# SCIENCE POLICY

## A DISCUSSION PAPER

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## 1. INTRODUCTION

Current investment in science[1] by the Department of Environment and Conservation (DEC) is estimated to be in the order of $30M per annum. Approximately half of this is through consolidated funding to DEC's Science Division (SD). The Regional Services Division (including Fire Management Services) and specialist branches within the divisions of Nature Conservation, Strategic Policy and Sustainable Forest Management, and Air Quality Branch, also undertake and sponsor significant biodiversity and environmental research and monitoring. Tourism and recreation research and monitoring in protected areas is coordinated through the Parks and Visitor Services Division. A significant proportion of this science is administered largely in isolation from the SD. While there are well-established mandatory procedures for science administration within the SD, these procedures (or alternatives) are not routinely implemented across DEC.

With a standard administrative framework for science in DEC, it is more likely the immediate and longer-term benefits of the current and future investment in science by the department will be fully realized. Furthermore, formal approval, documentary and quality control processes will lead to less duplication, improved retention of corporate knowledge, better quality science and enhanced knowledge transfer into policy, planning and operational management.

The Science Policy Discussion Paper has been prepared to facilitate discussion and understanding of the need for a standard approach to science administration in DEC through the development and implementation of a DEC Science Policy. A draft science policy approach is included.

## 2. DEFINITION OF SCIENCE

Science is defined here as: *research, monitoring* and *science communication* and refers to both the biophysical and social environments. ***Research*** is about improving our understanding of the structure and functioning of the biophysical and human environments and their interaction. ***Monitoring*** (and evaluation) is about measuring trends against agreed benchmarks or targets within the context of an active adaptive management approach. ***Science communication*** is about communicating the results of research and monitoring programs to ensure new knowledge is incorporated into DEC's policy and planning processes, operational management and regulatory programs and to the wider community. Detailed definitions are given in Appendix I.

## 3. THE ROLE OF SCIENCE IN DEC

DEC is a conservation agency and an environmental regulatory agency. The conservation of the State's biodiversity is achieved primarily via the progressive establishment and management of terrestrial and marine protected area networks under the *Land Administration Act 1997* and the *Conservation and Land Management Act 1984* (CALM Act), respectively, and via the implementation of threatened species recovery plans and exploited species management plans under the *Wildlife Conservation Act 1950.* State forest and timber reserves are managed under the CALM Act. Environmental protection is achieved through the environmental assessment, environmental protection policy and pollution control provisions of the *Environmental Protection Act 1986*.

The effectiveness of DEC's policy, planning, management and regulatory frameworks is largely dependent on the scientific evidence that informs these processes.

[1] Science is defined as *research, monitoring* and *science communication (including knowledge transfer)*

## 4. NEED FOR A SCIENCE POLICY IN DEC

DEC's primary investment in science is through consolidated and external funding to the SD. Most of this science is undertaken by SD staff in collaboration with DEC regional offices and specialist branches and with external science providers. Current investment in science to the SD is about $13M of consolidated funding per annum and about $4M per annum from external funding sources. Current staffing levels consist of about 175 scientists and support staff, of which about 30% are contract staff employed on external funds. As outlined above, other divisions and specialist branches within DEC also undertake and sponsor significant biodiversity, environmental and social research and monitoring. A significant proportion of this research and monitoring is administered in isolation from the SD. Although it is difficult to assess the level of current investment in science external to the SD, based on discussions with relevant directors and program managers, it is estimated to be at least of a similar magnitude to the level of current funding to the SD. This being the case, the total investment by DEC in science may well exceed $30M per annum.

