

Southern Cassowary *Casuarius casuarius*

Key Findings

Southern Cassowaries are found in Queensland’s Wet Tropics and Cape York Peninsula, but occurrence within their natural range has been greatly reduced and fragmented by historical forest clearance. Since the 1990s, habitat protection and rehabilitation of the Wet Tropics rainforest has reduced the threat of ongoing habitat loss and cassowary populations currently appear stable.

Photo: Wet Tropics Management Authority



Significant trajectory change from 2005-15 to 2015-18?

No, population appears generally stable

Priority future actions

- Plant and restore cassowary habitat in priority corridors to create movement corridors for the species to reduce traffic deaths
- Improve dog management in cassowary habitat and corridors to reduce harrassment
- Implement post-cyclone response plans to improve recovery outcomes

Full assessment information

Background information

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The primary purpose of this scorecard is to assess progress against achieving the year three targets outlined in the Australian Government’s Threatened Species Strategy, including estimating the change in population trajectory of 20 bird species. It has been prepared by experts from the **National Environmental Science Program’s Threatened Species Recovery Hub**, with input from a number of taxon experts, a range of stakeholders and staff from the Office of the Threatened Species Commissioner, for the information of the Australian Government and is non-statutory. It has been informed by statutory planning documents that guide recovery of the species, such as Recovery Plans and/or Conservation Advices (see Section 11). The descriptive information in this scorecard is drawn from Latch (2007), unless otherwise noted by additional citations.

The background information aims to provide context for estimation of progress in research and management (Section 7) and estimation of population size and trajectories (Section 8).

1. Conservation status and taxonomy

Conservation status	2018
IUCN	Vulnerable
EPBC	Endangered
QLD	Endangered

Taxonomy:

Seven subspecies, one in Australia and six in New Guinea, were once recognised but the species is now considered monotypic (Folch et al. 2018).

2. Conservation history and prospects

The closed tropical forest habitat of the Southern Cassowary is naturally of relatively limited extent in Australia, distributed in patches on the east coast of Cape York from the Jardine to the Stewart River, and between Cooktown and Townsville in the Wet Tropics bioregion of north Queensland. The Southern Cassowary is a large-bodied flightless bird that feeds primarily on fruit. It lives at low densities, making it particularly sensitive to habitat loss. Also, losing cassowaries from rainforest also removes their function as dispersers of seeds, particularly large seeds, which over time can change the forest community structure.

Over 25% of Southern Cassowary habitat in the Wet Tropics was cleared for agriculture up until the 1960s, with smaller areas continuing to be isolated by tourist and residential infrastructure until the end of the century. Since 2000, habitat protections and rehabilitation of rainforest have reduced the threat of ongoing habitat loss. A survey carried out in the 1980s estimated a population size in the Wet Tropics of 1500-4000 birds. In the 1990s, another survey estimated the population at less than 1500 birds; this lower estimate led to concerns that Southern Cassowaries were declining. However, the most recent survey (2012-14) estimates the current population in the Wet Tropics is about 4400 individuals, and it is likely the population has been relatively constant since the 1980s (Westcott et al. 2014).

3. Past and current trends

Cassowaries in the wet tropics were historically distributed between Cooktown in the north, south to Townsville and west to the extent of rainforest including the entire rainforested portion of the Atherton Tableland. The external boundary of the present distribution remains similar but the occupancy of the cassowary within this distribution is greatly reduced and fragmented by historical (pre-1990) forest clearance. Cassowaries no longer occur in large parts of the Atherton Tablelands, the lower Goldsborough Valley, the floor of the Whyanbeel valley, the Clohesy River region and the Cassowary Range. The threat of habitat loss has diminished substantially since the 1990s, and cassowary numbers are thought to have been stable since at least 1990 (Westcott et al. 2014).

On Cape York Peninsula, cassowaries historically extended from just west of the tip of the Cape (at the mouth of the Jardine River) down the east coast to at least as far south as Massey River. Cassowaries are known today from all historical sites with the exception of those in the far north; they are thought to have disappeared from the Lockerbie Scrub though there have been recent anecdotal reports of persistence and no thorough surveys.

