive population for effective advocacy

As of the beginning of 2015, 76 kea were held in 20 facilities around New Zealand. Of these, 71 kea are held in 17 public facilities that welcome well over 1,000,000 people through their doors annually. These facilities have the potential to educate and influence the perceptions and behaviour of visitors about the species in their care and to inform about wider conservation initiatives outside their walls. As stated by DOC, the primary purpose for holding and displaying kea in captivity in New Zealand is to advocate for kea conservation in the wild (Collen, 2011). This includes an undertaking to raise awareness of threats to the species, increase empathy and understanding for kea, educate the public on appropriate behaviour when in kea habitat and to encourage public involvement in conservation initiatives. Currently only a minority of captive facilities actively engage in meaningful advocacy with their captive kea. Recommendations from a review of captive kea management (ibid) state that an advocacy plan that identifies "appropriate advocacy objectives, and the actions and resources needed to achieve them" should be developed and that implementation of this plan should be "part of permit holders' requirements to hold kea".

Project 3.4: Develop and action a detailed advocacy plan for captive kea holders.

5.3.3 Increase education opportunities and support external research initiatives

Effective education, both formal and informal, is key to increasing knowledge, interest in, and positive perceptions of kea. Any education programme must allow engagement of diverse cultures, communities, social dynamics, ages, education levels, and abilities. Key messages and learning outcomes should also be identified and developed to be rolled out quickly and effectively in response to specific issues occurring in order to maximise learning and media impact (eg. Kea killed while car surfing at Otira Viaduct). Formal education channels and relationships should be developed at primary, secondary and tertiary levels to enable external development of education material that can be shared between and supported by kea stakeholders. Advocating for and supporting kea research will significantly speed up the delivery of conservation outcomes for kea. To enable this, a research and projects list should be made available to all appropriate research organisations who express an interest in the objectives of this strategy to provide direction and opportunity for involvement. Additional knowledge and support should also be available through a network of advisors.

Project 3.5: Develop an education strategy and programme.

Project 3.6: Develop a research and project list to engage and guide further stakeholder involvement.

5.3.4 Facilitate formation of community-led kea conservation initiatives

The importance of communities buying-in to the success and longevity of local conservation initiatives has been demonstrated repeatedly worldwide (Berkes, 2004). Increasing community collaboration and involvement with kea conservation initiatives will be achieved through a number of key projects, including development of a memorandum of understanding (MOU) directly between communities and kea, development of an active and effective volunteer base, and supporting and encouraging external stakeholder kea conservation initiatives.

Project 3.7: Develop a MOU between South Island communities and kea.

Project 3.8: Develop and maintain an active volunteer database.

Project 3.9: Identify and support external stakeholder kea conservation initiatives.

6 Standard Operating Procedures

Ensuring consistent, best practice in all aspects of kea conservation work will result in high quality conservation outcomes for the species. Development of Standard Operating Procedures (SOPs) will ensure clarity (to those working with kea), consistency (of process, standards and data collection) and minimal risks. These will be divided into two main areas i) SOPs for processes and ii) SOPs for those working with kea.

These standards are to be adopted throughout the South Island. Each protocol will be updated as new technology and information becomes available (to be reviewed annually).

Project 6.1: Develop SOPs for working with kea.

Project 6.2: Develop SOPs for volunteers

Project 6.3: Develop SOPs for contractors

7 Assessment of outcomes – implementation, monitoring, reporting and review

The aims and projects outlined in this strategy must be able to adapt and evolve in response to on-going monitoring and assessment of outcomes. Reevaluation and reassessment of individual projects will be conducted annually, while the strategic plan itself is to be reviewed every 5 years. This will ensure that projects that are implemented remain responsive to real needs and that strengths, weaknesses, opportunities and threats for each project and the management documents are identified and managed (Bryson & Alston, 2011).

Project 7.1: Develop an outcomes assessment table for each project

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9 Bibliography

Adams, N.J., Kemp, J., Orr-Walker, T., and Roberts, L.G. 2011. Surveying the Southern Alps: Substantial differences in indices of kea (*Nestor notabilis*) abundance across its range may reflect response to pest management. Australasian Ornithological Conference, James Cook University, Cairns.

Berkes, F. 2004. Rethinking Community-Based Conservation. *Conservation Biology*, Pages 621 -630. Vol 18, No.3, June 2004.

BirdLife International 2012. *Nestor notabilis*. The IUCN Red List of Threatened Species. Version 2015.2. <www.iucnredlist.org>. Downloaded on 29 June 2015.

Bryson, J.M and Alston, F.K. 2011. *Creating your strategic plan*. Third edition. A workbook for public and nonprofit organisations. Published by Jossey-Bass, San Francisco, CA.