The SD has formal and mandatory planning, quality control, data management, reporting, accountability, knowledge transfer and archival processes in place to ensure an appropriate return on the public investment in science. The implications of climate change, ethical issues and licensing requirements are also considered explicitly within the approvals process. These processes provide the necessary 'third-party' scrutiny to ensure the relevance of the science to departmental objectives, that what is proposed is feasible and beneficial, the quality of science planning, implementation and reporting is high, as well as ensuring publications are timely and appropriately distributed and data are accessible, stored and easily retrieved for future application. Furthermore, these processes promote personal accountability for projects (via annual staff performance management and reporting), foster synergies and collaborations, minimise duplication and reduce the likelihood of expenditure on low priority or curiosity-driven science. The archival processes in place to capture data and publications ensure a legacy remains after the project is completed and hence promotes the retention of corporate knowledge and knowledge uptake.

While these processes have been in place in the SD for decades, similar or equivalent processes are not implemented routinely outside the SD. Formal approval, documentary and quality control processes will ensure there is less duplication, improved retention of corporate knowledge and priority given for high quality science that is needed for management. This situation, in turn, leads to more efficient and effective use of human and financial resources, promotion of the department's reputation for evidence-based decision-making and an enhancement of DEC's credibility across the board. Scrutiny of the science behind DEC policies and programs will inevitably increase as the development of the State continues and economic interests are affected by these policies and programs. Furthermore, the integrity of long-term monitoring programs can only be protected through formal science administration procedures. The protection of long-term data sets is a key issue as the decadal-plus time-series generated by long-term research and monitoring programs will be an increasingly critical element in assessing the effectiveness of DEC's management and regulatory programs and guiding DEC's future adaptive management strategies, particularly in the face of long-term threatening processes such as climate change.

The above rationale highlights the need for a standard approach to science administration across DEC. The science policy approach addresses these issues.

## 5. SCIENCE PRIORITIES

Because of the technical and scientific uncertainties surrounding natural resource management, including managing for biodiversity conservation, and the dynamic and ever-changing social, economic and political environment, the range of potential research issues is vast but the resources to carry out the

research are limited. This reality necessitates setting priorities and the process for doing this is essentially risk-based, with the following general risk management criteria:

- What are the consequences (environmental, social, economic and political) of doing, and conversely, not doing or delaying research on a specific issue to fill a knowledge gap?
- Over what temporal and spatial scales might these consequences occur?
- If the consequences are adverse, how easily might they be reversed?
- What level of ecosystem organisation will be impacted?
- How feasible and practical is the research?
- Can it be completed in a timely manner?
- What is the likelihood of success?
- How broadly applicable are the findings?
- Has the research been done elsewhere?
- Are we best placed to do the research? If not, who?
- Are there opportunities for partnerships/collaborations?
- To what extent will knowledge gained from the research improve risk assessment?
- Who are the end-users/beneficiaries?
- What is the potential for successful up-take of the research?
- Will the research findings adequately prevent or mitigate the risk efficiently, cost effectively and in a manner acceptable to stakeholders?

Science priorities are driven by existing Government/DEC obligations identified through a variety of planning processes including protected area management plans, threatened flora and fauna recovery plans and wildlife management programs. Government/DEC policy commitments and strategies, such as DEC's Corporate Plan 2007–2009 (DEC 2007), 'A 100-year Biodiversity Conservation Strategy for Western Australia (Draft);Phase One: Blueprint to the Bicentenary in 2029' (DEC 2006), the 'Forest Management Plan 2004–2013' (Conservation Commission of Western Australia 2004), the rolling five-year Regional Nature Conservation Service Plans (DEC 2006), protected area establishment and regional planning timelines, departmental and controlling body requirements (i.e. Environmental Protection Authority, Conservation Commission, Marine Parks and Reserves Authority) and, to some extent, external influences such as industrial development projects, also influence DEC science priorities.

Science Division's long-term priorities are summarised in "*A Strategic Plan for Biodiversity Conservation Research 2008-2017"*. Climate change research priorities are determined through links with external initiatives such as the Indian Ocean Climate Initiative (IOCI) and the South African National Biodiversity Institute (SANBI) and direct interaction with the Biodiversity Climate Change Unit (within Science Division) and DEC's Office of Climate Change. At an ecological and social asset level, science priorities are developed through a risk assessment approach embedded in the management planning processes (see above). Tourism and recreation science priorities are outlined in DEC's social science strategy[2].