Monitoring (existing programs):

There is no regular monitoring but surveys using different methods were carried out in the late 1980s (Crome and Moore 1990), in the 1990s, and then in 2012-14 (Westcott et al. 2014) in the Wet Tropics region. A survey was carried out in 2017-18 in Mcllwraith Range National Park by CSIRO, Cape York NRM and Kalan Enterprises which may provide a baseline for monitoring there.

Population trends:

Tables 1 and 2 summarise the overall trend and status of the Southern Cassowary. The information provided in this table is derived from Latch (2007), with some amendments made by contributing experts based on new information.





Table 1. Summary of the available information on Southern Cassowary distribution and population size, and (where possible) trend estimates between 2015 and 2018 for each parameter.

Population parameters	Published baseline	2015 Estimate	2018 estimate	Confidence in estimates
Extent of Occurrence	23,400 km ²	CY: 488,547 ha WT: 800,00ha	CY: 488,547 ha WT: 800,000 ha	Medium
Area of Occupancy	2100 km ²	2100	2100	Medium
Dates of records and methods used		As per Bird Action Plan		
No. mature individuals	2500	c 4000 mature birds (Wet Tropics) 1000-2000 mature birds (CYP; based on relative area and greater fragmenttaion)	No reason to think the 2018 value is different to the 2015 value	Medium
No. of subpopulations	2	3	3	Medium
No. of locations	>10	>10 (Wet Tropics/Cape York)	>10 (Wet Tropics/Cape York)	High
Generation time	12.1	n/a	n/a	High; based on recent global modelling by BirdLife International

Table 2. Estimated recent (2005-2015) and current (2015-2018) population trends for the Southern Cassowary

Sub-population	Est. % of total pop'n (pre-2015)	2005-2015 trend	Confidence in 2005-2015 trend	2015-2018 trend	Confidence in 2015-2018 trend	Est. % of total pop'n (2018)	Details
Wet Tropics	80		High		Moderate	80	Trend follows Westcott et al. (2014)
Cape York	20		Low		Low	20	Trend expected because no change in threats known
Whole population	100		High		Moderate		

KEY:

Improving	Stable	Deteriorating	Unknown	Confidence	Description
				High	Trend documented
				Medium	Trend considered likely based on documentation
				Low	Trend suspected but evidence indirect or equivocal

4. Key threats

The threats listed here are derived from Latch (2007) with some amendments from contributing experts based on new information. Note that this is not a list of all plausible threats, but a subset of the threats that are likely to have the largest impact on populations.

Domestic dogs (*Canis familiaris*)

Dog attacks are known to cause injury and death and their presence potentially affects cassowary feeding, movement and behaviour. Dogs can be a localised threat near residential areas, but also on farms and in areas frequented by pig-hunters.

Habitat loss and degradation

The major threat to the long-term survival of Wet Tropics cassowaries has been clearing and fragmentation of habitat, particularly in the lowlands. By 1983, 57% of lowland rainforest had been cleared with most of the rest highly fragmented. Although most of the remaining habitat for cassowaries is now within protected tenures and clearing rates have been very low in the last decade compared to historic rates, some continues for urban or tourist development. Although clearing rates have slowed, the fragmentation that is a legacy of past clearing will have impacts for some time; fragmentation reduces movement paths, may segregate feeding and breeding sections of an individual's range, and could lead to genetic isolation and local extinctions. Linear infrastructure such as roads and railways also inhibits movement. Selective logging, weed invasion and disturbance to rainforest by changed fire regimes have also all been considered factors that degrade habitat quality for cassowaries, by decreasing shelter and degrading breeding sites and food sources. Severe fires can

progressively destroy rainforest on steep slopes. Cassowaries are known to persist in logged forest but logging has now largely ceased. Pond apple (*Annona glabra*), one of the most threatening weeds of the Wet Tropics, has invaded and dominated some cassowary habitat but also provides them with food for a limited period of the year.

Roads and traffic

Roads fragment habitat, create barriers to cassowary movement, produce edge effects, introduce exotic species and cause substantial mortality through direct strikes. Road mortality results in deaths of cassowaries in some areas, such as the Mission Beach area. From 2001-2005, 28 Southern Cassowaries (or 76% of the total recorded deaths) at Mission Beach were killed on roads. Population impacts, however, are unknown. Roads also provide access to areas throughout the cassowary's range resulting in exposure to hunting dogs.