Collen, R. 2011. Review of captive management of kea (*Nestor notabilis*) - report on initial consultation with stakeholders July 2011. Docdm-790070. Retrieved June 29 2015 from <http://www.doc.govt.nz/Documents/conservation/native-animals/birds/kea-consultation-report.pdf>

de Kloet, R. S. and de Kloet, S. R. 2005. "The evolution of the spindle gene in birds: Sequence analysis of an intron of the spindlin W and Z gene reveals four major divisions of the Psittaciformes." *Molecular Phylogenetics and Evolution* **36**(3): 706-721.

Diamond, J. and Bond, A. 1999. *Kea Bird of Paradox: The Evolution and Behaviour of a New Zealand Parrot*. University of California Press, Ltd. London, England.

Department of Conservation (DOC). 2010. Statement of Intent 2010-2013. Retrieved on May 14, from [http://www.doc.govt.nz/upload/documents/about-doc/role/policies-and-plans/statement-of-intent/statement-of-intent-\(2010-2013\).pdf](http://www.doc.govt.nz/upload/documents/about-doc/role/policies-and-plans/statement-of-intent/statement-of-intent-(2010-2013).pdf).

Dussex, N., D. Wegmann, N.D., and Robertson, B.C. 2014. Postglacial expansion and not human influence best explains the population structure in the endangered kea (*Nestor notabilis*). *Molecular Ecology*. *Mol Ecol.* **23**(9):2193-209.

Dussex, N., Rawlence, N.J., Robertson, B.C. 2015. Ancient and Contemporary DNA Reveal a Pre-Human Decline but No Population Bottleneck Associated with Recent Human Persecution in the Kea (*Nestor notabilis*). *PLoS One*. **10**(2):e0118522.

Elliott, G and Kemp, J. 1999. *Conservation Ecology of Kea*. WWF NZ – Final Report.

Grant, A., O'Donnell, C., Garland, P. 1993. Population viability analysis. Kea (*Nestor notabilis*) and Kaka (*Nestor meridionalis*). New Zealand Department of Conservation and IUCN/SCC Captive Breeding Specialist Group. Christchurch, NZ.

Grant, A. 1993. *Wild Kea Management Statement*. Canterbury Conservancy Miscellaneous Report Series No. 4. Department of Conservation, Te Papa Atawhai, Christchurch.

Greer, A.L. 2015. Intraspecific variation in the foraging ecology and morphology of kea *Nestor notabilis*. A thesis submitted in partial fulfilment of the requirement for the Degree of Doctor of Philosophy in Ecology. University of Canterbury, Christchurch, New Zealand.

Hitchmough, R. Bull, L. Cromarty, P (compilers). 2007. New Zealand Threat Classification System Lists –2005. Retrieved May 14 2015 from <http://www.doc.govt.nz/templates/MultiPageDocumentTOC.aspx?id=42704>.

McBride, N. 2011. Endangered Species Management Planning in New Zealand. A thesis in partial fulfilment of the requirements for the degree of Master of Applied Science in Natural Resource Management at Massey University, Palmerston North, New Zealand.

Ministry for the Environment (MfE) 2007. Environment New Zealand 2007. Retrieved on May 14, 2015 from <http://www.mfe.govt.nz/publications/ser/enz07-dec07/>.

Parliamentary Council Office (PCO), 1998. Ngāi Tahu Claims Settlement Act 1998. Sections 287 - 296

Downloaded from

<http://www.legislation.govt.nz/act/public/1998/0097/latest/DLM429090.html#DLM430185>

Parry, M.L, Canziani O.F., Palutikof J.P., van der Linden P.J. and Hanson C.E. (eds) 2007. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, 2007. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

Peat, N. 1995. Kea Advocacy Strategy. Towards resolving conflicts between kea and people. Miscellaneous Report Series No.28, Department of Conservation, Dunedin.

Pullar, T. 1996. Kea (*Nestor notabilis*) Captive Management Plan and Husbandry Manual. Threatened Species Occasional Publication No.9. Department of Conservation Threatened Species Unit, Wellington.

Robertson, C.J.R, 2007. Atlas of Bird Distribution in New Zealand. The Ornithological Society of New Zealand, Inc. Wellington.

Robertson HA, Dowding JE, Elliott GP, Hitchmough RA, Miskelly CM, O'Donnell CJF, Powlesland RG, Sagar PM, Scofield RP, Taylor GA. 2013. Conservation status of New Zealand birds, 2012. New Zealand Threat Classification Series 4. Department of Conservation, Wellington. 22p.

Young, L.M, Kelly, D., Nelson, X.J. 2012. Alpine flora may depend on declining frugivorous parrot for seed dispersal. *Biological Conservation* 147 (2012) 133–142.

10 Appendix

10.1 Figure 2: Diagram of Strategic Plan outline and main projects

This diagram summarises the vision, mission, aims and strategic objectives of the overarching Strategic Plan for Kea Conservation. Each strategic objective is generated as a separate document but should be read in conjunction with the Strategic Plan.