## 6. SCIENCE DELIVERY OPTIONS

DEC's science needs are delivered via internal and external science capacity and through strategic collaborations and partnerships. The balance of internal, external and collaborative delivery of science will be different for *research, monitoring* and *science communication* because of the varying organisational objectives, capacities, expertise and interests of the external science providers and the institutional imperatives of DEC. For example, external science providers may be more focused on short-term research rather than strategic research, monitoring and science communication, because research,

[2] A Strategy for Social Sciences in the Environment

rather than management, is their primary focus. Research generally is of greater professional interest to most scientists as it has, by definition, a broader area of focus than is more amenable to scientific publication. Within the *research* area, external science providers' interests relate more to fundamental or basic research than applied research for much the same reasons. Furthermore, they are primarily interested in the process/prediction part of the knowledge continuum and are significantly less interested in the biophysical and social inventories and on-going recording of long-term time series datasets that provide 'core' knowledge for management/regulatory agencies like DEC.

Agencies with conservation and operational management responsibilities, like DEC, require an appropriate balance between these three areas of science to achieve their objectives. Short-term applied research, of relevance to DEC, is most appropriately delivered through collaborative research programs between DEC and external science providers. Strategic, long-term research, and monitoring and evaluation requirements, with the exception of industry compliance monitoring, and science communication programs are, in general, most effectively delivered via departmental programs as key elements of an active adaptive management approach to natural resource management.

A most important benefit to DEC maintaining a significant in-house science capability is that new knowledge and information is transferred relatively quickly and efficiently within the organization, leading to rapid uptake and utilisation by practitioners, planners and policy makers – the science has impact and the scientist's motivation is to improve the way DEC does business. Where scientists are institutionally disconnected from end-users, not only is the science done by such institutions sometimes irrelevant and self-serving because these institutions often have different drivers, but technology transfer and uptake is highly problematic, significantly diminishing the value and effectiveness of the research. In addition, DEC managers, and the Minister, via the Director General, have ready access to high quality advice from a core of people with expertise across a range of disciplines relevant to the conservation, environment and land management portfolio and natural resource management generally.

## 7. CURRENT SCIENCE ADMINISTRATION IN DEC

As outlined above, DEC allocates significant funding for science to support departmental policies and programs, and this is implemented primarily through the SD[3]. Formal institutional administrative arrangements are in place within the SD to ensure the immediate, broader and longer-term benefits of this investment in science are maximised. A significant investment in science also occurs outside the SD. Much of this science is administered through informal arrangements determined at the branch/district/regional level.

This section outlines the science administration frameworks currently in place within DEC.

### 7.1 Science Division

The existing quality control practices of the SD for both DEC and externally-funded science projects involve the development of 10-year strategic science plans, a formal two-stage approvals process[4] and annual progress reporting against approved projects. The current SD strategic science plan[5] provides guidance for SD priorities. Within this context, Science Concept Plans (SCP) are developed and submitted to the SD Science Management Team (SMT)[6]. The SCP, usually less than 1000 words, outlines the broad intent, relevance, outputs and budget of a proposed science project. The SMT approves the SCP if the SCP is consistent with departmental priorities (Section 5 above) and divisional

[3] It is acknowledged funding for science is 'technically' to the three output programs of Nature Conservation , Parks and Visitor Services and Sustainable Forest Management

[4] Science Division Guideline Number 7 provides a detailed description of the above requirements

[5] A Strategic Plan for Biodiversity Conservation Research 2008-2017

[6] It is proposed that the Social Science Co-ordinator in PVSD be a *de facto* SMT member for social science R&M.

capabilities. Once approved, a Science Project Plan (SPP) reference number is allocated to the project and the Director (through the Program Leader) then directs the Principal Investigator (PI) to develop an SPP.