Climate change

Tropical cyclones may cause considerable widespread disturbance to cassowary habitat, causing short-term food loss. If the frequency/intensity of such events increase, there may be impacts on cassowary population size. Furthermore, an analysis of the impacts of climate change on the distribution of fleshy fruited rainforest plants and frugivorous vertebrates indicates that, by the end of this century, there will be substantial losses of lowland rainforests and substantial consequent reductions in cassowary populations (>60% decline); these effects will begin well before the end of the century (Mokany et al. 2014, 2015).

Feral pigs (*Sus scrofa*)

Feral pigs are a major Wet Tropics pest and significant threat to World Heritage values, but there is no evidence that feral pigs adversely affect cassowary survival. They reportedly destroy nests and eat eggs, and compete for food, but the impacts on cassowary populations is unknown. However, there are some indirect impacts such as cassowaries being caught in pig traps and fencing of farms for biosecurity (e.g. Panama disease in bananas) which blocks cassowary movement.

The impacts of the major threats are summarised in Table 3.

Table 3. The major threats facing the Southern Cassowary and their associated impact scores.

CURRENT THREAT IMPACT (five greatest threats)			
Threat	Timing	Extent	Severity
1. Domestic dogs (<i>Canis familiaris</i>)	Continuing/ongoing	1-50% of range	Not negligible but <20%
2. Habitat loss and degradation	Continuing/ongoing	1-50% of range	Not negligible but <20%
3. Roads and traffic	Continuing/ongoing	1-50% of range	Not negligible but <20%
4. Climate change	Continuing/ongoing	50-90% of range	Not negligible but <20%
5. Feral pigs	Continuing/ongoing	>90% of range	Not negligible but <20%

Timing: continuing/ongoing; near future: any occurrence probable within one generation (includes former threat no longer causing impact but could readily recur); distant future: any occurrence likely to be further than one generation into the future (includes former threat no longer causing impact and unlikely to recur).

Extent: <1% of range; 1-50%; 50-90%; >90%.

Severity: (over three generations or 10 years, whichever is sooner) Causing no decline; Negligible declines (<1%); Not negligible but <20%; 20-29%; 30-49%; 50-100%; Causing/could cause order of magnitude fluctuations.

5. Past and current management

Recent and current management actions thought to be contributing to the conservation of the Southern Cassowary are summarised in Table 4. This information is a collation of material provided by experts.

This species has a Recovery Plan in place (2007), guiding recovery action (see Section 11).

Table 4. Management actions thought to be contributing to the conservation of the Southern Cassowary

Action	Location	Timing	Est. % population	Contributors and partners
Cassowary Habitat Acquisition	Daintree / Atherton and Evelyn Tablelands /Mission Beach	2015-18	2	Rainforest Trust, Rainforest Rescue, Rainforest Reserves, QTFN/C4 (Lot 66), South Endeavour Trust Trees for the Atherton and Evelyn Tablelands (TREAT)
Cassowary habitat and corridor revegetation	Daintree / Atherton and Evelyn Tablelands /Mission Beach & Walter Hill Range/ Kuranda	2015-18	2	Cassowary Coast Regional Council, (CCRC), Terrain, C4, Dept. Environment and Science QPWS, South Endeavour Trust, Rainforest Reserves Australia, Rainforest Trust Rainforest Rescue, Kuranda Conservation, Kuranda EnviroCare, Terrain through NLP
Partnership with Energy Qld to Trial Vegetation Management under power- lines for cassowary Connectivity	Smith's Gap	2018	1	Terrain, Energy Qld
New Nature refuges	Atherton Tablelands Walter Hill Range	2015-18	1	Private land holders, Terrain through NLP, QTFN
Integration of Cassowary Corridors into Planning Scheme	Cassowary Coast	2015-18	1	Cassowary Coast Regional Coastal, Terrain through NLP
Provided expert advice on Wet Tropics Lowland Rainforest nomination for EPBC Listing	Wet Tropics	2018	1	Terrain, Humane Society of Australia / Terrain WTMA

Threatened Species Strategy – Year 3 Priority Species Scorecard (2018)

Vehicle strike solutions workshops and on-site project design	Mission Beach	2015-17	1	Terrain, TMR
Significant Cassowary Incident Mapping (SCIM)	Wet Tropics	2015	2	Zoo Aquarium Association
Vehicle strike solutions sub-committee	Wet Tropics	2017	2	CRT
Animal Management and Wildlife Stewardship policy	Wet Tropics	2018	80	Far North Queensland Regional Organisation of Councils (FNQROC)
Cassowary friendly pig trapping guideline	Wet Tropics	2015	80	Biosecurity Qld, CCRC,, Terrain
Advocacy on appropriate dog management in cassowary habitat	Wet Tropics	ongoing	80	Cassowary Keystone Conservation, Rainforest Trust
Cassowary Vehicle strike solutions Social Research	Cassowary Coast	2018	5	Terrain
Garners Beach and Tablelands Cassowary rehabilitation facilities	Wet Tropics	2016-17	2	Rainforest Reserves Australia
Northern Wildlife Management Unit (DES) Upgrade of Garners Beach rehabilitation facility	Mission Beach	2018	2	DES
Dept. Environment and Science cassowary rescue and release policy review	Wet Tropics	2018	2	DES Northern Wildlife Operations
Walter Hill Range/Smiths Gap Landholder Surveys	Walter Hill Range	2017	1	JCU, Terrain
World Cassowary Day Festival	Mission Beach, Daintree Cairns	2015 2016 2017	100	Rainforest Reserves Australia, All Cassowary Recovery Team Members
Mission Beach cassowary festival	Mission Beach	2017 2018	5	Mission Beach Cassowaries, C4
Threatened Species Commissioner Wet Tropics Tour	Wet Tropics	Sept 2015	2	Threatened Species Commissioner, Terrain, WTMA, other NGOs
Cassowary Recovery Team Website	Wet Tropics	2015-18	100	WTMA

Threatened Species Strategy – Year 3 Priority Species Scorecard (2018)

Terrain threatened species web page and Story map		2017	80	Terrain
		2018		
Connecting the Tourism Industry and Wet Tropics threatened species video	Wet Tropics	2018	80	Terrain, WTMA, TTNQ, NLP
Recovery team Meeting (4 meetings per year)	Wet Tropics	2015	100	All partners, full engagement with members, diverse and varied members 25 per meeting
		2018		
Cassowary Recovery Plan review	Wet Tropics & Cape York	2015	100	Cassowary Recovery Team
Community mapping portals including cassowary sightings	Mission Beach & Kuranda	2017-18	10	Kuranda Conservation, Mission Beach Cassowaries, C4, Terrain
Smith's Gap Cassowary Survey	Smith's Gap	2017	2	Biotropica, Transport & Main Roads (TMR)
Colour & thermal monitoring at cassowary road crossings	Mission Beach	2018	2	CSIRO
Threatened Species hotspots	Mt Lewis, Mt Spurgeon & Mt Windsor national parks	2015		Australian Wildlife Conservancy, Queensland Government
Cape York habitat improvement	McIlwraith Ranges	2016-18		Traditional Owners and Cassowary Recovery Team

6. Actions undertaken or supported by the Australian Government resulting from inclusion in the Threatened Species Strategy

Since 2014, the Australian Government has invested over \$6 million in initiatives supporting the Southern Cassowary, including 33 Green Army projects and seven projects under the 20 Million Trees program that directly protect and restore its' habitat, including through reconnection of fragmented rainforest.

The Australian Government has funded Terrain NRM and Cape York NRM through NLP to work with partners on priority cassowary recovery projects. The Threatened Species Commissioner toured the Wet Tropics meeting stakeholders and attended World Cassowary Day 2015. Priority Southern Cassowary recovery projects identified by the Cassowary Recovery Team were included in the Threatened Species Prospectus. Terrain NRM has subsequently worked with the Cassowary Recovery Team to develop and market project plans for the Prospectus cassowary projects.

A \$150,000 project under the Threatened Species Recovery Fund is supporting Indigenous rangers, NRM managers and researchers to identify areas of key Cassowary habitat on Cape York Peninsula and to manage the threats of fire, pigs and cattle in these areas.