The SPP is a detailed account of the rationale, objectives, scientific methods, milestones, science outputs (including science, communication and knowledge transfer outputs[7]), data management, personnel, timing, duration and budget of the project. In some cases, the SMT requests that the SPP be peer-reviewed before being presented to the SMT for approval. Once approved, the SPP reference number and the relevant details of the project are entered into a standard format SPP meta-database. An electronic copy of the SPP is also archived on the SD SPP database (WASPP). Any significant changes to the SPP must be approved by the above process. The major activities, milestones and outputs achieved for each project (listed in the SPP meta-database) are required to be reported annually by the PI against the proposed activities and outputs outlined in the SPP in the SD Annual Research Activity Report which is published in August each year and distributed widely both within and outside of DEC. Personal responsibility for the project is maintained through staff performance management agreements (i.e. EPDP[8]) within all SD Programs. A framework for assessing the productivity of SD scientists[9], and which forms a basis for discussion during annual individual performance appraisals, is outlined in Appendix II. A database of SD publications is maintained in the SD's Kensington library. Large research projects are sometimes required to operate under the direction of a scientific advisory committee that may comprise external specialists.

The SD also has a formal annual process to terminate, suspend and conclude approved science projects. This process ensures that unproductive projects are terminated or suspended, pending a review, to avoid further resources being allocated. At the conclusion of projects, this process ensures data and science and knowledge transfer publications have been appropriately communicated, distributed and archived.

### 7.2 Regional Services Division

In general, the Regional Services Division (RSD) adopts a supportive role for research and a partnership role in monitoring and communication/education with SD. Fire Management Services Branch also undertakes some R&D, especially in the fields of remote sensing and communications technology. While many internally-funded research projects are developed and undertaken in collaboration with SD, some externally-funded research projects, and internally-funded monitoring projects have, in the past, been initiated, developed and implemented by RSD with limited involvement of SD. The administrative arrangements for these projects are largely informal and determined at regional or branch level. The appointment of SD Regional Liaison Officers to all DEC Regional offices in recent years has facilitated better communication, integration and coordination between SD and RSD in this regard.

DEC regional offices also provide support for a variety of externally-funded research and monitoring projects. A recent assessment of current marine science projects being supported by DEC regional offices lists over 30 projects throughout Western Australia. A similar situation exists for terrestrial research and monitoring projects. Many of these projects are initiated by external scientists, often with limited consideration of DEC's science priorities and programs. The RSD involvement in these types of science projects is mostly confined to the provision of cash and/or 'in kind' support and the administrative arrangements of many of these projects are largely informal[10].

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7 Science Division outputs are outlined in Appendix II

8 EPDP = Employee Performance Development Program

9 As well as the standard science outputs (e.g. reports, papers etc) the framework also includes science communication and knowledge transfer outputs, reflecting an increased focus by SD on these important aspects of science delivery

10 Data from RSD supplied by Drew Haswell

The recent development of formal Adaptive Management programs is a mechanism for not only 'learning by doing' and delivering on-ground outcomes, but for integrating the resources of SD and RSD.

### 7.3 Nature Conservation Division

Specialist branches within the Nature Conservation Division (NCD) undertake and/or support a range of research and monitoring to support the branches' primary functions. Current examples include the development and implementation of native vegetation and wetland monitoring programs (Species and Communities Branch), hydrological research to better understand the impacts of dryland salinity on terrestrial biodiversity (Natural Resources Branch), marine habitat mapping and biodiversity surveys for marine park planning (Marine Policy and Planning Branch) and whale monitoring (Nature Protection Branch).

Some of these activities are internally-funded, some are externally-funded and many are both. The projects are usually priority projects identified in departmental strategies[11], management plans or flow from Government commitments[12]. Most of these science projects are administered with limited input from SD and the administrative arrangements are largely informal and determined at the branch level.

### 7.4 Parks and Visitor Services Division

The Parks and Visitor Services Division sponsor social research and undertake monitoring with RSD[13] related to recreation and tourism in WA's terrestrial and marine protected areas. Some of these activities are internally-funded, some are externally-funded and some are both. Many of the research projects are associated with the *Sustainable Tourism CRC*. The projects are usually priority projects identified in departmental strategies[14] and management plans and support the Division's primary functions. Student seed-funding research priorities are determined through the DEC Naturebase Recreation and Tourism Reference Group. The social research and monitoring projects are administered with limited input from SD and the administrative arrangements are largely informal and determined at the divisional level.

### 7.5 Strategic Policy & Programs Division

The Strategic Policy & Programs Division[15] undertakes and/or supports research and monitoring in order to provide the scientific basis for the development and implementation of environmental protection policies (EPP) and for the provision of technical advice to the department and the EPA. The science priorities are largely determined by DEC's and the EPA's strategic needs (e.g. EPPs), in relation to the management of strategic issues (e.g. marine impacts of dredging, clearing of native vegetation) and the assessment and regulation of specific development proposals. The administrative arrangements are informal and largely determined at branch level. However, due to the sensitive nature of many of the issues dealt with by this division, past science administrative arrangements include many of the elements of a 'best practice' approach such as the development of standard procedures and protocols, use of external technical advice in the project planning phase, quality-assured data management and external review of technical publications.

### 7.6 Sustainable Forest Management Division

The Sustainable Forest Management Division (SFMD) undertakes and/or supports research and monitoring in order to provide the scientific basis for the sustainable management of State forests. Science priorities are derived from forest management plans and by internal divisional processes

[11] A 100-year Biodiversity Conservation Strategy for Western Australia; State Salinity Action Plan 1996: Review of the Department of Conservation and Land Management's Programs; Buntine-Marchagee Recovery Plan: 2007-2027.

[12] The marine surveys associated with the Pilbara-Eighty Mile Beach marine parks and reserves process

[13] e.g. VISTAT

[14] A Strategy for Social Science in the Environment

[15] With particular reference to the Marine Ecosystems Branch, Terrestrial Ecosystems Branch and the Air Quality Branch

including the development of Service Priorities as part of the annual budget process, SFM Service Strategic Plan and branch planning documents. The SFMD collaborates closely with the Landscape Conservation Program of SD and with other forest scientists in the SD through a SD / SFM Liaison Committee and this contributes to the development of Service Priorities for science on an annual basis.

The administrative arrangements for science undertaken within SFMD are determined at a divisional level and projects are based on the priorities identified in the SFM Service Strategic Plan and supported by approved project plans. However, due to the sometimes sensitive nature of many of the issues dealt with by this division, past science administrative arrangements include many of the elements of a 'best practice' approach such as the development of standard procedures and protocols, use of external technical advice in the project planning phase, quality-assured data management and external review of technical publications.

## 8. PROPOSED SCIENCE POLICY APPROACH

### 8.1 Objectives

The goal of the science policy is to ensure DEC receives an appropriate return on the department's investment in science. The specific objectives of the science policy are to ensure:

- DEC-funded science is relevant to departmental objectives;
- the quality of science planning, implementation and reporting is high;
- publications and other science, science communication and knowledge transfer outputs[16] are timely and appropriately communicated and distributed;
- the integrity of long-term research and monitoring programs and datasets;
- data (including metadata) are accessible to all, stored and easily retrieved for future application;
- personal responsibility for science investment is promoted via links to staff performance management and through annual reporting requirements; and
- a legacy remains to promote the retention of corporate knowledge and facilitate knowledge transfer and uptake.

### 8.2 Research undertaken by DEC (internally and externally-funded)

The administration of internally-funded and externally-funded[17] research projects undertaken by DEC staff are consistent with the processes currently established within the Science Division as outlined in section 7.1 (above).

### 8.3 Monitoring undertaken by DEC (internally and externally-funded)

The administration of internally-funded and externally-funded monitoring projects undertaken by DEC staff are consistent with the processes currently established within the Science Division as outlined in section 7.1 (above).