7. Measuring progress towards conservation

Table 5. Progress towards management understanding and management implementation for each of the major threats affecting the Southern Cassowary in 2015 (i.e. timing of TSS implementation) and 2018, using the progress framework developed by Garnett et al. (2018).

PROGRESS IN MANAGING THREATS (five greatest threats)			
Threat	Year	Understanding of how to manage threat	Extent to which threat being managed
1. Domestic dogs (<i>Canis familiaris</i>)	2015	1. Research being undertaken or completed but limited understanding on how to manage threat	1. Management limited to trials
	2018	1. Research being undertaken or completed but limited understanding on how to manage threat	1. Management limited to trials
2. Habitat loss and degradation	2015	5. Trial management under way but not yet clear evidence that it can deliver objectives	4. Solutions are enabling achievement but only with continued conservation intervention
	2018	5. Trial management under way but not yet clear evidence that it can deliver objectives	4. Solutions are enabling achievement but only with continued conservation intervention
3. Roads and traffic	2015	2. Research has provided strong direction on how to manage threat	1. Management limited to trials
	2018	2. Research has provided strong direction on how to manage threat	1. Management limited to trials
4. Climate change	2015	1. Research being undertaken or completed but limited understanding on how to manage threat	0. No management
	2018	1. Research being undertaken or completed but limited understanding on how to manage threat	1. Management limited to trials
5. Feral pigs (<i>Sus scrofa</i>)	2015	2. Research has provided strong direction on how to manage threat	1. Management limited to trials
	2018	2. Research has provided strong direction on how to manage threat	1. Management limited to trials

> Green shading indicates an improvement in our understanding or management of threats between years 2015 and 2018, while red shading indicates deterioration in our understanding or management of threats.

KEY

Score	Understanding of how to manage threat	Extent to which threat is being managed
0	No knowledge and no research	No management
1	Research being undertaken or completed but limited understanding on how to manage threat	Management limited to trials
2	Research has provided strong direction on how to manage threat	Work has been initiated to roll out solutions where threat applies across the taxon's range
3	Solutions being trialled but work only initiated recently	Solutions have been adopted but too early to demonstrate success
4	Trial management under way but not yet clear evidence that it can deliver objectives	Solutions are enabling achievement but only with continued conservation intervention
5	Trial management is providing clear evidence that it can deliver objectives	Good evidence available that solutions are enabling achievement with little or no conservation intervention
6	Research complete and being applied OR ongoing research associated with adaptive management of threat	The threat no longer needs management

8. Expert elicitation for population trends

An expert elicitation process was undertaken to assess population trends for the period 2005-2015 and post-2015 under the following management scenarios. Please note that differences between Management Scenarios 2 and 3 (Fig. 1) are difficult to attribute, as it can be difficult to determine whether actions undertaken after 2015 were influenced by the Threatened Species Strategy or were independent of it (see Summary Report for details of methods).

Management Scenario 1 (red line): *no conservation management undertaken since 2015, and no new actions implemented.*

- Clearance controls on private land removed to allow coastal and other development
- No attempts to control dogs, pigs or traffic in areas cassowaries frequent
- No support after stressful climatic events

This scenario assumes no active management of the species or retention of its habitat outside protected areas.

Management Scenario 2 (blue line): *continuation of existing conservation management (i.e. actions undertaken before implementation of the Threatened Species Strategy).*

- Habitat protection outside protected areas
- Ineffective traffic control
- No attempts to control dogs or pigs
- Some habitat restoration at key sites
- Advice provided for helping cassowaries responsibly after cyclones

This scenario assumes ongoing protection of almost all cassowary habitat and ongoing attempts to connect fragments

Management Scenario 3 (green line): *continuation of existing management, augmented by support mobilised by the Australian Government under the Threatened Species Strategy.*

- As for Scenario 2 but larger areas of rainforest rehabilitated

This scenario resembles Scenario 2 but with larger areas of rainforest rehabilitated or secured for conservation to connect fragments and create corridors

Overall estimated population trajectories subject to management scenarios considered

The southern cassowary is currently being managed under Scenario 3 (green line).