### 8.4 Research undertaken by external science providers and supported by DEC

All external research projects that are supported by DEC (i.e. cash and/or '*in kind*' contributions such as staff time, equipment, cars, boats etc) will require a SCP to be developed by a designated project officer and submitted for approval (as in section 7.1) to the appropriate Regional/Branch Manager, on advice from the appropriate SD Regional Liaison Officer/Program Leader, prior to the provision of support. The SCP will specify the DEC staff position (and current incumbent) responsible for the project should support be approved.

[16] See Appendix II

[17] The SD Science Concept Plan and the Science Project Plan requirements will generally meet external funding agency requirements for project specification and planning.

This process will ensure only priority research is being supported, determine the level of departmental support for the project, allocate responsibility, ensure follow-up of research outputs and record details of the research proposal on departmental databases. Science project plans (or equivalent) will be required from external research providers for all projects where the DEC is contributing resources, prior to support being provided, and is required to be forwarded to the designated project officer once the DEC support is approved. The project officer will be required to report on the project each year in the SD Annual Research Activity Report.

### 8.5 Monitoring undertaken by external science providers and supported by DEC

All external monitoring projects that are supported by DEC (i.e. cash and/or '*in kind*' contributions such as staff time, equipment, cars, boats etc) will require a SCP to be developed by a designated project officer and submitted for approval (as in section 7.1) to the appropriate Regional/Branch Manager, on advice from the appropriate SD Regional Liaison Officer/Program Leader, prior to the provision of support. The SCP will specify the DEC staff position (and current incumbent) responsible for the project should support be approved.

This process will ensure only priority research is being supported, determine the level of departmental support for the project, allocate responsibility, ensure follow-up of research outputs and record details of the research proposal on departmental databases. Science project plans (or equivalent) will be required from external research providers for all projects where the DEC is contributing resources, prior to support being provided, and is required to be forwarded to the designated project officer once the DEC support is approved. The Region/District/Branch (via the project officer) will be required to report on the project each year in the SD Annual Research Activity Report.

## 9. ACKNOWLEDGEMENTS

The Science Management Team and the Marine Science Program of the Science Division provided helpful comments on the discussion paper. Drew Haswell provided information on research and monitoring projects being undertaken within Regional Services Division and Ray Masini, John Sutton, Geoff Stoneman and Amanda Smith provided helpful comments on aspects of the discussion paper.

## APPENDIX I: Definitions

***Research*** is about increasing the understanding of: (i) the structure and functioning of ecosystems (i.e. fundamental or strategic research) and (ii) human interactions with the natural environment (i.e. applied research). Research has four generic elements: ***inventory*****:** 'snap-shot' descriptions of the ecological and social assets (or attributes) of an area; ***baseline***: the natural variability, in space and time, of the ecological and social assets; ***process***: research linking natural or human 'forcing factors' with changes in the ecology or human use of an area; the ultimate target being clear cause-effect links but this may not always be possible and ***prediction***: models, risk assessments and other attempts to predict the future responses of natural systems to existing or proposed pressures from natural or human sources.

***Monitoring*** is about measuring trends in the environment, particularly resource *condition*, *pressure* and the effectiveness and efficiency of management *responses*. Ecological monitoring includes monitoring of *reference sites* to assess *natural variability*, routine *surveillance* or ecosystem 'health' monitoring and *compliance* (usually by industry) monitoring. Social monitoring is about measuring trends in human use, attitudes and aspirations. The term "monitoring" in this context includes evaluation and reporting.

***Science communication*** is about transferring scientific knowledge into improved policy, planning and operational management, positively influencing community attitudes and behaviour towards conservation and sustainable use of the environment and influencing the attitudes of politicians, stakeholders, media and industry groups with an aim of building confidence about governance, regulation and the use of science and technology.