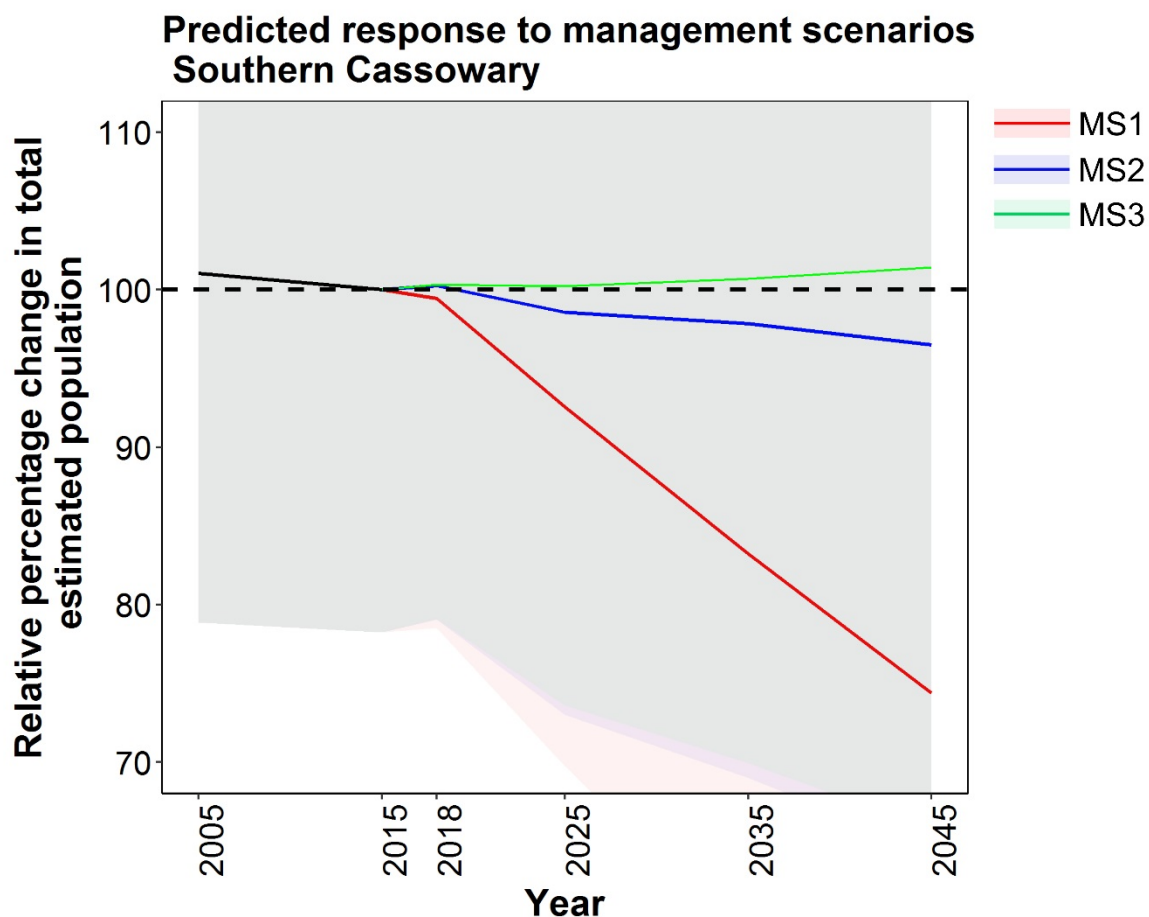



Figure 1. Estimated relative percentage change in population under each of the management scenarios described above. Data derived from 7 expert assessments of Southern Cassowary expected response to management, using four-step elicitation and the IDEA protocol (Hemming et al. 2017), where experts are asked to provide best estimates, lowest and highest plausible estimates, and an associated level of confidence. The dashed line represents the baseline value (i.e. as at 2015, standardised to 100). Values above this line indicate a relative increase in population size, while values below this line indicate a relative decrease in population size. Shading indicates confidence bounds (i.e. the lowest and highest plausible estimates).

Population size projections based on expert elicitation are extended here to 2025, 2035 and 2045 (i.e. 10, 20 and 30 years after the establishment of the Threatened Species Strategy) on the grounds that some priority conservation management actions may take many years to achieve substantial conservation outcomes. However, we note also that there will be greater uncertainty around estimates of population size into the more distant future because, for example, novel threats may affect the species, managers may develop new and more efficient conservation options, and the impacts of climate change may be challenging to predict.

Improved trajectory (Threatened Species Strategy Year 3 target):

The primary purpose of this scorecard is to assess progress against achieving the year three targets outlined in the Australian Government’s Threatened Species Strategy, i.e. a demonstrated improved trajectory for at least half of the priority species (10 birds and 10 mammals). To assess this, we first use the expert-derived trend between 2005-15 (i.e. 10 years prior to implementation of the TSS) as a baseline for assessing whether there has been an improvement in trajectory in the time since implementation of the TSS (i.e. 2015-18). Table 6 below summarises this information, where negative values indicate a declining population, and positive values indicate an increasing population. We used Wilcoxon match-paired tests to compare trajectories for these two periods; a significant result (probability <0.05) indicates that there was a high concordance amongst experts that their trajectory estimates for 2005-15 were different to their estimates for 2015-18.

Table 6. A comparison of the relative annual percentage population change for the periods 2005-2015 and 2015-2018.

	Pre-TSS trend (2005-2015)	Post-TSS trend (2015-2018)	Year 3 target met?	Significant concordance among elicitors?
Annual percentage population change	-0.10	0.11		The population trajectory improved after 2015, but with insufficient concordance among elicitors to reach significance.

Additional actions that could improve trajectory

The potential impact of carrying out specific additional conservation measures on the population trajectory of the Southern Cassowary was also evaluated through expert elicitation. Current management includes habitat protection outside protected areas; some habitat restoration at key sites; and advice provided for helping cassowaries responsibly after cyclones. However, traffic control is ineffective and there are no attempts to control dogs or pigs.

Additional actions that could further improve the population trajectory include:

- Effective controls on dogs using rainforest
- Traffic deaths reduced through a range of traffic calming techniques
- Effective planning of new developments to accommodate cassowaries
- Extensive habitat rehabilitation
- Strategic programs to support cassowaries after stressful climatic events
- Targeted management of pigs where these have proven deleterious to cassowaries

These actions rely on collaboration with dog owners in the Wet Tropics to reduce the probability of dog attacks on cassowaries, better planning of urban and tourist development and contingency plans for helping cassowaries cope after cyclones or other extreme climatic events.

9. Immediate priorities from 2019

The priorities listed here are derived from Latch (2007), with some amendments made by contributing experts based on new information. Identification of these priorities in this document is for information and is non-statutory. For statutory conservation planning documents, such as Recovery Plans or Conservation Advices, please see Section 11.

Data collection:

- Monitor trends at selected high profile sites in the wet tropics using improved versions of the DNA –based tools developed by Westcott et al. (2014).
- Estimate Southern Cassowary population on Cape York Peninsula.
- Identify areas and corridors to protect, restore, manage, develop and implement Cassowary Conservation Local Area Plans as part of local planning
- Conduct roadkill research, driver education & develop road solutions at cassowary hotspots.
- Assess impact of traffic deaths, pigs and dogs on population size and trends
- Assess impact of cyclones on affected cassowary populations and, if necessary, develop a post-cyclone response plans that maximise persistence of cassowaries and minimise harmful interactions with people

Management actions:

- Plant and restore cassowary habitat in priority corridors to create movement corridors for the species
- Improve engagement, education, regulation and compliance to improve dog management in cassowary habitat and corridors
- Implement post-cyclone response plans
- Engage Traditional Owners more fully in management of cassowary habitat
- Coordinate and enhance voluntary conservation agreements and/or buy back of priority habitat and corridors on private land.

10. Contributors

Cassowary Recovery Team, Stephen Garnett, Sarah Legge, David O’Malley, David Westcott, John Woinarski, Hayley Geyle, Guy Dutson, Nicholas Macgregor, Peter Menkhorst, Richard Loyn.

11. Legislative documents

SPRAT profile: http://www.environment.gov.au/cgi-in/sprat/public/publicspecies.pl?taxon_id=25986

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Significant impact guidelines for endangered southern cassowary (Casuarius casuarius johnsonii)

2010 Nationally threatened species and ecological communities EPBC Act policy statement 3.15
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13. Citation

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