**APPENDIX II: Scientist Productivity Review Framework**

**SCIENTIST PRODUCTIVITY REVIEW FRAMEWORK - NAME HERE**

| OUTPUTS for the period ……to…….. | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **SCIENCE** *What did we learn?* | | | **COMMUNICATION** *Who did we tell?* | | | **KNOWLEDGE TRANSFER** *What difference did it make?* | | |
| **Type** | **Purpose** | **Achievements (list titles)** | **Type** | **Purpose** | **Achievements (list titles)** | **Type** | **Purpose** | **Achievements (list titles)** |
| **SPP** | Ensures projects are properly planned, approved and implemented.<br>*Timing: SPP prepared prior to project starting.*<br>*Expectation: See Staff Guideline #17* | | **Media interviews (radio/TV/print)** | Communicates research findings to wider community.<br>*Expectation: Minimum of 1 per year.* | | **Advice (e.g. EIA)**<br>(verbal) | Promotes best practice by DEC<br>*Expectation: On-going, as & when necessary.* | |
| **Data report/ databases** | Ensures project data (incl. data quality statements) are accessible, archived, registered on the Division's meta-database and easily retrievable for alternative and future uses.<br>*Timing: within 3-6 months of data collection ending.*<br>*Expectation: For all approved SPPs* | | **Pamphlets / Information sheets/ Newsletters etc** | Communicates research findings to key internal and external stakeholders and wider community.<br>*Expectation: Minimum of 1 per year.* | | **Advice (e.g. EIA)**<br>(written) | Promotes best practice by DEC.<br>*Expectation: On-going, as & when necessary.* | |
| **Technical report** | Ensures timely delivery of research findings and policy/planning/management implications for departmental purposes.<br>*Timing: within 12 months of data collection ending.*<br>*Expectation: Variable, depending on nature of research.* | | **Briefings / formal discussions etc** (verbal) | Communicates research findings to key stakeholders<br>*Expectation: Minimum of 1 per year.* | | **Planning/ management guideline**<br>(contributing author) | Promotes science-based approach to species and protected area management<br>*Expectation: Minimum of 1 per year.* | |
| **Conference paper** | Ensures accessibility and longevity of research findings to wider scientific community; promotes professional | | **Web-based communications** | Electronic communication of research findings to wider community | | **Planning/ Management guideline** (primary | Promotes science-based approach to species and protected area | |

| OUTPUTS for the period ……to…….. | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | networks etc<br>*Expectation: Minimum of 2 over 5 years* | | | *Expectation: Minimum of 1 per year* | | author) | management<br>*Expectation: Minimum of 1 per year.* | |
| **Journal paper** | Ensures accessibility and longevity of research findings to wider scientific community; promotes DEC science capability; reinforces science-based approach of DEC's conservation programs<br>*Timing: within 3 years of data collection ending.*<br>*Expectation: Minimum of 10 over a 5 year period* | | **Popular article (e.g. Landscope)** | Communicates science findings to wider community<br>*Expectation: Minimum of 1 per year.* | | **Species and protected area management plans**<br>(contributing author) | Ensures science-based approach to conservation planning<br>*Expectation: On-going, as & when necessary.* | |
| **Book chapter** | Contribution to 'big picture' science<br>*Timing: as appropriate.*<br>*Expectation: Minimum of 1 over a 5 year period* | | **Milestone reports** | Communicates progress to external funding agencies<br>*Expectation: For all externally funded projects.* | | **Species and protected area management plans**<br>(primary author) | Ensures science-based approach to conservation planning<br>*Expectation: On-going, as & when necessary.* | |
| **Major review** | Major update and summary of existing knowledge<br>*Timing: as appropriate.*<br>*Expectation: Minimum of 1 over a 10 year period* | | **Conference / seminar / lecture/ workshop abstract and presentation / poster/ formal field days** | Communicates science findings to scientific community / stakeholders<br>*Expectation: Minimum of 5 over a 5 year period* | | **Policy/strategy statement**<br>(contributing author) | Ensures science-based approach to policy/strategy development in DEC.<br>*Expectation: On-going, as & when necessary.* | |
| **Book** | Major contribution of new scientific knowledge<br>*Timing: as appropriate.*<br>*Expectation: Not expected but encouraged* | | | | | **Policy/strategy statement**<br>(primary author) | Ensures science-based approach to policy/strategy development in DEC.<br>*Expectation: On-going, as & when necessary.* | |